NORWEGIAN MINISTRY OF
CLIMATE AND ENVIRONMENT

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Norway's Seventh National Communication

Under the Framework Convention on Climate Change

Photo: Sindre Fosse Rosness

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1 Executive summary

This report is Norway's seventh national communication on national circumstances, policies and measures related to climate change under the Framework Convention on Climate Change (UNFCCC). The previous national communications were submitted in 1994, 1997, 2002, 2006, 2010 and 2014 respectively. The latest National Inventory Report (NIR) for greenhouse gases was submitted in April 2017. Norway ratified the UNFCCC on 9 July 1993. Norway ratified the Kyoto Protocol on 30 May 2002 and became a Party when the Protocol entered into force on 16 February 2005, and ratified the Doha amendment in June 2014. In addition, Norway ratified the Paris Agreement on 20 June 2016.

1.1 National Circumstances

Norway is a constitutional monarchy with a democratic parliamentary system of governance. The current Government which took seat in 2013, is a minority coalition that up to 17 January consisted of Høyre (the Conservative Party) and Fremskrittspartiet (the Progress Party), the Solberg Government, and from 17 January also included Venstre (the Liberal Party). Norway has been part of the European Union's internal market through the Agreement on the European Economic Area (EEA Agreement) since 1994. The objective of the EEA Agreement is to strengthen trade and economic relations between the EEA/EFTA States and the EU Member States, with equal conditions of competition throughout the EEA. The Agreement gives the EFTA countries opportunities to influence EU policy making also in areas of relevance to the internal market, including environmental policies. The Storting (Norwegian Parliament) determines Norway's overall climate policy and the government implements and administers the most important policies and measures.

Most of Norway has a maritime climate with mild winters and cool summers. Because of the influence of the North Atlantic Ocean, Norway has a much warmer climate than its latitudinal position would indicate. During the period 1900-2016, the annual mean temperature in Norway has increased by about 1.1°C.

Norway is a small, open economy. Exports constitute about 35 per cent of Gross Domestic Product (GDP). Production of crude oil and natural gas accounts for 15 per cent of the Norwegian GDP in 2016. The share of oil and gas production in total value added has about halved after the fall in oil and gas prices in 2014 and 2015. While the manufacturing sector is relatively small compared with that of many other countries, the service sector (private and public) accounts for 65 per cent of GDP and over 75 per cent of employment. 30 per cent are employed in the public sector. Emissions were 53.9 million tonnes of CO_2 equivalents in 2015. With a population of around 5.2 million, emissions per capita is about 10.3 tonnes CO_2 equivalents, when the LULUCF sector is excluded. Despite strong economic growth and population growth driven by immigration, Norway's greenhouse gas emissions have remained stable between 53 and 54 million tonnes of CO_2 equivalents since 2012.

Norway's three largest sources of emissions is transport, petroleum activities and manufacturing industry. In 2015, these sources contributed to 81 per cent of Norway's greenhouse gas emissions, respectively 31 per cent from transport (including fishing and motor equipment), 28 per cent from petroleum activities and 22 per cent from industry. Electricity production is almost entirely renewable, and electricity is used to heat buildings and water to a greater extent than in other countries. In addition, the large energy-intensive industry in

Norway is using electricity from the grid rather than producing its own energy from fossil fuels. Norway has a cold climate and many areas that are sparsely populated. Natural conditions and industrial structure therefore leads to a Norwegian energy consumption per capita that is higher than the OECD average.

Emissions from industrial processes and product use were 8.5 million tonnes in 2015, accounting for about 15.7 per cent of total emissions. Metal production, of which most is exported, and use of HFCs are the largest contributors.

Greenhouse gas emissions from transport in 2015 were 16.7 million tonnes CO_2 equivalents, which was almost 31 per cent of the emissions. Norway's decentralized settlement gives rise to a relatively high demand for transport. In addition, the Norwegian economy has a relatively large share that is based on the extraction of raw materials and exports of goods, which means entails a large volume of goods transport. The demand for rapid transport and more frequent deliveries of goods has also been increasing.

Less than 2 per cent of the land is built up. Close to 50 per cent of the mainland consist of mountains and moorlands, of which most is above the tree line. Wetlands and freshwater covers about 11 per cent. Agricultural areas account for only 3.9 per cent of the mainland, while about 38 per cent is covered by forest. About 77 per cent of the forest area is privately owned by persons, with many small properties. In 2016 there were 127.600 forest holdings in Norway with more than 2.5 hectares of productive forest land. Owing to the ownership structure and specific terrain conditions, Norwegian forestry is diversified and characterized by small-scale activity. In 2015, the Land Use, Land-Use Change and Forestry (LULUCF) sector contributed with net removals of 23.4 million tonnes CO_2. These removals are substantial and equal to almost half of total Norwegian greenhouse gas emissions. The average annual net removals from the LULUCF sector was about 21.6 million tonnes CO_2 equivalents per year for the period 1990–2015. Forest land was responsible for the vast majority of the CO_2 removals in 2015, with 29.0 million tonnes CO_2 equivalents that year.

In 2015, agriculture accounted for 8.4 per cent of Norway's emissions of greenhouse gases. The cropland area has remained stable compared to 1990 while the grassland area has decreased by 1.4 per cent compared to 1990. The number of sheep has increased about 10 per cent over the last decade to more than 1.1 million, while cattle has been fairly stable around 0.3 million, with an increase in beef and decrease in milk cows respectively.

Fishing is an important basis for settlement and employment along the Norwegian coast. Emissions from the sector accounted for 1.9 per cent of Norway's total emissions in 2015. The Norwegian fishing and aquaculture industries are among Norway's most important export industries.

1.2 Greenhouse gas inventory information

Norway's national greenhouse gas inventory covers emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and hydrofluorocarbons (HFCs) from 1990 to 2015. Norway prepares its National Inventory Reports (NIR) in accordance with the UNFCCC Reporting Guidelines, and generally, the estimation methods follow the Guidelines for National Greenhouse Gas Inventories published by the Intergovernmental Panel on Climate Change (IPCC). The UNFCCC reviews all parties'

NIRs and emission inventories every year. Norway submitted its latest NIR and Common Reporting Format (CRF) covering the years 1990-2015 to the UNFCCC secretariat on 7 April 2017.

The total emissions of greenhouse gases, measured as CO_2 equivalents, were about 53.9 million tonnes in 2015, and a preliminary total for 2016 from Statistics Norway is 53.4 million tonnes. The total emissions show a marked decrease between 1990 and 1992 and an increase thereafter with small interruptions in 1995, 2000 and 2002. Emissions peaked at 56.8 million tonnes in 2007. Between 1990 and 2015 the total greenhouse gas emissions increased by 2.2 million tonnes, or by 4.2 per cent. The main drivers are the expansion of petroleum extraction, strong income growth and population growth driven by immigration. These factors have led to increased use of fossil fuels, and consequently higher CO_2 emissions.

Norway also monitors emissions of black carbon and organic carbon as well given that these particles have an effect on the climate system as well as on public health. The UNFCCC does not regulate black carbon and it is not included it in Norway's inventory reported to the UNFCCC. For more details, see box 2.

1.3 Policies and measures

1.3.1 Introduction

Norway’s climate policy is based on the objective of the Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement. The scientific understanding of the greenhouse effect set out in the reports from IPCC is an important factor in developing climate policy. Thus, the policies and measures reported are seen as modifying long-term trends in anthropogenic greenhouse gas emissions and removals.

Climate change and emissions of greenhouse gases have featured on the Norwegian policy agenda since the late 1980s. Today, Norway has a comprehensive set of measures covering almost all emissions of greenhouse gases as well as removals. Norway overachieved the commitment for 2008-2012 under the Kyoto Protocol by about 13 per cent and implements its commitments for 2013-2020, having ratified the Doha amendment 12 June 2014.

On 14 June 2016, the Storting (Norwegian parliament) gave its consent to Norway’s ratification of the Paris Agreement, and on 20 June the same year, Norway ratified the agreement. Norway has through its National Determined Contribution (NDC) under the Paris Agreement committed to a target of at least 40 per cent emissions reduction by 2030 compared to 1990. Norway's intention is to fulfil this target jointly with the EU.

In June 2017, the Storting adopted a Climate Change Act (Lov om klimamål) which establishes by law Norway’s emission reduction target for 2030 and 2050, cf box 1. The act will have an overarching function in addition to existing environmental legislation. The Climate Change Act introduces a system of five-year reviews of Norway’s climate targets, based on the same principle as the Paris Agreement. In addition the act introduces an annual reporting mechanism. The Government shall each year submit to the Parliament updated information on status and progress in achieving the climate targets under the law, and how Norway prepares for and adapts to climate change. Information on the expected effects of the proposed budget on greenhouse gas emissions and projections of emissions and removals are also compulsory elements of the annual reporting mechanism. The Solberg government has strengthened the broad political agreement on climate policy that was made in the Storting in 2012, cf. Innst. 390 S (2011-2012). This has been done through specific measures such as a green tax shift, a stepwise increases in the biofuel quota obligation, continued preferential treatment of electric vehicles, the promotion of carbon capture and storage (CCS), forest fertilisation and the restoration of peatlands and other wetlands.

The Solberg government has identified five priority areas for Norway's climate policy: reducing emissions from the transport sector, strengthening Norway's role as a supplier of renewable energy, the development of low-emission industrial technology and clean production technology, environmentally sound shipping and carbon capture and storage. These are all fields where technology development and transfer is needed, and global emissions must be greatly reduced. Another aim is to lay the foundation for new industrial development and a forward-looking business sector.

In June 2017 the Solberg government presented a White Paper on its strategy for fulfilling the 2030 climate target (Meld. St. 41 (2016-2017). The government is working towards an agreement with the EU on joint fulfilment of its 2030 commitment. Norway and the EU already cooperates to reduce emissions through the common Emission Trading Scheme (ETS) and has the same legislation in many areas as a consequence of the EEA (European Economic Area) agreement. Should an agreement on joint fulfilment of the 2030 target be established, Norway would also cooperate with the EU on reducing non-ETS emissions covered by the proposed Effort Sharing Regulation. The Commission's proposal estimates that Norway would be attributed a target for reduction of non-ETS emissions of 40 per cent below the 2005 level in 2030. The Government intends to achieve its 2030 target with main emphasis on domestic emission reductions, and with the use of EU flexibility mechanisms as necessary. The White Paper has not been debated by the Norwegian Parliament.

BOX 1: Norway's climate targets

1. Reduce emissions by 30 % by 2020
2. Reduce emissions by at least 40 % by 2030
3. Climate neutrality by 2030
4. Low-emission society by 2050

The targets are further explained in chapter 4.

When developing its climate policy, Norway also addresses drivers of climate change other than reduction of the greenhouse gases included in Annex A to the Kyoto Protocol. Measures towards certain sources of CO_2 emissions may also have an effect on black carbon emissions and other short lived climate forcers. Reducing black carbon can contribute to the slowing down of global warming, and may in addition have positive health effects.

The Solberg government presented a national strategy for green competitiveness in October 2017. The aim of the strategy is to provide more predictable framework conditions for a green transition in Norway, while maintaining economic growth and creating new jobs. In October the

Solberg government also appointed an expert commission to analyze Norway's exposure to climate risk. The expert commission will submit its report on 14 December 2018.

In September 2017, Norway ratified the Kigali amendment to the Montreal Protocol to phase down hydrofluorocarbons (HFCs). In November 2017, the necessary 20 parties had ratified the amendment and as a result, the agreement will enter into force 1 January 2019. Norway will phase down the consumption of HFCs in accordance with the agreement. Norway already has strong measures in place in the form of tax and regulations, see 4.3.8.10 and 4.3.8.11. The agreement may contribute to a further reduction in national emissions of HFCs.

The Ministry of Climate and Environment has the overarching cross-sectoral responsibility for co-ordination and implementation of the Norwegian climate policy. Other Ministries are responsible for developing and implementing policies in their respective sectors. The Ministry of Finance is responsible for the economic and tax policy, including green taxes. The polluter pays principle is a cornerstone of the policy framework on climate change. The policy should be designed to yield the greatest possible emission reductions relative to cost, and should result in emission reductions both in Norway and abroad. General policy instruments are a key part of the domestic climate policy. Cross-sectoral economic policy instruments (i.e. CO_2-tax) form the basis for decentralized, cost-effective and informed actions, where the polluter pays. In areas subject to general policy instruments, additional regulation should as a main rule be avoided. At the same time, the possibility of employing other policy instruments in addition to emission trading and taxes is to be continued, also in these sectors. In it's White Paper on the 2030 climate strategy (Meld St. 41 (2016-2017)) the Government states that it will promote the use of cost-effective mitigation measures to meet the 2030 commitment. If the CO_2 tax is not considered to be an adequate or appropriate instrument, other instruments that provide equally strong incentives to reduce emissions will be considered, including direct regulation under the Pollution Control Act and voluntary agreements.

1.3.2 Cross-sectoral policies and measures

Over 80 per cent of Norway’s domestic emissions is subject to mandatory emissions trading or a tax on greenhouse gases, or both.

CO_2 taxes were introduced in 1991 as a step towards a cost-effective policy to limit emissions of greenhouse gases. The CO_2 tax is now levied on about 60 per cent of total greenhouse gas emissions. The standard CO_2 tax was NOK 450 per tonne in 2017 and was increased to 500 kroner per tonne in 2018. In its White Paper on the 2030 Climate Strategy the Government states that it will consider the introduction of a flat tax on all non-ETS emissions.

Norway established a national emissions trading scheme in 2005. The scheme closely resembled the EU ETS and covered 11 per cent of total Norwegian greenhouse gas emissions. Emissions already subject to CO_2 tax were not included in the scheme. From 2008, Norway became part of EU ETS, which broadened the scheme to cover nearly 40 per cent of the Norwegian greenhouse gas emissions. In addition to the sectors included in the EU ETS, Norway decided unilaterally to also include from 1 July 2008 nitrous oxide emissions from the production of nitric acid. Starting from 2012, the aviation sector was also included in the scope of the EU ETS in Norway. From 2013, phase III (2013-2020), the coverage of the EU ETS was further expanded, covering both new sectors and gases. From 2013, about 50 per cent of the Norwegian emissions are covered by the EU ETS.

According to The Pollution Control Act, it is prohibited to pollute unless one has a specific permit to pollute according to law or a decision made by the relevant authority. The Pollution Control Act applies also to greenhouse gas emissions. Greenhouse gas emissions are therefore included in the discharge permit which for instance industrial installations are obliged to obtain pursuant to the Pollution Control Act. Hence, to the Pollution Control Act, technological requirements relevant to emissions can be formed as conditions laid in the permit, e.g. requirement to implement carbon capture and storage. This is currently a prerequisite for all new gas fired power plants.

1.3.3 Sector specific policies and measures

Petroleum activities
A CO_2 offshore tax regime was introduced in 1991. The tax regime includes emissions from burning of natural gas and oil and venting in the production phase on the Norwegian Continental Shelf. From 2008 offshore activities were included in the EU Emissions Trading Scheme (EU ETS). More than 90 per cent of the emissions from the sector are covered by the EU ETS. In addition, most of the emissions from the sector is subject to the offshore CO_2 tax.

The CO_2 tax on petroleum activities has been the most important instrument for reducing emissions in the petroleum sector to date, and the impact has been significant. The CO_2 tax and regulations under the Pollution Control Act have resulted in improvements in technology and emission-reducing measures such as the CO_2 storage projects at Sleipner (including Gudrun) and Snøhvit, and the replacement of gas turbines with electricity from the onshore power grid. Since the power production system in Norway is based on hydro power (96% in 2016), providing power supply from the mainland to offshore installations results in significantly lower emissions compared with using offshore gas turbines.

Carbon capture and storage
Carbon capture and storage (CCS) is one of five priority areas for enhanced national climate action. Norwegian CCS activities span a wide range of activities, from research, development and demonstration to large scale projects and international work promoting CCS.

The Technology Centre Mongstad (TCM) is the world's largest facility for testing and improving CO_2 capture technologies. The Norwegian Government has an ambition to realize at least one new full-chain CCS demonstration facility.

Energy and transformation industries
Electricity generation in Norway is almost exclusively renewable. In a normal year, hydro-power constitutes 96 per cent of the electricity generation. In addition, wind power contributes with approximately 2 per cent of the energy generation (normal year average). Norway's thermal power plants account for about 2 per cent of total production capacity. The legal framework encompasses statutes and regulations concerning public ownership of hydropower resources, licenses for the construction and operation of installations and regulations of the power market. The legislation is intended to ensure effective management of resources, and to ensure that various user and environmental interests are heard and considered. A tax on electricity consumption was introduced in 1951. At present an excise duty is levied on electricity supplied in Norway. The excise duty on electricity is mainly a fiscal tax. Since the majority of the stationary energy consumption in Norway is based on electricity generated from hydropower, emissions from energy consumption are very low in Norway compared to most

other countries. Energy efficiency measures and new renewable capacity will therefore have limited effect on emissions in Norway.

The EU renewable energy directive (2009/28/EC) is incorporated into the EEA Agreement. The Norwegian target for renewable energy share is 67.5 per cent by 2020. A common Norwegian-Swedish market for electricity certificates was established 1 January 2012. The electricity certificate system is a market-based support scheme with the objective of increased renewable electricity production.

The excise duty on mineral oils, comprising mostly fuel oils, was introduced in 2000. Norway also has other energy-related taxes. Fuel oils, kerosene and natural gas are subject to CO_2 tax. In June 2017, the Solberg Government put forward a regulation banning use of mineral oil for heating of buildings from 2020.

The Climate and Energy Fund is a government fund owned by the Ministry of Petroleum and Energy. Capital, totaling about NOK 2.8 billion in 2018, is transferred to the fund each year. The state enterprise Enova manages the Climate and Energy Fund. It started its operation 1 January 2002. Enova's obligations are specified in an agreement between the Ministry and Enova. From 2017, Enova's focus has been shifted more towards climate-related activities and innovation, in line with the new agreement for the period 2017–2020. Enova now puts greater emphasis on reducing emissions from the transport sector and other sectors, which are not part of the emissions trading system, and on innovative solutions adapted to a low-emission society. The new agreement between Enova and the Ministry of Petroleum and Energy gives higher priority to reducing and eliminating barriers to new technologies and to promoting permanent market change. In the long term, energy-efficient and climate-friendly solutions should succeed in the market without government support. Pursuant to the changes in government 17 January 2018, the Minister for Climate and Environment is responsible for Enova.

Transport
The tax system is the main instrument for limiting CO_2 emissions from the transport sector, including domestic air traffic. In Norway, a CO_2 tax is levied on mineral products. This entails that petrol and diesel are subject to CO_2 tax, while bio ethanol, biodiesel and hydrogen are not subject to this tax. Currently biodiesel and bioethanol are subject to a road usage tax at the same level as autodiesel and petrol when used to fulfil the quota obligation for biofuels. However, volumes of biodiesel and bioethanol sold beyond the level of the sales mandate are exempted from the road usage tax. In order to increase the use of biofuels, there is also a mandatory biofuels turnover in Norway. A quota obligation was introduced in 2009, committing the economic operators to sell at least 2.5 per cent biofuels. From January 1st 2018, 10.0 volume per cent of the total yearly amount of fuel sold for road transport has to be biofuels. Since January 2014 advanced biofuels are double counted towards the quota obligation. In addition, a sub target was introduced in the quota obligation on January 1st 2017. This amount is 3.5 percentage points of the general quota obligation from January 1st 2018. Since January 2014, sustainability criteria for biofuels must be met by all biofuels and bioliquids that are counted towards the renewable energy targets or part of government support schemes.

Changes in the vehicle purchase tax towards a system that rewards vehicles with low CO_2 emissions and penalizing vehicles with high emissions has contributed to reduced emissions from new cars. The White Paper on Climate Policy (Report no. 21 (2011-2012)) to the

Norwegian Parliament adopted a target where the average emissions from new passenger cars in 2020 shall not exceed an average of 85 grams CO_2/km. In the broad climate agreement the majority in the Norwegian Parliament took note of this goal. From January to November 2017, the average type-approved CO_2 emission from new passenger cars sold has been about 83 grams CO_2/km.

The government has increased its efforts to achieve the goal that the growth in passenger traffic in urban areas shall be met by public transport, cycling and walking. Mobility in urban areas has been improved through targeted investments, better public transport and future-oriented solutions. The nine largest urban areas either have urban environment agreements, urban growth agreements or a reward scheme for public transport, which all share the same common goal of zero growth in passenger traffic by car. These urban areas will soon be negotiating or re-negotiating urban growth agreements. The agreements consist of specific measures and transport projects that are funded by contributions from both the national, regional and local government, as well as road tolls. The broad agreement on climate from 2012 gives high priority to developing a competitive railway transport system for passengers and freight. During recent years the investment in new railways as well as funding maintenance of existing railways has increased substantially.

Norway has for a number of years worked actively through the International Maritime Organization (IMO) to pursue limitation of greenhouse gas emissions from international shipping. Since the last National Communication submitted by Norway, the IMO has adopted energy efficiency requirements which entered into force on 1 January 2013. This framework has been expanded further in 2014, and further tightening of the energy efficiency requirements is under consideration at the IMO. The IMO data collection system which will collect fuel consumption data, was adopted in October 2016, and is expected to enter into force on 1 March 2018. At present Norway is contributing actively to the development of a comprehensive IMO strategy on the reduction of Greenhouse Gases from international shipping.

At the national level, Norway implements all relevant provisions of the IMO to limit or reduce emissions. In addition, Norway has promoted the introduction of battery-electric car ferries through public procurement as a climate measure. Development of more energy-efficient technologies for shipping is also enhanced through research and development programmes under the Research Council of Norway, Innovation Norway and Enova.

The International Civil Aviation Organization (ICAO) has decided that international aviation should achieve carbon neutral growth from 2020. The largest emission challenge in air traffic is related to large aircraft and long-distance flights and Norway therefore welcomes international regulations on international aviation.

ICAO's General Assembly decided in October 2016 on development of a global market-based measure. Norway actively supported this process. Norway will take part in the six year voluntary phase of the market based mechanism from 2021. Norway participates in the EU Emission Trading Scheme (EU ETS) for aviation.

Industry

This sector includes emissions from processes in the manufacturing industries. A number of agreements concerning the reduction of greenhouse gas emissions have been concluded between the industry and the Norwegian Government in specific sectors of industry not covered by the EU ETS or other economic incentives (mainly energy intensive process industry). From 2013, emissions from processes in the manufacturing industries are to a large extent covered by the EU ETS.

The growth in HFC and PFC emissions from product use was slowed after a tax on import and production of HFCs and PFCs was introduced in 2003. In 2004, this tax was supplemented with a refund scheme, which prescribes a similar refund when gas is destroyed. From 2005, increased use due to regulation of ozone-depleting substances has once again led to increased emissions. Combined and over time, these two schemes amount to a proxy tax on emissions of HFC.

Norway has established a CO_2 compensation scheme for the manufacturing industry. The purpose of the scheme is to prevent carbon leakage resulting from increased electricity prices due to the EU ETS. Norway has implemented EU Regulation No. 842/2006 on certain fluorinated greenhouse gases. Measures following the regulation comprise containment of gases and proper recovery of equipment; training and certification of personnel and of companies; labelling of equipment; reporting on imports, exports and production of F-gases; restrictions on the marketing and use of certain products and equipment containing F-gases.

To encourage the Norwegian industry to bring the results from more projects on environmental technology to the market, Norway established an environmental technology scheme in 2010. The scheme aims to promote Norwegian environmental technology in national and international markets and to strengthening the competitiveness of Norwegian industry. See further explanation in chapter 4.3.8.8.

Agriculture
Greenhouse gas emissions from agriculture are mainly associated with methane from animal husbandry and N_2O in connection with nitrogen fertilization. Such emissions are difficult to measure, and are neither covered by the emissions trading system, nor subject to GHG-taxation. The emissions also derive from many small sources, which makes it difficult to include them in an emission trading system. The government will appoint a committee to evaluate introduction of GHG-taxation. However, Norway has implemented measures that affect the emissions from agriculture, through legislation and support schemes as well as information. New measures are outlined in white papers on Agricultural policy and Climate policy from 2016 and 2017.

Forestry
Forests are a major CO_2 sink in Norway, with a net uptake equal to half of our greenhouse gas emissions. Norway has an active forest policy, aimed at increasing forest carbon stocks. Forest resource also constitute an important source of renewable energy, and contributes to production of wooden materials that can replace materials with a stronger carbon footprint. A wide range of measures, including legislation, taxation, economic support schemes, research, extension services and administrative procedures, support the implementation of forest policy and mitigation actions in the forest sector. The current Forestry Act was adopted by the Norwegian Parliament in 2005 and came into force in 2006. Its main objectives are to promote sustainable management of forests. The Forestry Act applies to all categories of ownership. Funding of forest related mitigation efforts has increased substantially since the sixth National Communication in 2014. Norway now has economic support schemes for new activities like

improved seedling density, enhanced breeding of forest seedlings, and forest fertilization. With time, this will lead to an increased carbon uptake in forests, and to greater availability for environmentally friendly raw materials.

Waste

The main goal of the Norwegian waste policy is that waste is to cause the least possible harm to humans and the environment. Further, the growth in the quantity of waste generated is to be considerably lower than the rate of economic growth, and that the resources found in waste should be utilised as far as possible by means of waste recovery. Furthermore, the amount of hazardous waste is to be reduced, and hazardous waste dealt with in an appropriate way. The measures for reducing greenhouse gas emissions are to a large degree concurrent with measures for increasing recovery. The ban on deposition of biodegradable waste and methane recovery from landfills are important measures to limit greenhouse gas emissions. The most important measures are regulations under the Pollution Control Act.

1.4 Projections and the effects of policies and measures and the use of Kyoto Protocol Mechanisms

In the baseline scenario, total greenhouse gas emissions excluding LULUCF are projected to decline from the 2015 level to 51.8 Mt in 2020 and to continue this trend to 48.3 Mt in 2030. CO_2 sequestration mainly in managed forests will continue to be major compared to other sectors, although it is expected to decline in the decades to come. Net CO_2 sequestration in the LULUCF sector in 2030 is still projected to be equivalent to more than two fifths of greenhouse gas emissions in other sectors. Including LULUCF, emissions in 2020 and 2030 are projected at 28.4 and 27.1 million tonnes CO_2 equivalents, respectively as compared with 41.3 million tonnes in 1990.

There are considerable methodological difficulties in calculating the effect of policies and measures ex post, including establishing a hypothetical baseline and obtaining relevant data, and with multiple measures and policies covering the same emission sources. Nevertheless, effects are estimated for a number of policies and measures, including the most significant ones. According to the estimates, the projected GHG emissions in 2010 would have been 13-16 million tonnes CO_2 of equivalents higher than observed, if these policies and measures had not been implemented. This corresponds to about 25 per cent of actual emissions this year. It is estimated that GHG emissions would be 19.5-23.3 million tonnes of CO_2 equivalents higher than in the baseline in 2020 and 21.3-25.7 million tonnes higher in 2030.

Norway overachieved its commitment under the Kyoto Protocol's first commitment period (2008-2012) by about 13 per cent. Average annual emissions excluding the LULUCF sector were about 53.4 million tonnes (1996 GWPs) and the assigned amount 50.1 millions. Acquisition of Kyoto units through participation in the European Emissions Trading System was sufficient to ensure compliance. The state purchase program acquired enough units (mainly CERs) to realize the domestic target of overachieving the commitment for 2008-2012 by 10 per cent. Furthermore, issuance and cancellation related to RMUs under Article 3.4 added another 3 percentage points.

Norway's commitment under the Kyoto Protocol for the second commitment period (2013-2020) is that average annual emissions of greenhouse gases shall be limited to 84 per cent of emissions in 1990. Policies and measures needed to comply with this commitment represent a continuation from the first commitment period, balancing domestic measures with utilization of the Kyoto mechanisms. On average, the need for acquisition is about 9 Mt/year. Accounting for LULUCF activities under the Kyoto Protocol is expected to result in a small net emission despite significant overall sequestration. Participation in the European ETS is expected to result in a net acquisition of Kyoto units. The programme for the procurement of CERs from the CDM aims at acquiring 60 Mt for the period 2013-2020 and has contracted most of this volume.

1.5 Vulnerability assessment, climate change impacts and adaptation measures

As a political goal, Norwegian society will prepare for and adapt to climate change.

Projections[1] indicate a warming in all parts of Norway and during all seasons. The annual mean temperature for Norway is estimated to increase by 3.4 (2.3-4.6) ºC up to the year 2100. The growing season is projected to increase over large parts of the country. Annual and seasonal precipitation is also projected to increase. The annual runoff from the Norwegian mainland is estimated to increase, but regional differences can be expected. The snow season is projected to become shorter, and rainfall floods can be expected to increase. Higher temperatures and somewhat lower precipitation during the summer season may lead to reduced streamflow and increased soil moisture deficit. This will result in more serious summer droughts, particularly in Southern Norway. Medium climate projections for the period 2071–2100 indicates that 90 per cent of all the glaciers in Norway may melt completely, and 30–40 per cent of the total glaciated area may be gone by the year 2100. Climate change will also affect the oceans along the Norwegian coast. Over the course of the 21st century, the surface temperature and the sea level is expected to rise, and ocean acidification is expected to accelerate.

In recent decades, temperatures in the Arctic have been rising twice as fast as the global average. The annual mean temperature in the region is two degrees higher than it was one hundred years ago, and the IPCC states that this trend will continue. Modelling results and the observed rapid reduction of summer sea ice extent and sea ice thickness indicate that the Arctic seas may be almost ice-free in summer by the middle of this century

Climate change has impact on terrestrial, marine and fresh water ecosystems and increases the overall strain on the environment. Effects on the ecosystems are already observed, such as earlier arrival of migrating birds, earlier budding and pollen production, and plant species expanding northwards. The environment is affected in various ways by human activities through land and resource utilisation, transport and pollution. These activities and climate change affect ecosystems separately and in combination, and in some cases they are mutually reinforcing.

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[1] Hanssen-Bauer, I., H. Drange, E. J. Førland, L. A.Roald, K. Y. Børsheim, H. Hisdal, D.Lawrence, A. Nesje, S. Sandven, A. Sorteberg, S. Sundby, K. Vasskog, B. Ådlandsvik (2009) "The climate in Norway in 2100. Background material for the Official Norwegian Report on Adaptation to Climate Change." The Norwegian Climate Centre, September 2009, Oslo

The Norwegian society is in a good position to adapt to the effects of climate change. Future vulnerability, however, will be influenced by the extent to which climate change considerations are incorporated into planning and decision-making processes in all areas and at all levels of society. Climate affects all areas of society, but in different ways, to different extents and at different timescales. The natural environment, infrastructure and buildings, in particular water and sewage, are particularly vulnerable to climate change in Norway.

Climate change is a shared responsibility. Everyone – individuals, business and industry and the authorities – is responsible for assessing and addressing the impacts of climate change on their areas of competence. In line with the principle of responsibility, all ministries have responsibility to safeguard consideration for climate change within their sector.

The authorities are to provide national statutes, regulations and guidelines in order to facilitate all actors, both individuals, buisness, industry and the authoreties to adapt to a changing climate. The municipalities play an important role in climate change adaptation, as a number of the challenges will be at a local level. Land-use planning is one of the core elements of this responsibility.

Since the release of Norway's Sixth National Communication in 2014, Norway has passed several milestones in its work related to climate change adaptation, and important progress has been made on local to national administrative levels and across different sectors. Projections of climate change for Norway have been updated, an Official Norwegian Report (NOU) concerning urban storm water management has been published, and the development of guidelines on how to integrate climate change adaptation into municipal planning activities is under way. Capacity building has been strengthened through networks, cooperation and other activities related to climate change adaptation. Climate change adaptation is also integrated into strategies and action plans within and across relevant sectors, such as in the recently adopted White Paper *Risk in a Safe and Secure Society* (Meld.St. 10 (2016-2017)), where climate change is considered one of the major threats to the Norwegian society.

1.6 Financial resources and transfer of technology

Norway provides a wide range of financial, technological and capacity building support to developing countries in order to build their capacity to reduce greenhouse gas emissions and to adapt to climate change.

Historically Norway has been a major contributor of climate finance to developing countries. Norwegian total ODA has exceeded 0.7 per cent of Gross National Income (GNI) for many years. The volume of the Norwegian ODA budget has steadily increased as the economy has been growing. The increase has covered the increase in climate finance. In 2016, total public development climate finance amounted to NOK 4 339 million.

Norwegian climate finance is mainly concentrated in three areas; reducing emissions from deforestation and forest degradation, renewable energy and climate adaptation including risk reduction.

Norway is involved in development cooperation in areas where it has particular expertise: renewable energy (especially hydropower), long-term management of natural resources and competence- and capacity-building in the field of environmental policy. The choice of focus is based on the conviction that extensive energy efficiency measures, a marked rise in the use of renewables, and carbon capture and storage will all be necessary for the achievement of the 2 ºC target.

Norway's International Climate and Forest Initiative (NICFI) constitutes by far the largest part of Norway's mitigation assistance. The Initiative supports development of an international REDD+ architecture for achieving cost-effective and verifiable reductions in greenhouse gas emissions from deforestation and forest degradation in developing countries (REDD+). The initiative promotes the development of international climate finance mechanisms and works closely with other donors, multilateral organizations and REDD+ countries to reach its goals.

1.7 Research and systematic observation

The Norwegian long-term plan for research and higher education 2015–2024 has three objectives: competitiveness and innovation, tackling major social challenges and developing outstanding research communities. The objectives are inter-connected.

Climate, environment and clean energy is a priority area. Particularly important are the transition to a low-emission society and improving understanding of climate change and good practices for adaptation.

Funding for research and development has been strengthened the last years in all phases from research to pilot projects. In 2017 the funding for low-emission-research was strengthened with 71.5 million NOK, focusing on technologies for transport and agriculture. Renewable energy and carbon capture and storage are other areas given high priority. Regarding climate related research, the Research Council of Norway covers all disciplines and broad categories of climate research, i.e. the climate system and how it changes, the effects of the changes on society and nature and how society can transform to meet climate challenges. The total funding through the Research Council related to climate research, including low emission energy was approximately NOK 1.2 billion NOK in 2016, a substantial increase since 2008.

Norwegian climate researchers are active in international research co-operation, e.g. under the Nordic framework, and Horizon 2020, EUs Research and Innovation programme (2014-2020). A number of Norwegian researchers serve as authors for the Intergovernmental Panel on Climate Change (IPCC) working group reports.

Polar research is given high priority. Within the Polar Research programme it is estimated that approximately 80 per cent of the projects are within climate research. In 2017, the Research Council completed an international evaluation of Norwegian polar research. The evaluation committee found that Norwegian polar researchers publish world-class publications in many areas, such as the Arctic climate system and biogeochemical environment.

The Norwegian Environment Agency is responsible for management and funding of a number of environmental monitoring programmes. One of the monitoring programs that is conducted by the agency includes the monitoring of greenhouse gases, ozone layer thickness, UV-radiation levels, aerosols and other air pollutants. Other monitoring programs that relate to climate change includes coastal monitoring of flora and fauna, ocean acidification and terrestrial observations. The Norwegian Meteorological Institute (MET Norway) provides expertise on climate conditions on the global and national scale and provides climatological information for monitoring and planning purposes, and as input to the formulation of national climate policies. The Norwegian Institute for Air Research (NILU) has the main responsibility for performing the monitoring of greenhouse gases and aerosols (particles) in the atmosphere above Norway. The Institute of Marine Research (IMR) has an extensive monitoring programme on physical and biological oceanographic parameters. The Norwegian Mapping Authority (NMA) provides expertise on tides, sea level extremes (storm surges), reference levels for use in planning, and observed and projected changes in sea level. Norway has a great amount of terrestrial monitoring programmes that include climate parameters or indicators, which also may be used to evaluate the effects of climate change. Long-term monitoring programs of several glaciers on the Norwegian mainland is performed mainly by the Norwegian Water Resources and Energy Directorate (NVE).

1.8 Education, training and public awareness

Education, training and public awareness have been important elements of the Norwegian climate policy since the 1990s. Several activities have been initiated to give the general public a better understanding of climate change and its effects. Awareness of issues related to sustainable development and climate change has long been embedded in the Norwegian system of education. Awareness of issues related to sustainable development and climate change has long been embedded in the Norwegian education system. Norway takes part in the 2030 Agenda for Sustainable Development and UNESCO's the Global Action Programme on Education for Sustainable Development.

In 2017, the Solberg Government decided on a new broader part of the curriculum for Primary and Secondary Education. This broader part defines important values and principles for Norwegian schools. Respect for nature and sustainability are key values included in the new broader part of the curriculum.

The Sustainable backpack is an initiative between the Ministry of Education and Research and the Ministry of Climate and Environment in order to better implement sustainable development into mainstream education at schools. It has been developed in close cooperation with the NGOs.

The Environmental Information Act entered into force on 1st January 2004. It provides all citizens with a legal right to obtain environmental information, both from public authorities and from public and private enterprises. The Ministry of Climate and Environment works through many channels to enhance public awareness of issues related to climate change, and has built up extensive information resources on the Internet. News, publications, press releases and other relevant information are published on the Ministry’s website www.miljo.no. Another important website is State of the Environment Norway, www.environment.no. Statistics Norway publishes statistics on important natural resources, different types of environmental pressure, pollution such as releases to air and water, and waste management.

Norway aims to achieve a high degree of transparency in environmental policymaking and implementation of regulations. Norwegian environmental authorities have a long tradition of including civil society in environmental policymaking. Norway provides annual financial support to a number of NGOs listed in the Government’s annual budget. The Ministry of Climate and Environment also provides financial support for Norwegian NGOs to participate in different international meetings. Norway also aims to involve NGOs in the preparations for such meetings, and to enable them to contribute actively during the meetings.

2 National circumstances relevant to greenhouse gas emissions and removals

2.1 Government structure

Norway is a constitutional monarchy with a democratic parliamentary system of governance. The current Government (the Solberg Government), since October 2013, is a minority coalition that up to 17 January consisted of Høyre (the Conservative Party) and Fremskrittspartiet (the Progress Party), and from 17 January also included Venstre (the Liberal Party). The Storting (Norwegian parliament) determines Norway's overall climate policy and the government implements and administers the policies and measures.

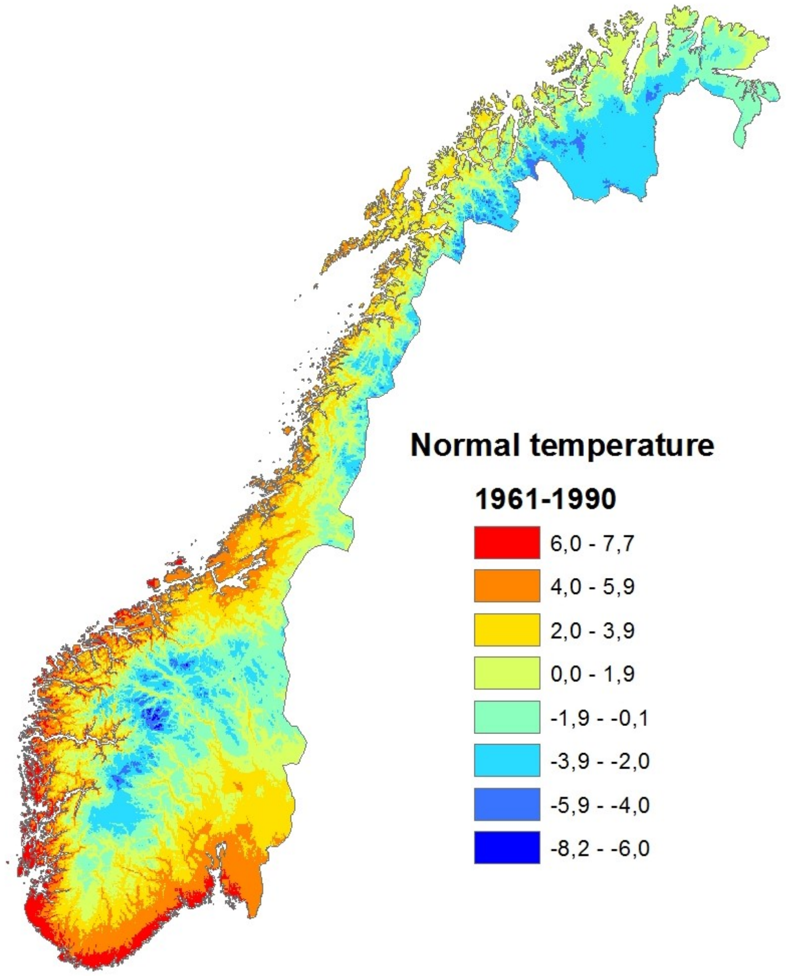
Although it is not a member of the EU, Norway has, since 1994, been part of the European Union's internal market through the Agreement on the European Economic Area (EEA Agreement). The objective of the EEA Agreement is to promote a continuous and balanced strengthening of trade and economic relations between the EEA/EFTA states and the EU member states, with equal conditions of competition throughout the EEA (see Article 1 of the EEA Agreement). The agreement institutionalises a regular consultation process with the EFTA countries, giving them opportunities to influence EU policymaking also in areas of relevance to the internal market, including environmental policies. A practical implication of the EEA agreement is that Norway adopts the same legislation as EU where relevant. Details on legislation relevant to climate change are given in chapters 3 and 4.

2.2 Geographic profile and land use

The mainland of Norway is 1 752 km from north to south, spanning about 13 degrees of latitude. The total area of the mainland is 323 781 km^2. In addition, the Norwegian continental shelf is 2 039 951 km^2. The mainland coastline is more than 2 500 km long, excluding fjords and bays. In the east, Norway shares borders with Sweden, Finland and Russia. In addition, the Arctic archipelago of Svalbard is under Norwegian jurisdiction. Emissions from Norwegian activities in Svalbard are included in the Norwegian emission inventories.

Most of Norway has a maritime climate with mild winters and cool summers. Because of the influence of the North Atlantic Ocean, Norway has a much warmer climate than its latitudinal position would indicate. On annual basis, the highest normal (1961- 1990) annual air temperatures, (up to 7.7°C) are found along the south-western coast (see Figure 2.1). Outside the mountain regions, the lowest annual mean temperatures (down to -3.1°C) are found on the Finnmark Plateau. During winter, the coast from Lindesnes to Lofoten has normal monthly mean temperatures above 0°C. The absolute lowest and highest temperatures measured at official weather stations on the mainland are -51.4°C and +35.6°C, respectively.

Figure 2.1 *Normal annual temperature in Norway 1961-1990*

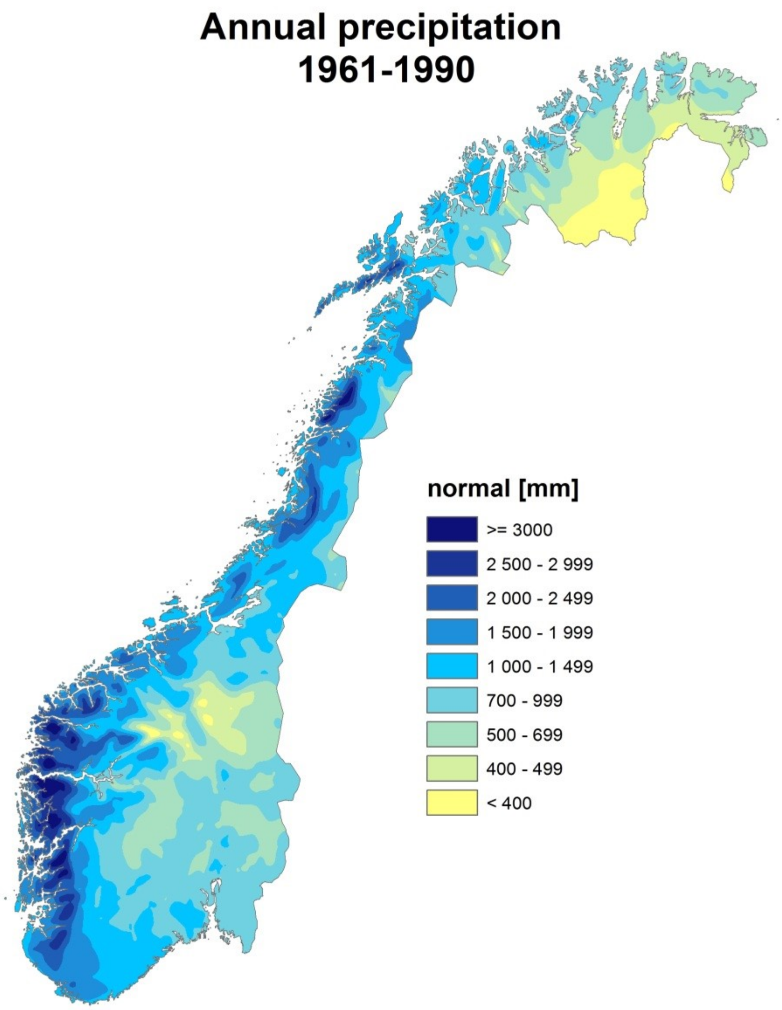


Source: Norwegian Meteorological Institute

In the cool Norwegian climate, there is a substantial need for heating of buildings. The "heating season" (defined as the period of the year with a daily mean temperature lower than 10°C) lasted during 1961-1990 around 240 days in coastal lowland areas. In mountain areas and northernmost parts of Norway, the "heating season" lasts the whole year through.

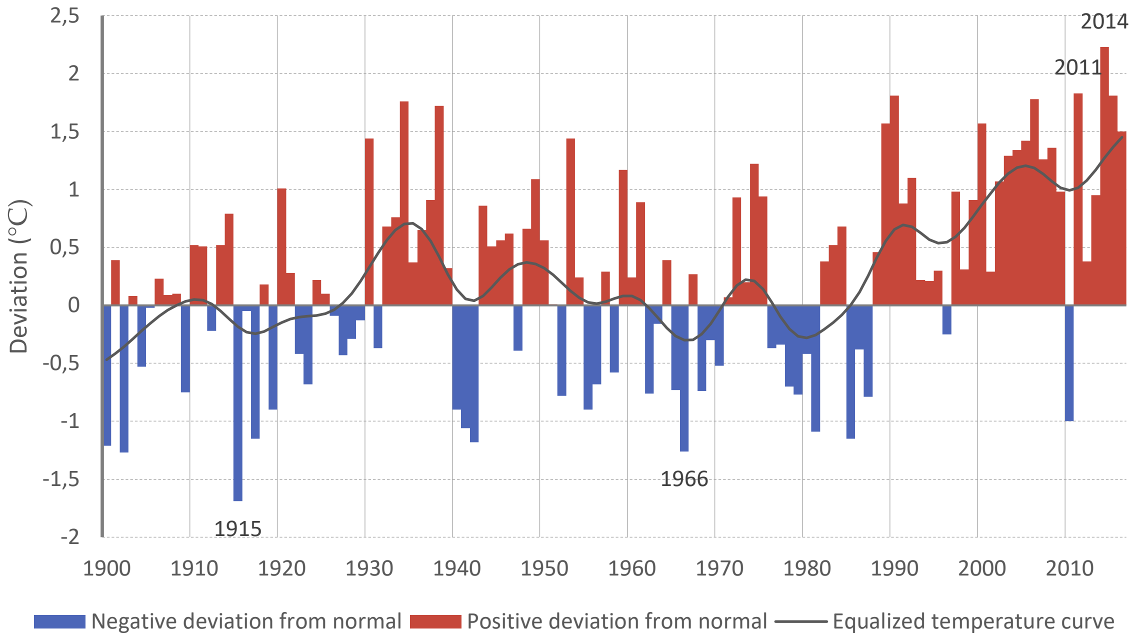
Because of prevailing westerly winds, moist air masses flow regularly in from the ocean giving abundant precipitation over most of Norway. Areas just inland of the coast of western Norway get the most precipitation (see Figure 2.2). This zone of maximum precipitation is one of the wettest in Europe, and several sites in this region have normal annual precipitation of more than 3500 mm. On the leeward side of the mountain ranges, the annual precipitation is much lower, and a few sheltered stations in the inland areas of south-eastern Norway and on the Finnmark Plateau have normal annual precipitation less than 300 mm.

Figure 2.2 *Normal annual precipitation in Norway 1961-1990*



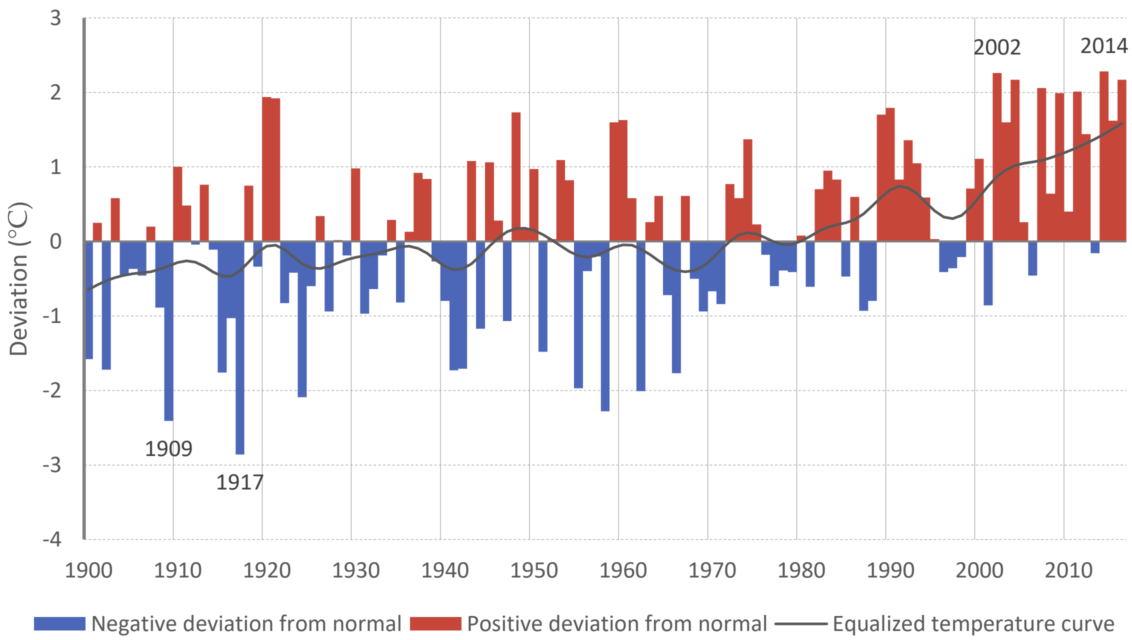
Source: Norwegian Meteorological Institute

Figure 2.3 *Annual temperatures for the Norwegian mainland 1900-2016, deviation from the 1961-1990 normal.*



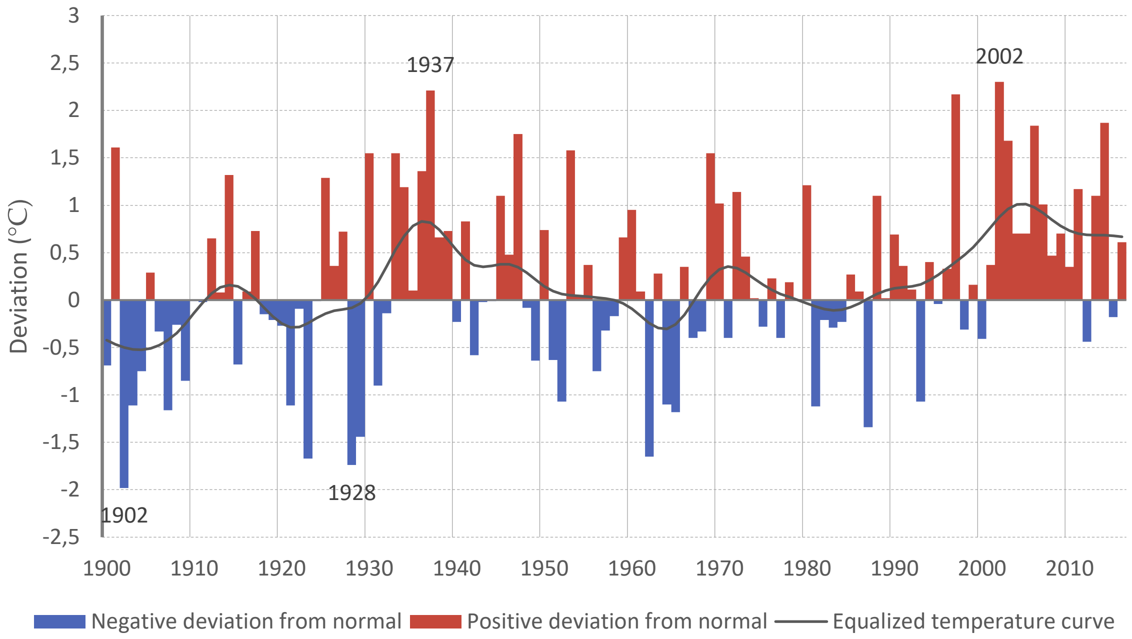
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.4 *Spring temperatures for the Norwegian mainland 1900-2016, deviation from the 1961-1990 normal.*



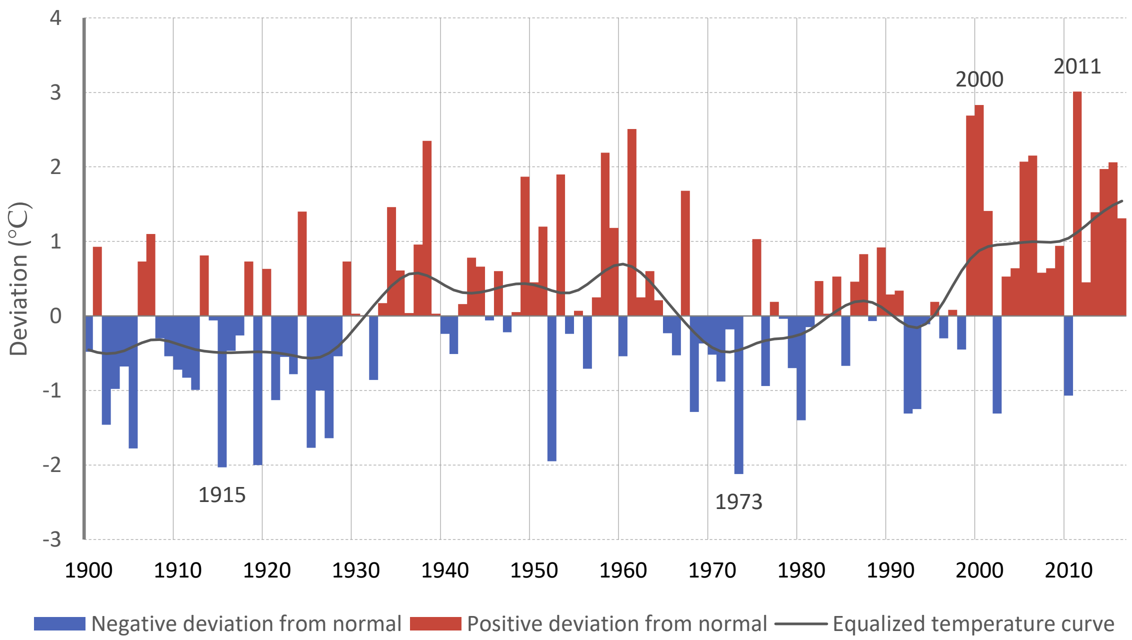
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.5 *Summer temperatures for the Norwegian mainland 1900-2016, deviation from the 1961-1990 normal.*



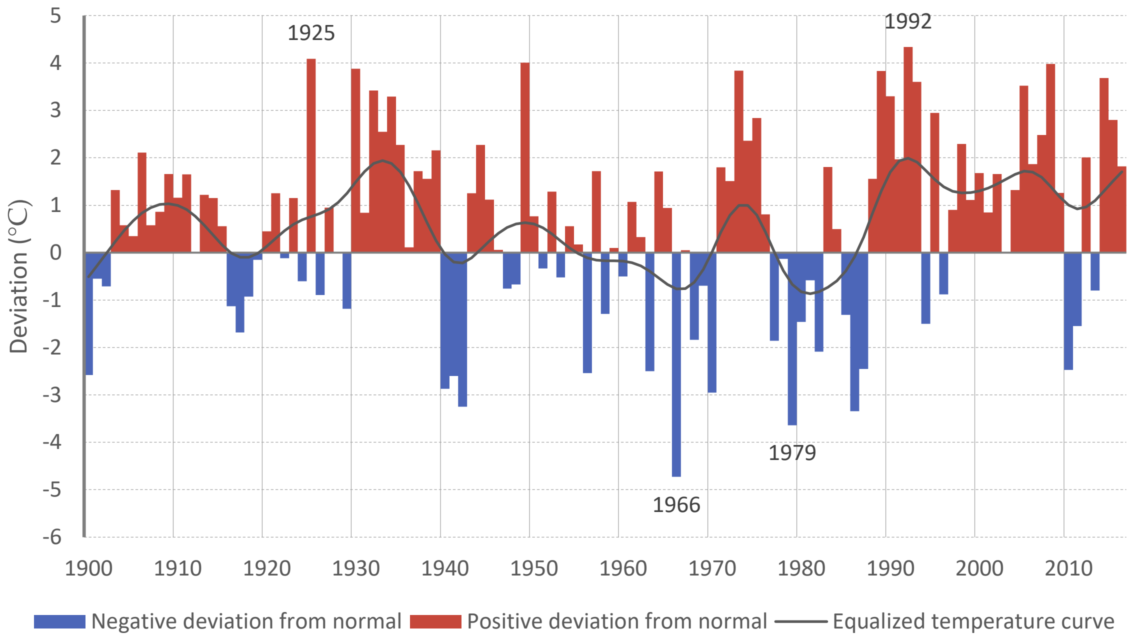
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.6 *Autumn temperatures for the Norwegian mainland 1900-2016, deviation from the 1961-1990 normal.*



Source: eKlima.no, Norwegian Meteorological Institute

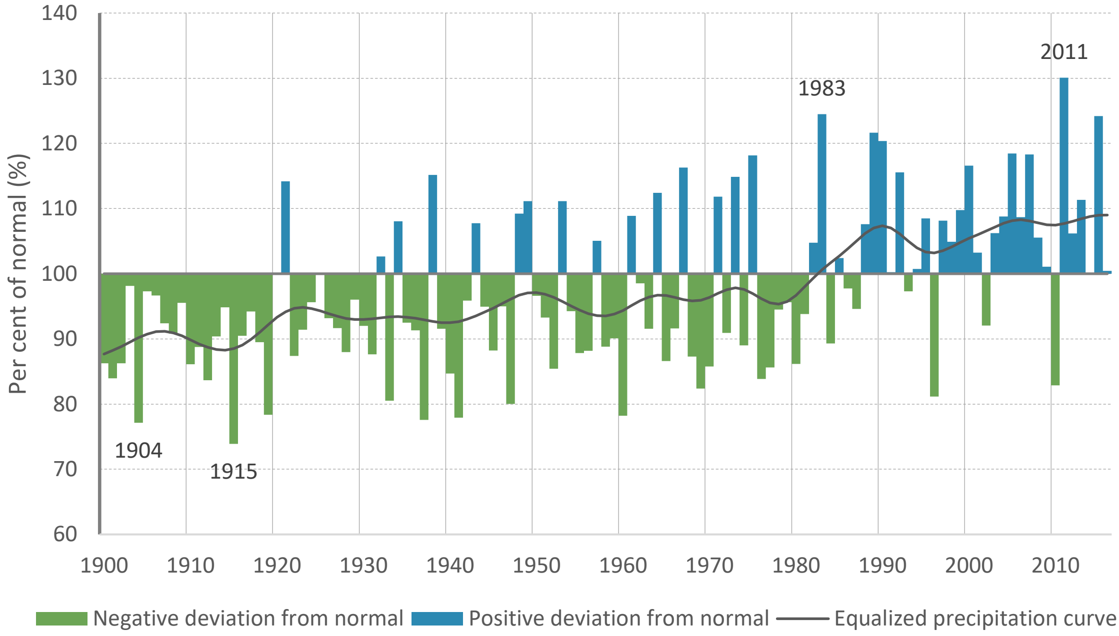
Figure 2.7 *Winter temperatures for the Norwegian mainland 1900-2016, deviation from the 1961-1990 normal.*



Source: eKlima.no, Norwegian Meteorological Institute

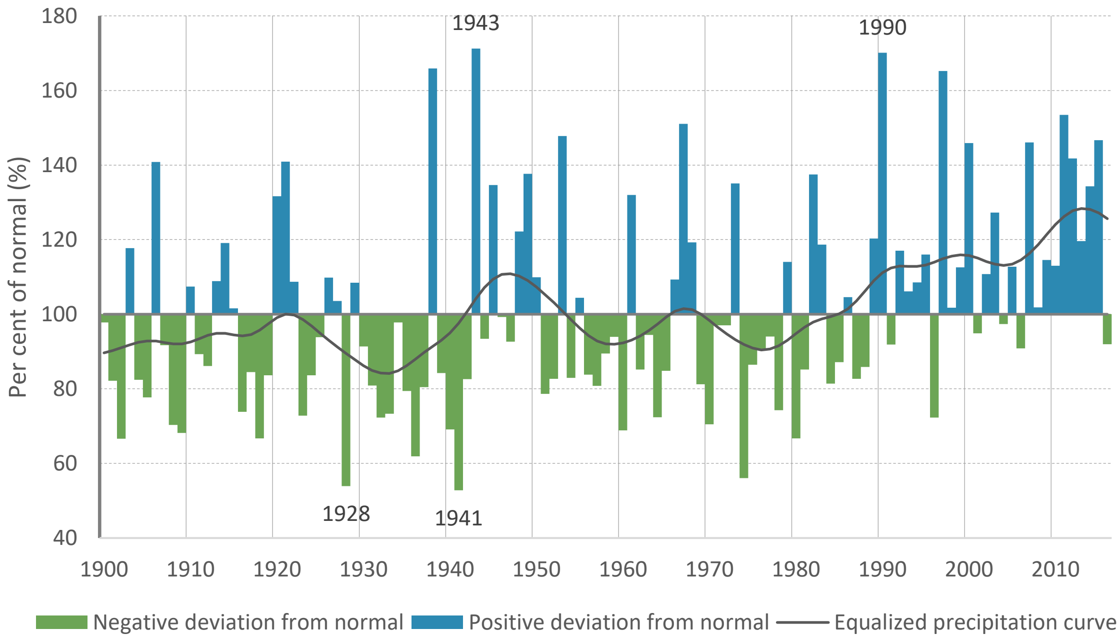
The figures (2.3 – 2.7) on annual and seasonal temperature anomalies show deviations (°C) relative to the 1961-1990 average. The smoothed black curves in Figures 2.3 to 2.7 show decadal scale variability, while the bars indicate values for the individual years.

Figure 2.8 *Annual precipitation for the Norwegian mainland 1900-2016, per cent of the 1961-1990 normal.*



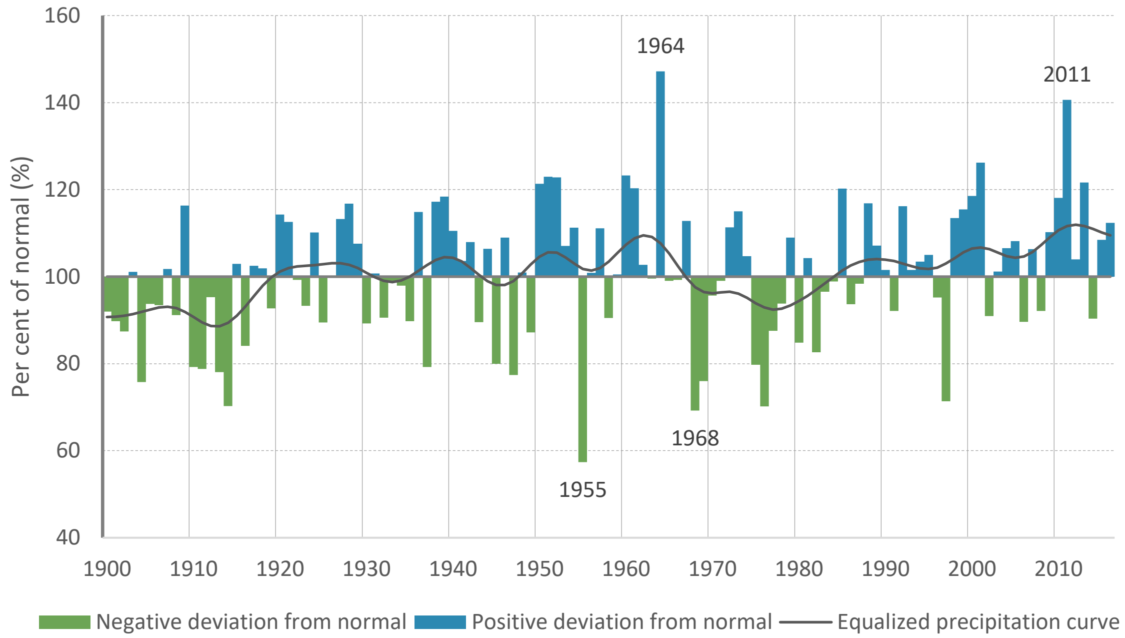
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.9 *Spring precipitation for the Norwegian mainland 1900-2016, per cent of the 1961-1990 normal.*



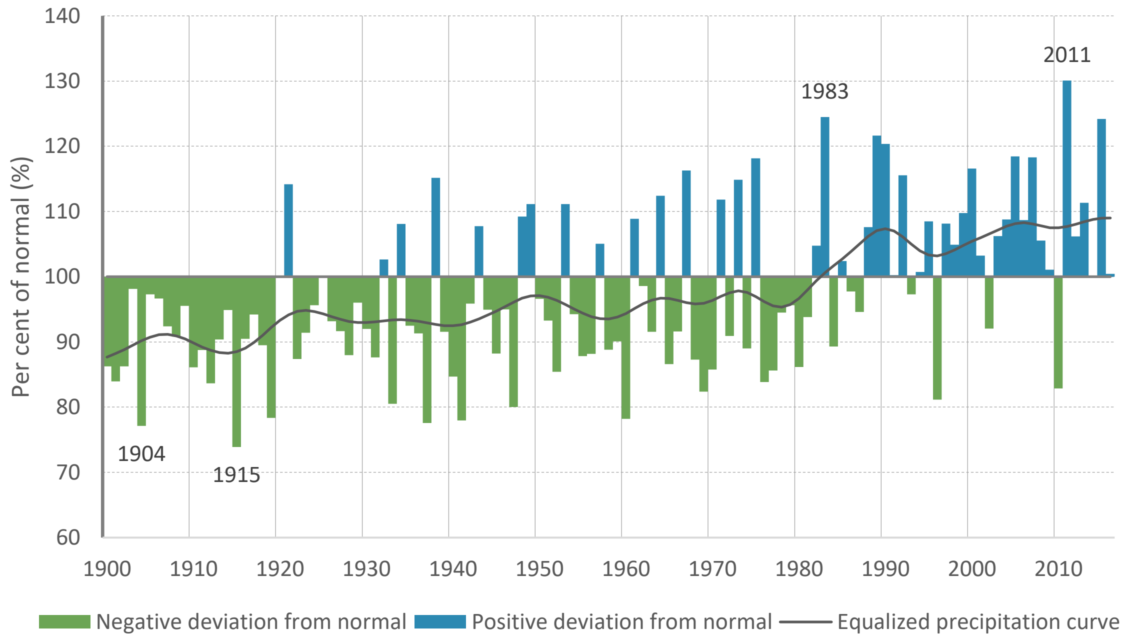
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.10 *Summer precipitation for the Norwegian mainland 1900-2016, per cent of the 1961-1990 normal.*



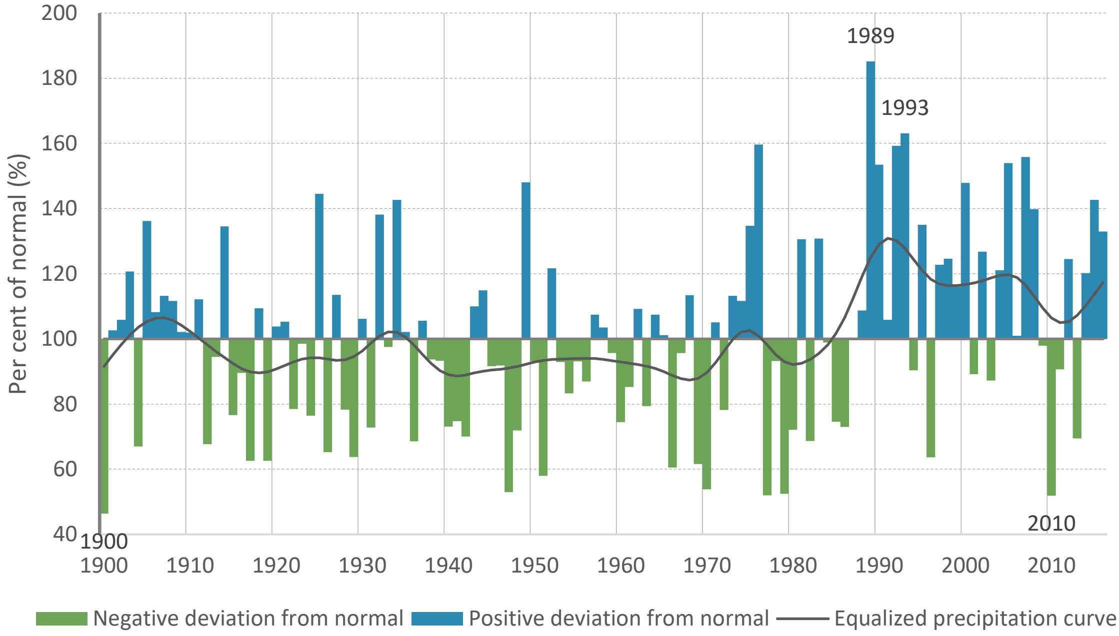
Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.11 *Autumn precipitation for the Norwegian mainland 1900-2016, per cent of the 1961-1990 normal.*



Source: eKlima.no, Norwegian Meteorological Institute

Figure 2.12 *Winter precipitation for the Norwegian mainland 1900-2016. In per cent of the 1961-1990 normal.*



Source: eKlima.no, Norwegian Meteorological Institute

The figures on annual and seasonal precipitation (Figures 2.8 to 2.12), show the values in per cent of the 1961-1990 average. The smoothed black curves in the figures show decadal scale variability, while the bars indicate values for the individual years.

The graphs in figures 2.3-2.12 show area-weighted variations in temperature and precipitation for the Norwegian mainland. Both annual as well as for every season temperatures have increased since the 1970s. The annual precipitation has also increased since the 1970s, particularly in the spring season.

During the period 1900-2016, the annual mean temperature in Norway increased about 1.1°C. The temperature increase has been largest in spring in the northern parts of Norway. The annual precipitation increased by about 18 per cent during 1900-2014. The largest increase is observed during spring and the smallest during summer.

In Svalbard, observations from the last hundred years show positive trends in temperature and precipitation. From 1900 to 2016 the temperature at Svalbard Airport increased by 3°C, although not linearly and with large variations on a yearly and decadal scale. The largest increase has been observed during the winter season the last 50 years, at 2-3°C per decade. Observations indicate an increase in precipitation in Longyearbyen of 20-30 per cent from 1900 to 2016.

The long and narrow shape of Norway results in wide variations in climate, geology and topography. This gives large variation in conditions for land use. About 30 per cent of the area lies 0–299 meters above sea level, and this is where most people live and where agricultural production is most intensive. As much as 20 per cent of the land area lies 900 meters above sea level or more. Agricultural areas account for only 3 per cent of the mainland, while about

37 per cent is covered by forest. The remaining area consists of other cultivated land, scrub, and heath along the coast, mountain forest and marginal forest, and sparsely vegetated mountains and mountain plateaus. About 46 per cent of the land is above the tree line. Currently, 17.1 per cent of the land area is protected under the Nature Conservation Act. Nevertheless, the proportion of wilderness-like areas, defined as areas more than 5 km from major infrastructure development, has been reduced dramatically from about 48 per cent of the land area in 1900 to about 12 per cent today. Only about 5 per cent of the area of southern Norway is characterised as wilderness-like.

2.3 Population and urban profile

With a total area of almost 324 000 km^2 and only 5.3 million inhabitants, Norway has the lowest population density in Europe after Iceland. The large majority of the Norwegian population is settled along the coast and the fjords, and an increasing percentage, at present about 80 per cent of the population lives in urban settlements. Most of the urban settlements are small e.g. under 20,000 inhabitants. Only six areas – Oslo, Bergen, Stavanger/Sandnes, Trondheim, Fredrikstad/Sarpsborg and Drammen – have more than 100,000 residents. More than a third of Norway's population lives in the six largest city areas. Population has grown about 25 per cent from 4.2 million in 1990 to almost 5.3 million in 2017.

2.4 Economic profile and industry

Norway is a small, open economy. Exports constitute about 35 per cent of GDP. Together with foreign shipping, the production of crude oil and natural gas account for 15 per cent of GDP in Norway, but only a small proportion of employment, see Table 2.1. The share of oil and gas production in total value added has about halved after the fall in oil and gas prices in 2014 and 2015. While the manufacturing sector is relatively small compared with that of many other countries, the service sector (private and public) accounts for 65 per cent of GDP and over 75 per cent of employment. Some 30 per cent are employed in the public sector.

Table 2.1 *GDP and employment by sector in 2016*

	GDP NOK millions	Proportion	Employed 1000 persons	Proportion
Total	2758504	1.00	2764	1.00
Primary industries	66499	0.02	70	0.03
Offshore activity and foreign shipping	415743	0.15	89	0.03
Manufacturing and mining	215263	0.08	238	0.09
Electricity and water supply	82311	0.03	29	0.01
Building and construction	189025	0.07	228	0.08
Service activities	1203226	0.44	1274	0.46
General government	586437	0.21	836	0.30

Source: Statistics Norway.

Few countries have benefitted more from cross-border trade and investments than Norway. Globalization facilitates access to financing, capital and labour inputs, export markets, technological transfers, and increases competition. The result is a more efficient use of available resources, which has contributed to a doubling of average global per capita purchasing power over the past 45 years. From the turn of the century until oil prices started falling in mid-2014, Norway also benefitted from rising export prices and falling import prices. Accordingly, Norway's terms of trade has improved and real disposable income has grown fast and resulted in high revenues for the state and companies and strong growth in real household earnings.

The petroleum industry has for several decades been a key driver for economic growth in Norway. Demand from this industry has stimulated activity in the mainland economy and generated high incomes and an ever-increasing number of well-paid jobs. The oil price decline three years ago spurred an economic setback, and the Norwegian economy was for a long time characterised by low income growth, redundancies and increasing unemployment. This has now turned into an economic recovery that has gradually strengthened. Businesses across the country are reporting of higher production. Households have also become more optimistic over the last year. Growth in the Norwegian economy has outpaced expectations in 2017, and unemployment is declining. Low interest rates, a distinct improvement in competitiveness and expansionary fiscal policy have been important drivers.

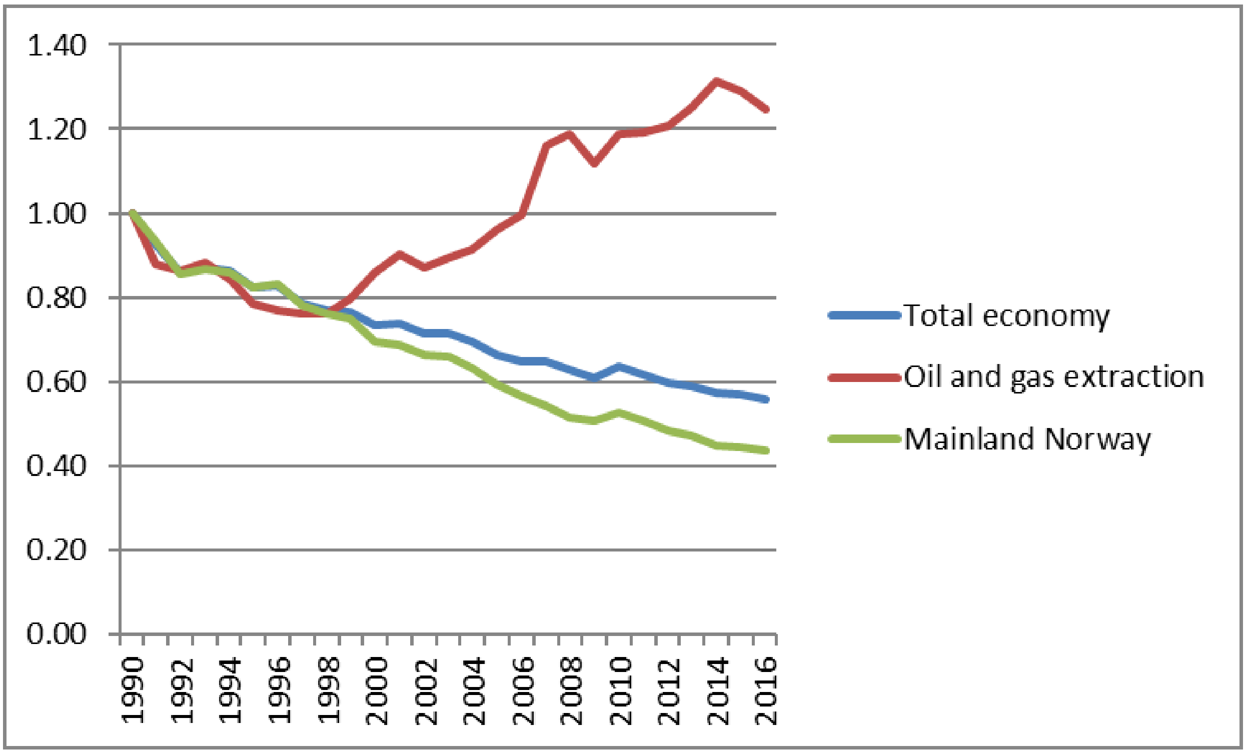
The economic policy has provided a strong growth impetus. The central bank has reduced the interest rate to a historically low level of 0.5 per cent, while the Government has actively used fiscal policy to counter unemployment. Such a response to the steep oil price decline has contributed to promote growth and reduce unemployment, also in southern and western Norway where economic activity was the most affected by lower oil prices. Economic growth is expected to be in line with trend growth this year and higher than trend growth next year. For the current year, this represents a significant increase from previous estimates, and the rebound appears to be swifter than what was anticipated.

The petroleum industry will remain important for the Norwegian economy for years to come, but the importance on the economy in the coming decades is expected to decline. A continuously stricter global climate policy and an ever faster technological development changes the overall conditions for Norwegian business. Norway will reduce emissions by at least 40 per cent by 2030. This transition will require higher growth and new jobs in less carbon-intensive sectors. The strategy for green competitiveness sets the direction for this change.

Norway accounts for around 0.1 per cent of global greenhouse gas emissions. Norway's emissions totalled 53.4 million tonnes of CO_2 equivalents in 2016, excluding LULUCF, according to preliminary figures. Norway's emissions peaked in 2007 and has since then decreased by 3.4 million tonnes CO_2 equivalents, or 6 per cent.

Emission intensity fell by 2.2 per cent annually from 1990 to 2016 (see Figure 2.14). An even more marked decline has occurred in the mainland economy, where emissions per produced unit have dropped by 3.1 per cent annually. Greenhouse gas emissions relative to GDP normally decline as scarce resources are utilized more efficiently. Use of taxes or quotas on emissions, resulting in higher energy costs, reinforce this trend. Norway introduced a CO_2 tax as early as 1991. This tax has subsequently been supplemented by the participation of Norwegian installations in the EU's emissions trading system. As from 2013, more than 80 per cent of all greenhouse gas emissions in Norway are subject to economic instruments. The use of economic instruments has contributed to the significant decline in emission intensity.

Figure 2.13 *Emission intensity. 1990=1*

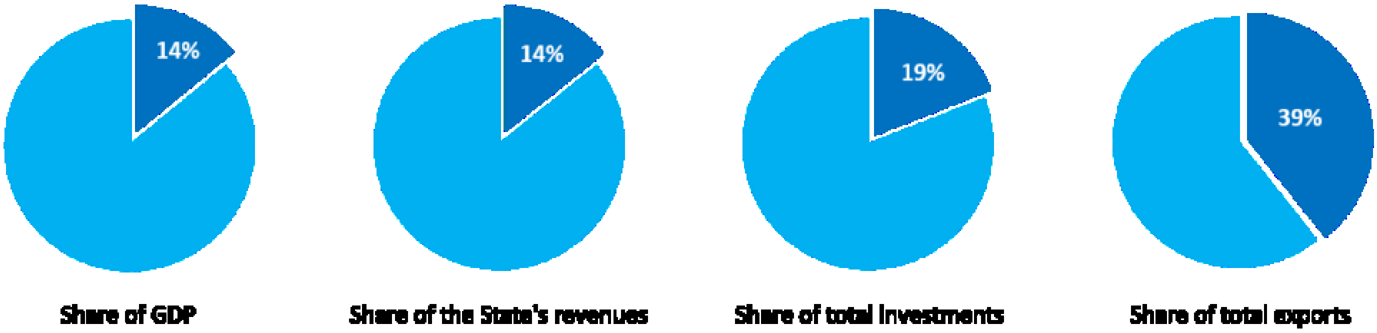


Source: Statistics Norway

2.5 Petroleum sector

Petroleum activities have given substantial impetus to Norway’s economic growth, and has helped finance the Norwegian welfare system. The oil and gas sector is Norway's largest in terms of value added, government revenue, investments and export value. Since oil and gas production started in the early 1970s, petroleum activities have contributed more than 13 000 billion (1 600 billion USD) in current NOK to Norway’s GDP. Related service and supply industries contribute to economic value creation as well. Currently more than half of the estimated recoverable resources on the Norwegian shelf remains to be produced.

__Figure 2.14__ Macroeconomic indicators for the petroleum sector, 2017. The service and supply industry is not included



Source: National Accounts, National Budget 2018

Since production started, oil and gas have been produced from a total of 102 fields[2] on the Norwegian shelf. At the end of 2016, 80 fields were in production: 62 in the North Sea, 16 in the Norwegian Sea and two in the Barents Sea. Two new fields started production in 2016, while a further nine were still under development at the end of the year.

In 2016, Norwegian petroleum production accumulated to 230.6 million Sm³ o.e. By way of comparison, total production was 228.0 million Sm³ o.e. in 2015 and 264.1 million Sm³ o.e. in the record year 2004. Oil production rose in 2016 for the third year running, after a continuous decline from 2001 to 2013. Important reasons for this are higher production regularity of Norway's oil fields and new fields coming on stream. Gas production rose until 2006, then dipped somewhat until same level was reached in 2015.

Gas production remained high in 2016, at about the same level as in 2015. Gas sales totalled 115 billion Sm³ (40 MJ) in 2016. Growing demand for natural gas in other parts of Europe is an important explanation for this rise as well as decreased gas production from continental Europe. In 2016, natural gas accounted for just under 50 per cent of total production by oil equivalents.

Like oil, gas is one of Norway's most important export commodities. Domestic consumption of gas is low, and nearly all the gas produced is exported. An extensive network of subsea pipelines links Norway's offshore gas fields and onshore terminals directly to recipient countries in Europe. In addition, liquefied natural gas (LNG) is shipped out from the Snøhvit field off Hammerfest on LNG carriers.

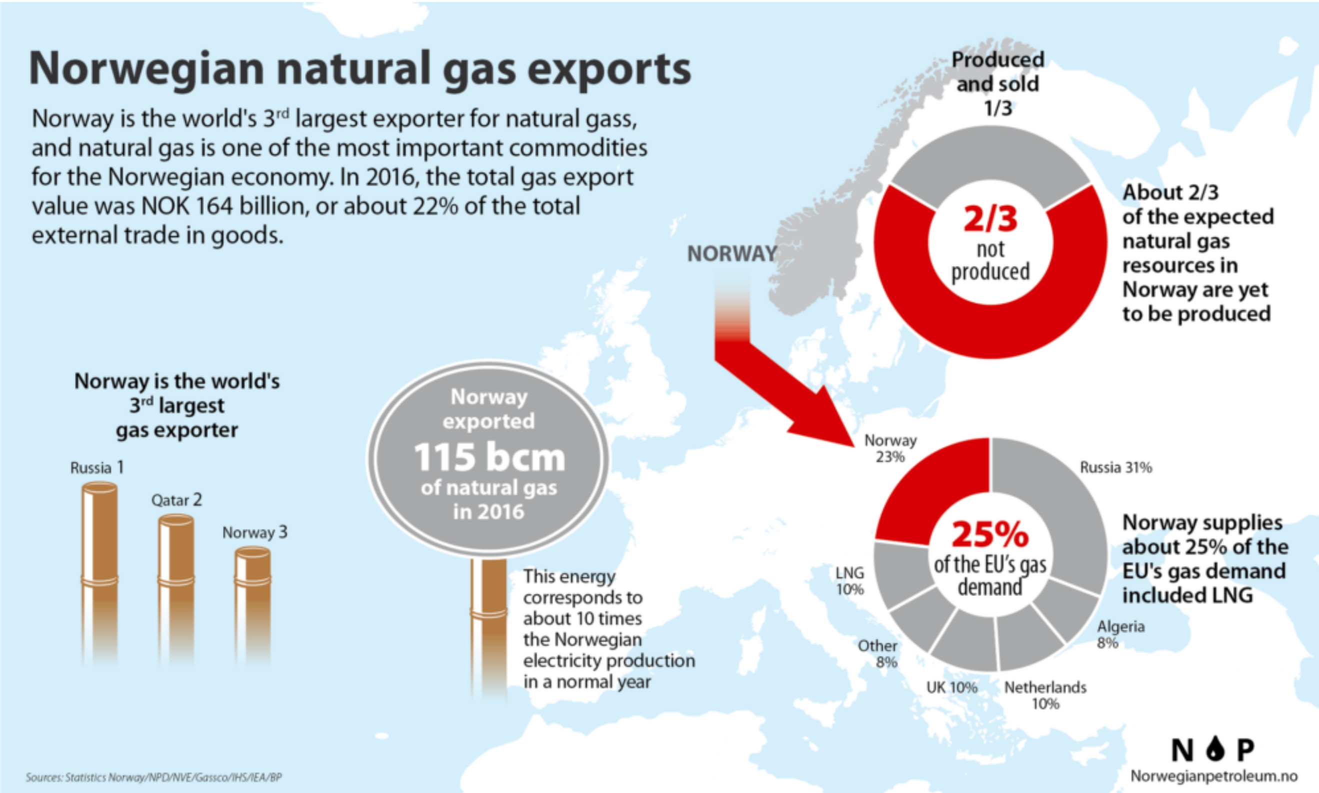
Only about one third of Norway's estimated gas resources have been produced so far. Production is expected to remain high for the next 20 years.

Norway is the third largest gas exporter in the world. In 2016, Norway exported about 115 billion Sm3 gas, mainly to other countries in Europe. This is the largest volume of gas ever exported from the Norwegian shelf. In much of Europe, gas is an important source of energy

[2] A field is one or more petroleum deposits, which together are comprised by an approved plan for development and operation (PDO) or for which exemption from the PDO requirement has been granted.

for heating, industrial use and for electricity generation in gas-fired power plants. Norwegian gas covers about 25 per cent of EU's gas consumption and provides an important contribution to energy security in Europe. The total length of the Norwegian gas pipeline network is about 8 800 kilometres, which is roughly the distance from Oslo to Bangkok. Most Norwegian gas sold on the European market is delivered to Germany, the UK, Belgium and France, where Norwegian gas accounts for between 20 and 40 per cent of total gas consumption. Norwegian natural gas may support the phasing-out of coal in energy consumption in many of these countries.

Figure 2.15 *Norwegian natural gas exports*



Sources: Statistics Norway/NPD/NVE/Gassco/IHS/IEA/BP, www.norwegianpetroleum.no

2.6 Energy use and electricity production[3]

Norway is in a unique position as regards renewable energy. Unlike most other countries, nearly all of Norway's electricity production is based on renewable sources, and the proportion of energy use accounted for by electricity is considerably higher than in most other countries.

Access to reasonably priced hydropower has shaped energy use in Norway. Norway has a large energy-intensive manufacturing sector, and electricity is used much more widely to heat buildings and water than in most other countries. Because such a large proportion of electricity

[3] Excluding the offshore petroleum activities

is produced from renewable sources and electricity is widely used in buildings and in manufacturing, greenhouse gas emissions associated with stationary[4] energy use are low in Mainland-Norway[5]. Emissions to air from energy use are therefore mainly concentrated in manufacturing[6], transportation, construction, and agriculture where the use of fossil fuels is still widespread. Emissions to air from offshore petroleum activities largely originate from the combustion of natural gas and diesel in turbines, engines and boilers, flaring of natural gas for safety reasons, venting and diffuse emissions of gas, and storage and loading of crude oil.

Important drivers of energy use

Energy use in Norway is influenced by a variety of factors. Variations in energy use from year to year are often related to fluctuations in weather conditions and in the prices of energy and activity in energy-intensive goods and services. Longer-term trends are related to population growth and other demographic factors, and to the rate of economic growth and structural changes in the economy.

Norway's population has increased by 1.1 million since 1990 (about 25 per cent). Strong economic growth has resulted in a doubling of GDP since 1990. Both production of and demand for goods and services that use energy are growing steadily. However, final energy consumption has risen by only 12 per cent, demonstrating that the Norwegian economy has become gradually less energy-intensive.

Energy use, by sector[3]

As seen in the figure below, energy use in absolute numbers is highest in the manufacturing and transport sectors, followed by services and households. Other sectors such as construction, agriculture and fisheries account for only a small proportion of energy use. Energy use has increased by about 23 TWh since 1990, with most of the increase taking place before 2000. In 2015, final energy consumption totalled 212.5 TWh, somewhat lower than the average since 2000.

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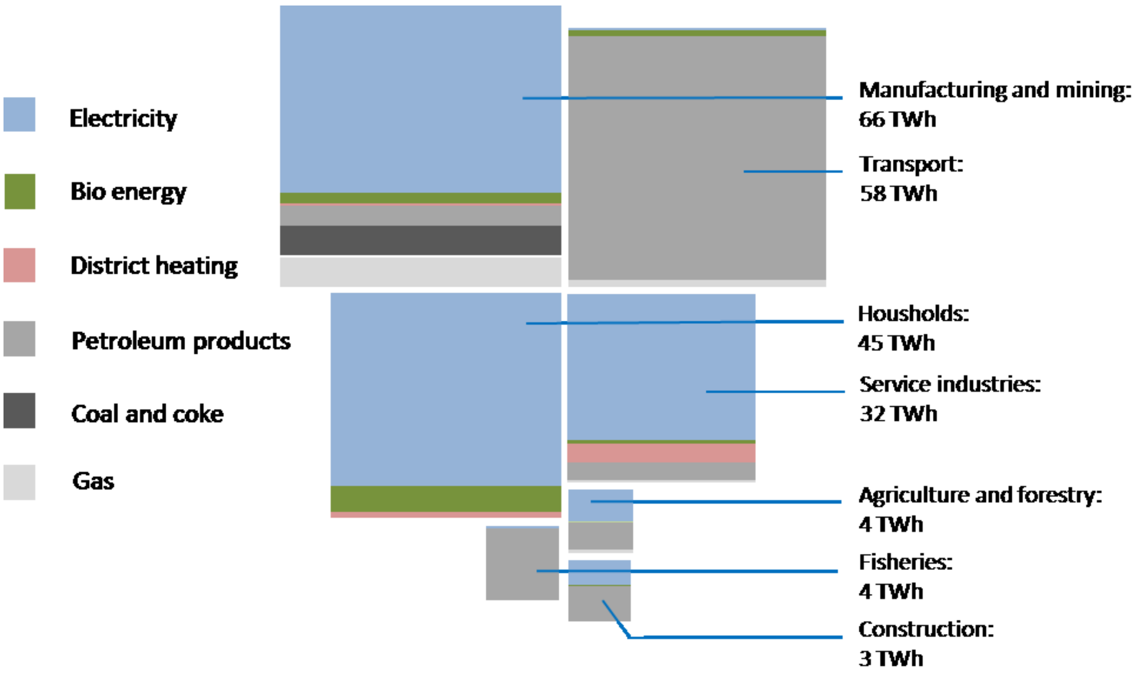
[4] Stationary energy consumption is defined as net domestic energy consumption minus energy for transport. It is common to distinguish between industry, households, the services sector and the energy sector

[5]Mainland Norway consists of all domestic production activity except exploration of crude oil and natural gas, transport via pipelines and ocean transport.

[6] The majority of emissions from manufactoring is associated with process emissions rather than energy use. Total emissions from manufacturing can be split into about 7 million tonnes CO_2-eq of process emissions and 2.8 million tonnes CO_2-eq associated with energy use.

__Figure 2.16__ Final energy consumption in Norway split by energy carrier. Excluding non-energy use and the offshore petroleum sector. Total in 2015: 212.5 TWh.



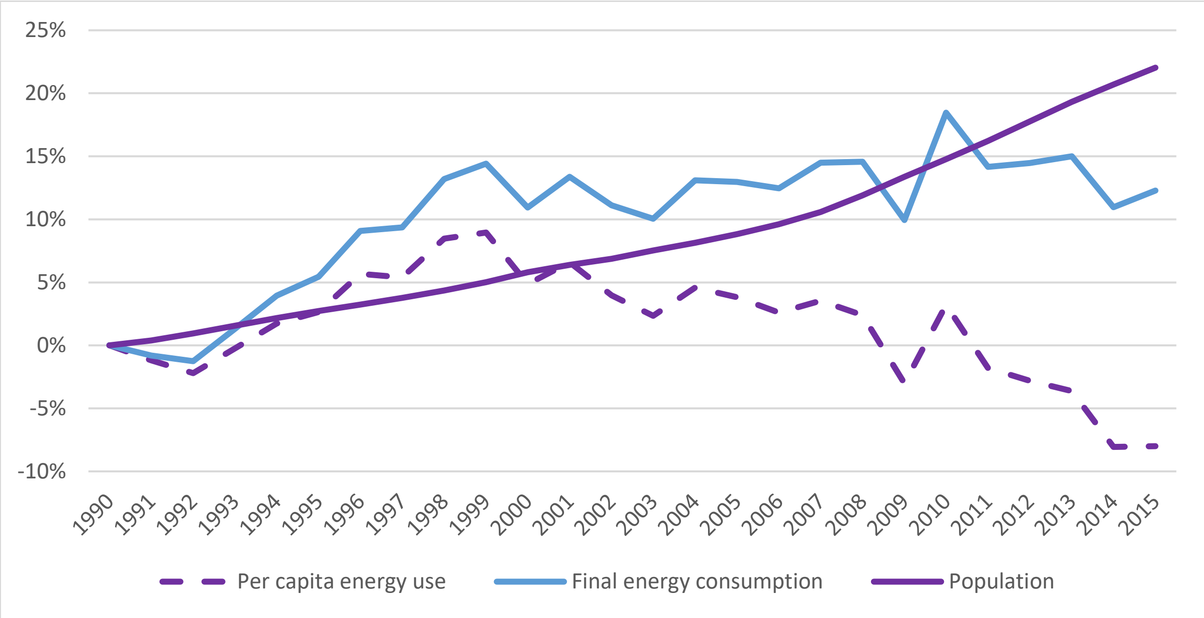
Source: Statistics Norway

Figure 2.16 shows that electricity is the dominant energy carrier, followed by petroleum products. Electricity dominates energy use in manufacturing, the household sector and service industries, while petroleum products account for a large proportion of energy use in sectors that make heavy use of transportation and machinery. District heating and natural gas account for only a small share of energy use, but this has been increasing in recent years. Consumption of district heating has risen, particularly in service industries and households, while there has been an increase in the use of gas in manufacturing industries and the transport sector. These energy carriers have been replacing fuel oil for heating and coal, coke and heavier petroleum products in industrial processes.

The energy intensity of the Norwegian economy has declined by more than 40 per cent since 1990. This indicates a decoupling of economic growth and energy use.

Per capita energy use has also declined in Norway during this period, and was 8 per cent lower in 2015 than in 1990 (see figure 2.17).

***Figure 2.17** Per capita energy use in Norway, shown as percentage change since 1990.*



Source: Statistics Norway

Features of the Norwegian energy system
Renewable energy sources account for 98 per cent of Norwegian electricity production[7] and the power sector has very low emissions compared to most other countries. In a normal year renewable electricity generation exceeds gross domestic consumption.

At the beginning of 2017, the installed capacity of the Norwegian power supply system was 33 200 MW with an estimated annual production of 139 TWh in a normal year.

Norway is now developing more renewable power production capacity than it has done for over 25 years. Wind power currently accounts for only a relatively modest share of production capacity, but is now dominating investments.

Hydropower accounts for 96 per cent of Norwegian power supply, and the resource base for production depends on the precipitation level in a given year. This is a distinctive feature of the Norwegian power system, compared to most power systems, where security of supply is secured by thermal power plants.

Norway has half of Europe's reservoir storage capacity, and more than 75 per cent of Norwegian production capacity is flexible. Production can be rapidly increased and decreased as needed, at low cost.

The Norwegian power system is closely integrated with the other Nordic systems, both in physical terms and through market integration. In turn, the Nordic market is integrated with the rest of Europe through cross-border interconnectors with the Netherlands, Germany, the Baltic states, Poland and Russia.

[7] Using a normalized expected yearly production for hydro power and wind power.

In 2015, district heating deliveries totalled 4.8 TWh, three times as much as in 2000. This is equivalent to about one tenth of the total need for energy to heat buildings and water in Norway.

District heating can be produced using many different types of fuel. In 2015, about 50 per cent of district heating was produced from waste and about 20 per cent from bioenergy. The use of petroleum products has declined steeply. Mineral oil accounts for only 1 per cent of district heating production.

Bioenergy is an important energy source for heat production in Norway. Annual consumption of bioenergy in Norway rose from 10 TWh in 1990 to 18 TWh in 2012. Since then, there has been some decline in consumption. Fuelwood consumption in households accounts for the largest proportion of biofuel consumption, and totalled more than 5 TWh in 2014. The second largest user is the manufacturing sector, where chippings and other wood waste are used as fuel in production processes.

In 2015, a further 4.9 TWh of natural gas was distributed to end users in Norway or used for small-scale distribution of liquefied natural gas (LNG). Pipeline distribution accounts for about 40 per cent of this, through two pipeline networks in Rogaland county. The customers are mainly commercial and use the gas for thermal purposes (space heating and heating water). In addition to use for industrial purposes, gas is increasingly being used as fuel for shipping. A small, but increasing amount of domestic gas consumption also consists of biogas, which when used as a transport fuel replaces fossil fuels. In 2016, almost 300 GWh biogas was consumed in Norway. Production of biogas is based on various waste products, further amplifying the environmental benefits.

2.7 Transport

Norway's decentralised settlement gives rise to a relatively high demand for transport. In addition, the Norwegian economy is largely based on the extraction of raw materials and exports of goods, which means that there is a large volume of goods transport. The demand for rapid transport and more frequent deliveries of goods has also been increasing. The proportion of passenger transport by cars and the proportion of goods transport by road and air have increased since 1990. Almost 31 per cent of the total Norwegian greenhouse gas emissions originated from transport in 2015. Road traffic was responsible for most of these emissions (19 per cent of total emissions in Norway in 2015), while domestic civil aviation navigation, railways and other means of transport were responsible for the rest. In the period from 1990 to 2015, greenhouse gas emissions from road transport increased by around 30 per cent, while emissions from domestic aviation increased by 46 per cent. Emissions from domestic maritime transport was reduced by nearly 5 per cent in the same period. Since 2007, emissions from the transport sector have been stable. Strong measures to curb emissions have contributed to a flattening out of emission growth, and in the latest projections CO_2-emissions from transport will be reduced within 2030, see chapter 5. The reduction is mainly attributed to reduced emissions from road transport.

2.8 Agriculture and forestry

Stretched along the western side of the Scandinavian Peninsula, approximately one fourth of the surface area of Norway lies north of the Arctic Circle. The long coastline has an Atlantic, humid climate, while the inland climate is continental. Approximately 3 per cent of Norway's land area is cultivated soil, and approximately 38 per cent of the land area is forested.

Agriculture is estimated to account for about 8.4 per cent of Norway's emissions of greenhouse gases. The cropland area has remained stable compared to 1990, while the grassland area has decreased by 1.4 per cent compared to 1990.

Agriculture
Agriculture is estimated to account for about 8.4 per cent of Norway's emissions of greenhouse gases. This particularly includes methane and nitrous oxide from animal husbandry and fertilisation. In addition, nitrous oxide emissions from cultivation of peatland are allocated to agriculture, while CO_2 emissions from the same source are allocated to LULUCF. Use of fossil fuels for agricultural activities are allocated to other sectors, e.g. transport. The agricultural emissions have been reduced by approximately 5 per cent since 1990.

Forestry
Forest and wooded land cover about 12 million hectares and constitute approximately 38 per cent of the land area in Norway. The most widespread species are Norway spruce (47 per cent), Scots pine (33 per cent) and birch (18 per cent).

2.9 Fisheries and aquaculture

The emissions of greenhouse gases from the Norwegian fishing fleet have been reduced considerably since its peak in 2012, from around 1.6 million tonnes CO_2 equivalents to 1.1 million tonnes in 2015. Fishing has always been an important basis for settlement and employment along the Norwegian coast. The Norwegian fishing and aquaculture industries are among Norway's most important export industries today, currently supplying seafood to consumers in more than 130 countries worldwide. This makes Norway the second largest exporter of seafood globally. According to the United Nations Food and Agriculture Organization (FAO), the consumption of seafood worldwide is expected to increase substantially over the next 20 to 30 years.

In addition to climate change, fisheries and aquaculture are affected by various types of pollution. With an increase in the level of CO_2 in the atmosphere, the ocean absorbs an increasing level of CO_2, causing ocean acidification. Ocean acidification is a source of concern for marine ecosystems and fisheries. Important focus areas for fisheries are improving fuel efficiency and finding alternatives to fossil fuel for engine power. Significant reductions have been achieved by replacing refrigerants that have high global warming potential, used in onboard cooling systems, by climate neutral ones.

Technological developments and improved fishing methods, equipment and vessels have made possible a restructuring of the fishing-fleet, which today catches much larger quantities per fisherman, per vessel and per trip than a few decades ago. This has reduced the general fuel-consumption of the fleet. For fish farming, optimizing feed use and feed composition play an important part in reducing the climate impact of salmon aquaculture products. Also in the fish farming industry, electricity is increasedly used as power for service vessels and farms instead of fossil fuel.

2.10 Manufacturing industries and construction

A considerable part of Norwegian manufacturing industries are based on its natural resources. The historic availability of low cost hydro power created a basis for the establishment of metal and fertilizer production. Some chemical production is based on the petroleum resources.

Production of pulp and paper derived from the forest resources has also been considerable, and the fisheries have also given a base for industry. Norwegian industry therefore has a high share of production of raw materials and semi-manufactured goods including iron and steel, non-ferrous metals, chemicals, fertilisers, pulp and paper, mineral industries, food processing industries, building and construction industry.

Process emissions from industry were at about 16 per cent of the national totals in 2015. Process emissions have come down 40 per cent from 1990. Emissions from energy use of fossil fuels on this sector were about 7 per cent.

3 Greenhouse gas inventory information, including information on national systems and national registries

3.1 Descriptive summary

3.1.1 Overview

The Norwegian National Inventory Report (NIR) has been prepared in accordance with the UNFCCC Reporting Guidelines on Annual Inventories, and the estimation methods generally follow the Guidelines for National Greenhouse Gas Inventories published by the Intergovernmental Panel on Climate Change (IPCC). The latest inventory with the National Inventory Report (NIR) and Common Reporting Format (CRF) covering the years 1990-2015 was submitted to the UNFCCC Secretariat 07 April 2017.

The NIR covers emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorcarbons (PFCs), sulphur hexafluoride (SF_6) and hydrofluorocarbons (HFCs) from 1990 to 2015. NF_3 emissions do not occur in Norway.

Table 3.1 presents emission figures for all greenhouse gases, expressed in absolute emission figures and total CO_2 equivalents using GWP-100 values from the IPCC's fourth Assessment report. Between 1990 and 2015 the total greenhouse gas emissions increased by 2.2 million tonnes, or by 4.2 per cent. Preliminary figures for 2016 show a total of 53.3 Mt.[8] Between 1996 and 2011, emissions exceeded 54 million tonnes CO_2 equivalents in all years except in 2009, which was a special year as the economy was set back by the financial crisis. Emissions peaked at 56.8 million tonnes in 2007. Since 2012, emissions have stayed below 54 million tonnes CO_2 equivalents. The net greenhouse gas emissions including all sources and sinks amounted to 29.2 million tonnes in 2015. The total contribution from different sources from 1990 to 2015 is illustrated in Figure 3.1. Figure 3.2 illustrates the development of emissions of greenhouse gases from various sectors (excluding LULUCF) in changes in per cent. The overall increased emissions of greenhouse gases have been caused by increased activity in the energy sector. The increase has been slowed by the reduced emissions from waste handling and industrial processes.

In 2015, the net greenhouse gas removals in the LULUCF sector was 24.3 million CO_2 equivalents, which would offset almost half of the total greenhouse gas emissions in Norway that year. The average annual net removals from the LULUCF sector was about 21.6 million tonnes of CO_2 equivalents for the period 1990-2015. The calculated changes in carbon stocks depend upon several factors such as growing conditions, harvest levels, age-class effects and land use changes. In particular, variations in annual harvest will in the short term directly influence the variations in changes in carbon stocks and dead organic matter. For more information on the annual variation in CO_2 removals on forested land, please see chapter 6.1.1 of the Norwegian National Inventory Report 2017.

Total emissions increased in the 1990s, but have, since the turn of the century, been more or less stable, cf. Figure 3.1. While emissions of CO2 from most sources have increased, emissions of other greenhouse gases have decreased (cf. Figure 3.3). Since 1990 Norway has experienced strong economic and population growth as well as expansion of petroleum extration. These factors have led to increased use of fossil fuels, and consequently higher CO2 emissions. However, the growth in CO2 has been almost fully offset by reductions in other gases and sectors.

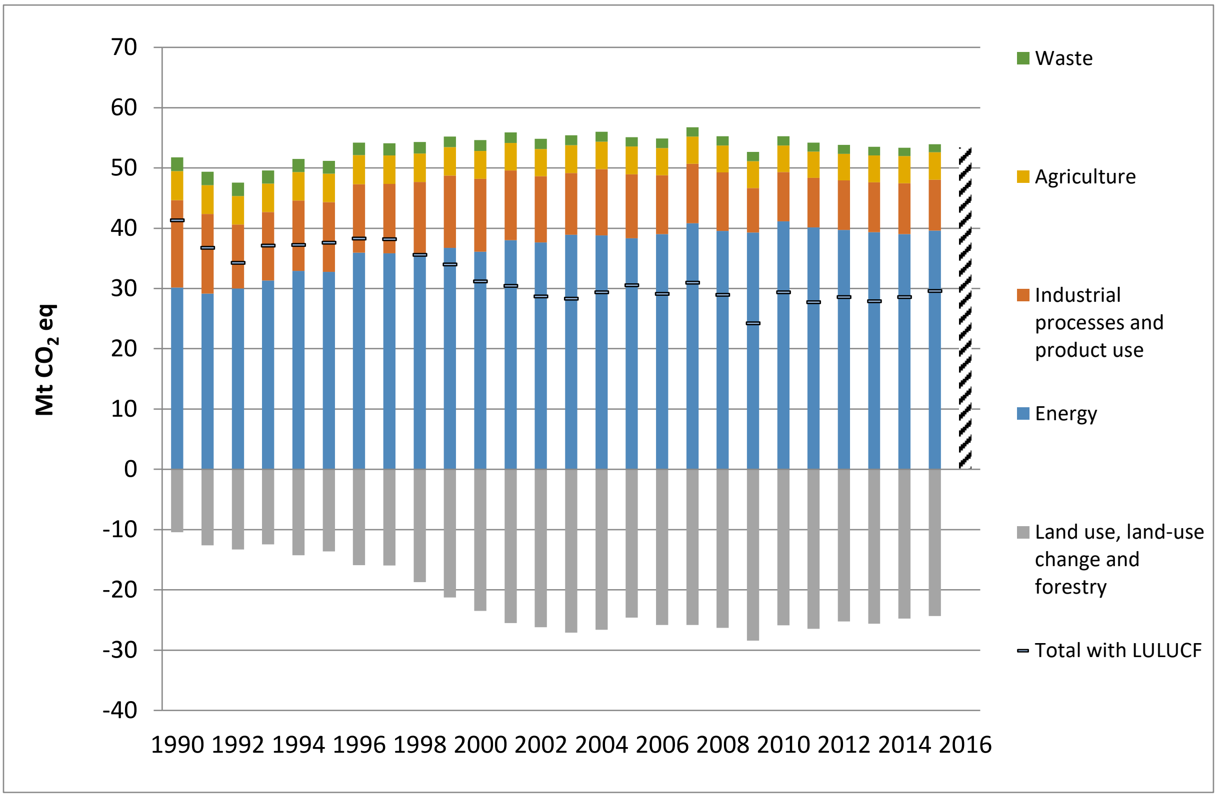
In 2015, emissions have increased by 1.1 per cent, and were 4.2 per cent above the 1990-level. Emissions in 2015 are illustrated by gases in Figure 3.4.

***Table 3.1** Emissions of greenhouse gases in Norway, 1990-2015. Units: CO_2 in Mtonnes (Mt), CH_4 and N_2O in ktonnes (kt) and other gases in tonnes (t).*

Gas	CO_2	**CH_4**	**N_2O**	**PFC**			**SF_6**	**HFC**								
				CF_4	**C_2F_6**	**C_3F_8**		**23**	**32**	**125**	**134a**	**143a**	**152a**	**227ea**	**134**	**143**
Year	**Mt**	**kt**	**kt**	**t**			**t**	**t**								
1990	35.7	232.0	14.2	467.4	36.2	0.0	92.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
1995	38.5	235.4	12.9	283.3	18.1	0.0	25.4	0.0	0.4	5.2	38.6	4.1	1.3	0.0	0.0	0.0
2000	42.2	228.1	13.2	186.4	11.6	0.0	39.1	0.1	2.0	34.8	90.5	28.7	7.0	0.2	0.0	0.0
2005	43.6	219.6	14.1	116.7	7.6	0.0	13.1	0.1	6.1	57.2	139.4	44.8	26.8	1.0	0.8	1.1
2006	43.9	214.5	13.0	102.1	8.6	0.0	8.9	0.1	7.9	63.2	158.5	48.0	30.1	0.9	0.8	1.9
2007	45.8	219.3	12.4	111.7	10.3	0.0	3.2	0.1	10.0	64.4	184.9	46.6	31.7	1.1	0.7	1.6
2008	44.9	213.6	10.9	104.7	10.0	0.0	2.7	0.1	12.5	68.9	218.5	52.0	30.5	0.8	2.7	1.4
2009	43.2	215.2	9.1	49.8	5.8	0.0	2.6	0.1	15.9	73.9	245.1	50.4	30.7	0.9	2.2	1.3
2010	45.8	215.9	8.8	27.3	3.0	0.0	3.2	0.1	19.8	94.2	280.2	69.3	34.6	0.7	2.0	1.1
2011	44.9	209.7	8.8	29.9	3.4	0.0	2.5	0.2	22.6	99.0	305.9	65.0	34.5	2.1	1.8	1.0
2012	44.6	208.8	8.8	22.9	2.6	0.0	2.5	0.5	25.5	99.0	339.5	60.6	35.0	1.9	1.7	0.9
2013	44.3	209.8	8.7	20.6	2.3	0.0	2.7	0.4	31.1	97.3	364.4	57.4	34.6	1.2	1.5	0.8
2014	44.0	212.7	8.7	20.3	2.4	0.0	2.4	0.3	34.6	103.8	367.1	69.4	36.6	0.9	1.4	0.8
2015	44.7	207.7	8.8	16.7	1.9	0.0	3.3	0.3	39.5	111.7	351.3	66.9	37.8	1.1	1.3	0.7

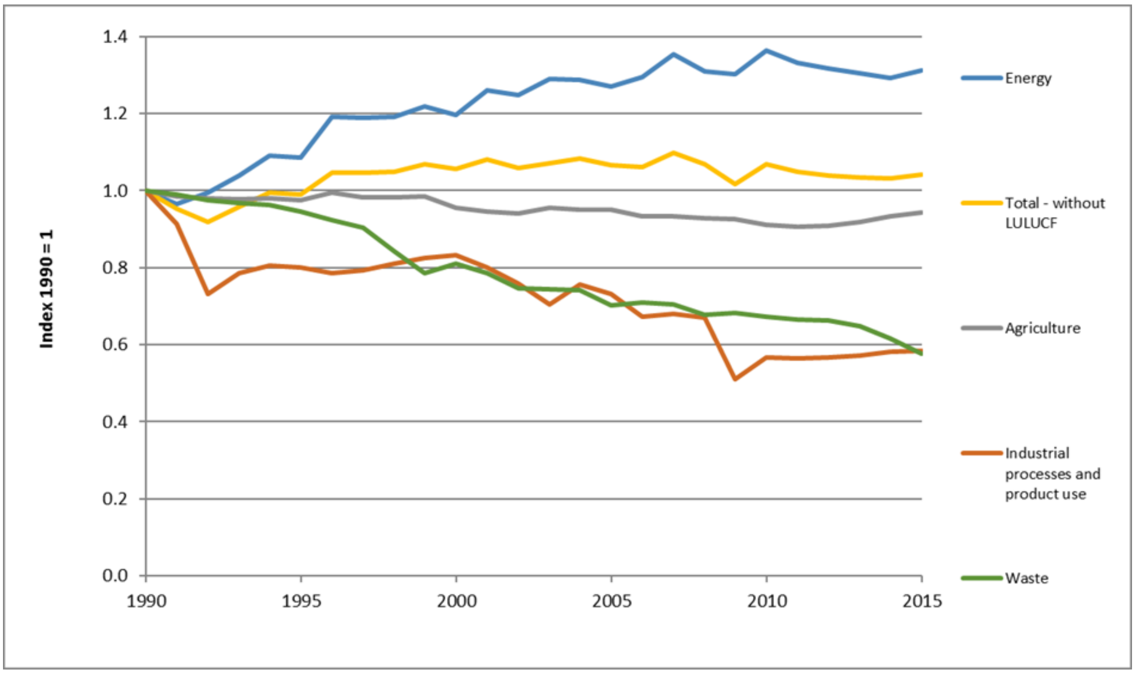
Source: Statistics Norway/ Norwegian Environment Agency

Figure 3.1 *Total emissions of greenhouse gases by sources and removals from LULUCF in Norway, 1990-2016 (Mtonnes CO_2 equivalents). The 2016 estimate is preliminary*



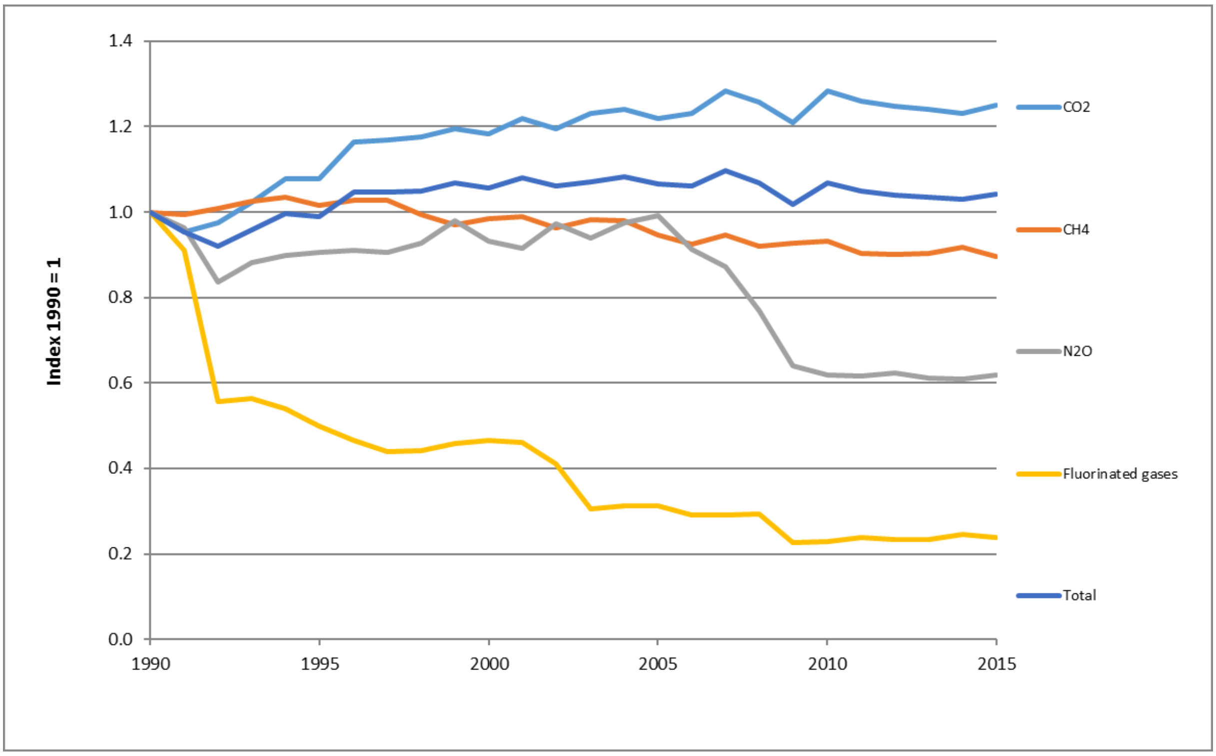
Source: Statistics Norway/Norwegian Environment Agency/Norwegian Institute of Bioeconomy Research

Figure 3.2 *Changes in emissions of greenhouse gases, relative to 1990, illustrated by UNFCCC source categories, 1990-2015. Index 1990 = 1.*



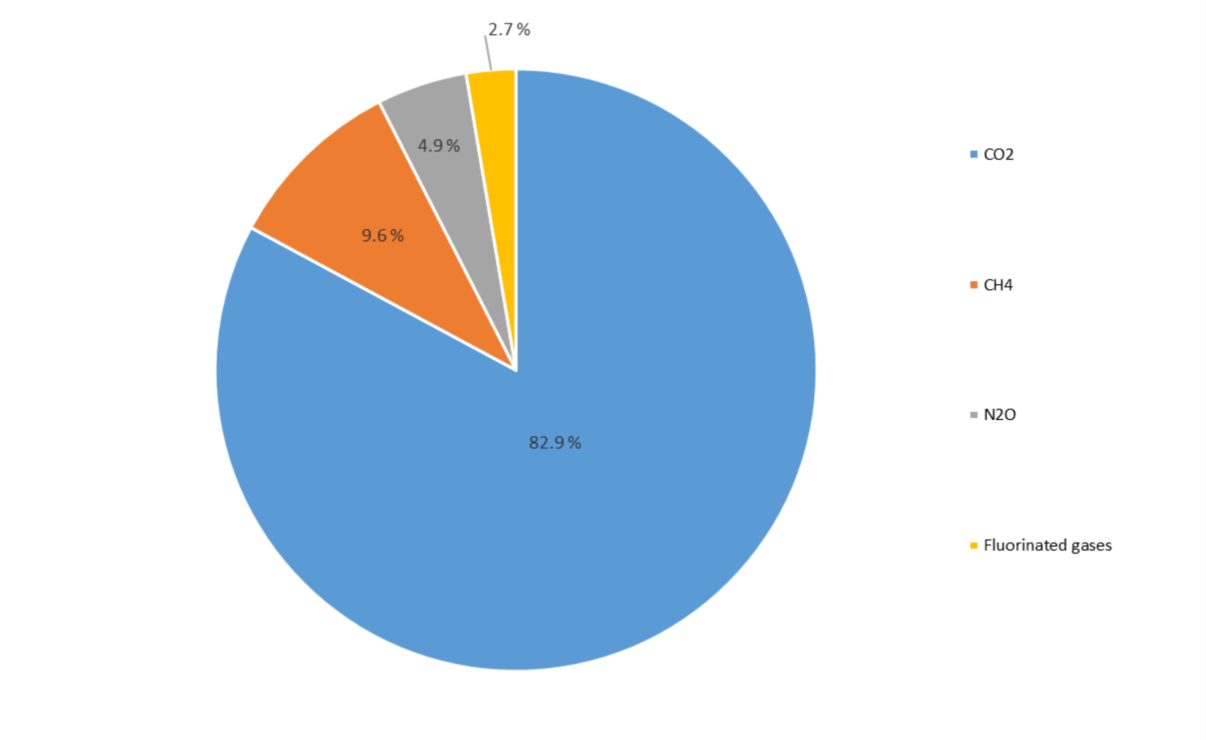
Source: Statistics Norway/Norwegian Environment Agency

Figure 3.3 . *Changes in emissions of greenhouse gases, relative to 1990, by gas, 1990-2015. Index 1990 = 1****.***



Source: Statistics Norway/Norwegian Environment Agency

Figure 3.4 *Distribution of emissions of greenhouse gases in Norway by gas, 2015*



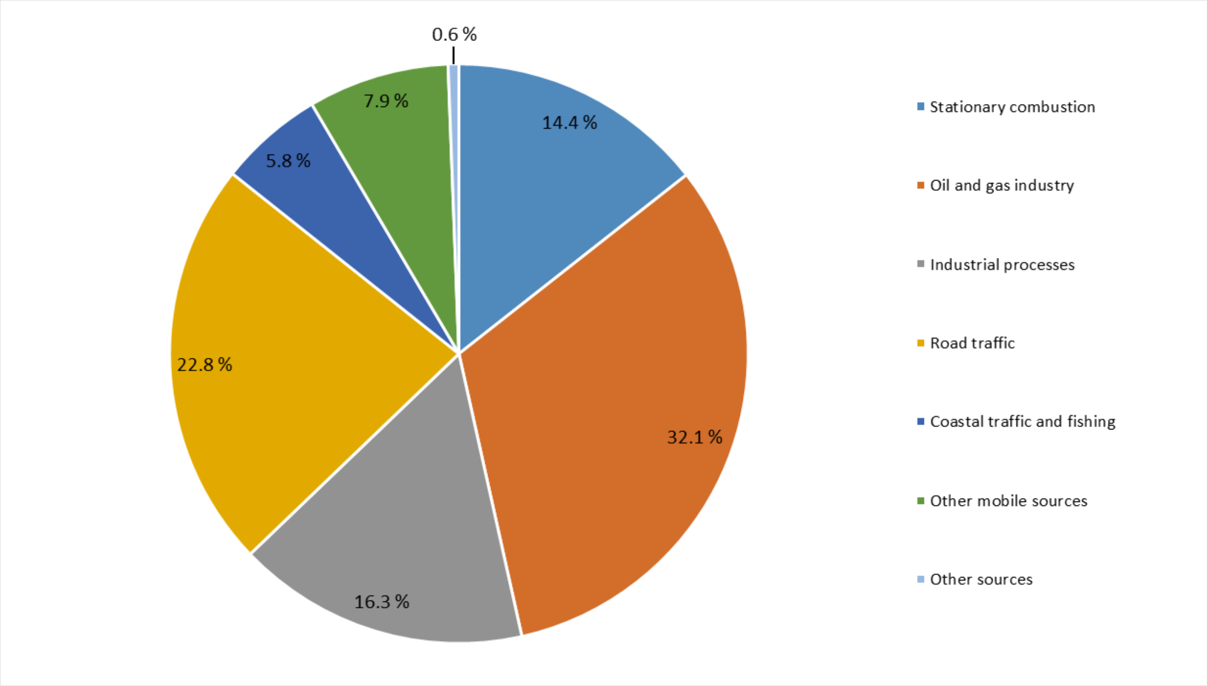
Source: Statistics Norway/Norwegian Environment Agency

3.1.2 Emissions of carbon dioxide (CO_2)

In 2015, CO_2 emissions amounted to 44.7 million tonnes. These emissions originated mainly from the source categories energy (83 per cent) and industrial processes and products use (16 per cent). The source category energy includes sub-categories such as oil and gas extraction, transport and stationary combustion. During the period 1990-2015, the total emissions of CO_2 increased by 25 per cent, or by 9 million tonnes. This is mainly due to increases in emissions from oil and gas extraction and from transport, particularly from road traffic, civil aviation, coastal traffic and fishing. On the other hand, emissions from stationary combustion have decreased by almost 1 million tonnes CO_2 since 1990 and by more than 2 million tonnes CO_2 since 2010. The CO_2 emissions from the category industrial processes have increased by 0.5 million tonnes of CO_2 since 1990.

The Norwegian electricity production is dominated by hydroelectric power, which causes no emissions

Figure 3.5 *Distribution of CO_2 emissions in Norway by sub-categories in 2015*



Source Statistics Norway/ Norwegian Environment Agency

Table 3.2 *CO_2 emissions (million tonnes) from different source categories, 1990-2015*

Year	Stationary combustion	Oil and gas industry	Industrial processes	Road traffic	Coastal traffic and fishing	Other mobile sources	Other sources	Total
1990	7.41	7.85	6.79	7.64	3.16	2.28	0.57	35.70
1995	7.30	9.48	7.32	8.09	3.19	2.61	0.48	38.48
2000	7.02	12.24	8.06	8.36	3.67	2.48	0.38	42.20
2005	6.76	13.41	7.36	9.56	3.37	2.73	0.35	43.55
2006	7.31	13.11	6.99	9.86	3.40	2.91	0.34	43.92
2007	7.11	14.49	7.20	10.10	3.53	3.10	0.33	45.85
2008	6.86	14.24	7.26	9.96	3.24	3.02	0.32	44.90
2009	7.57	13.17	6.02	9.80	3.47	2.90	0.29	43.22
2010	8.51	13.34	6.85	10.03	3.63	3.21	0.27	45.84
2011	7.80	13.09	6.98	9.99	3.56	3.23	0.27	44.93
2012	6.93	13.20	7.17	10.02	3.57	3.40	0.27	44.56
2013	6.90	13.18	7.23	10.04	3.11	3.56	0.28	44.30
2014	6.39	13.90	7.07	10.17	2.63	3.54	0.27	43.97
2015	6.43	14.34	7.29	10.20	2.60	3.52	0.27	44.66

Source: Statistics Norway/ Norwegian Environment Agency

36.6 per cent of the total Norwegian CO_2 emissions originate from transport[9]. Of this, about 62 per cent originates from road transport. Since 1990, CO_2 emissions from this source have increased substantially. However, the growth has stopped in recent years.

The petroleum sector emitted more than 14 million tonnes CO_2 in 2015, which was 32.1 per cent of total CO_2 emissions in Norway. The majority of CO_2 emissions from the petroleum sector stems from combustion of natural gas and diesel in turbines on offshore installations. Other CO_2 emissions originate from onshore oil and gas terminals and indirectly from NMVOC emissions (process emissions). Total CO_2 emissions from the sector have grown year by year up to 2007, primarily as a result of the increased activity level, more mature oil fields and increased gas production and sales. Emissions have been reduced by 4 per cent between 2007 and 2014. In 2015, emissions have increased by 3 per cent.

CO_2 emissions from industrial processes were 7.3 million tonnes in 2015, a decrease of 0.5 million tonnes since 1990.

In 2015, about 68 per cent of the CO_2 emissions from industrial processes are from metal production. CO_2 emissions from metals manufacturing derive primarily from the use of coal, coke and charcoal as a reducing agent, and are therefore primarily dependent on the volume of production. Mineral production accounted for 15 per cent and manufacturing of chemicals accounted for 12 per cent of the CO_2 emissions from industrial processes in 2015.

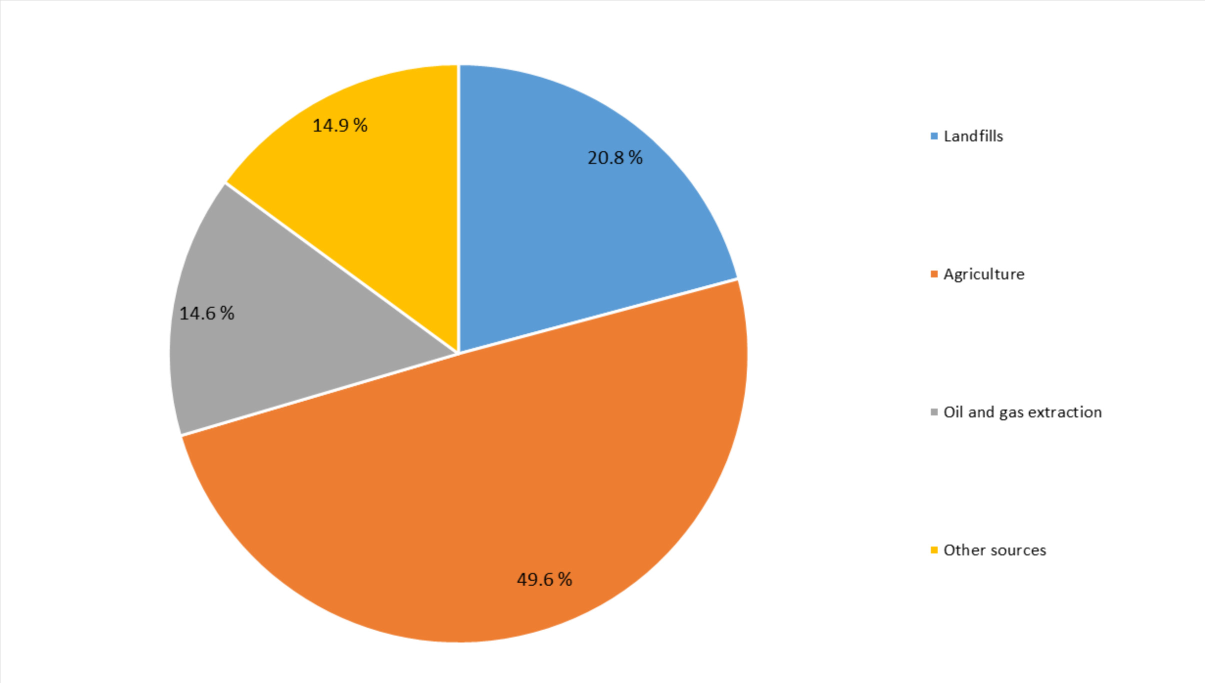
CO_2 emissions from stationary combustion derive from combustion in onshore industry, energy production and heating in buildings. These emissions constituted 14 per cent of the total CO_2 emissions in 2015, a decrease of 13 per cent compared with 1990. While emissions from electricity production and district heating have increased somewhat during the period, emissions from use of oil for heating has been reduced, resulting in the observed reduction trend in total for stationary combustion.

3.1.3 Emissions of methane (CH_4)

The total emissions of methane (CH_4) amounted to 208 ktonnes (5.2 million tonnes of CO_2 equivalents) in 2015. About 50 per cent of the emissions in 2015 derived from agriculture, primarily releases from enteric fermentation and about 21 per cent from landfills (Figure 3.6). Combustion and evaporation/leakage related to oil and gas extraction accounted for almost 15 per cent of the total emissions in 2015. The category "other sources" includes emissions from petrol cars, domestic heating, coal mining and oil refineries and amounted to about 15 per cent in 2015.

[9] The transport sector includes road transport, civil aviation, navigation and fishing, railway and off road vehicles and other machinery.

Figure 3.6 *Distribution of CH_4 emissions in Norway by sub-categories in 2015*



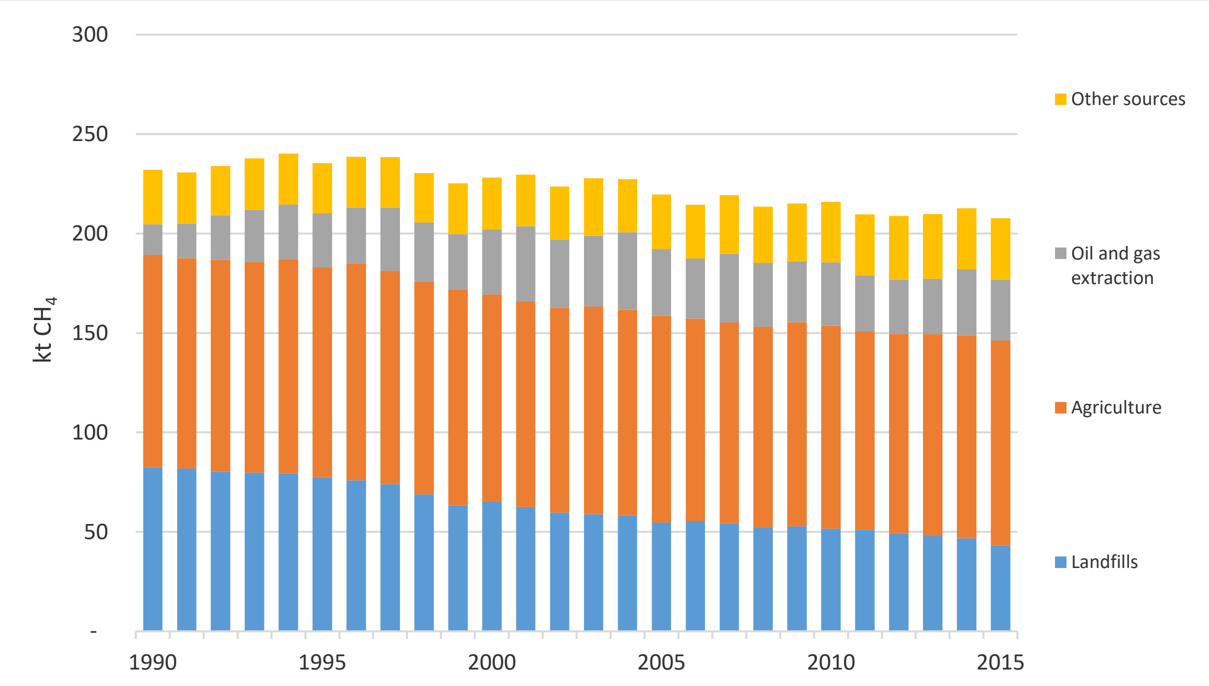
Source Statistics Norway/Norwegian Environment Agency

Agricultural emissions are relatively stable from year to year. Methane emissions from the agricultural sector amounted to 103 ktonnes in 2015, and constituted about 50 per cent of total Norwegian methane emissions. The emissions were reduced by 3 per cent from 1990 to 2015.

During the period 1990-2015, total CH_4 emissions decreased by 10 per cent. Figure 3.7 shows that this was primarily caused by decreased emissions from landfills (-48 per cent from 1990 to 2015), which more than compensated for the growth in emissions from the oil and gas industry. The waste volumes increased during the period 1990-2015, but this effect was more than offset by increased recycling and incineration of waste and increased burning of methane from landfills.

Methane emissions in the oil and gas industry accounted for 30 ktonnes in 2015. These emissions are largely caused by landing and loading of crude oil offshore. Methane emissions from the oil and gas industry have increased by 98 per cent since 1990 due to higher production.

Figure 3.7 *CH_4 emissions in Norway between 1990 and 2015. The emissions are given in kilo tonnes.*

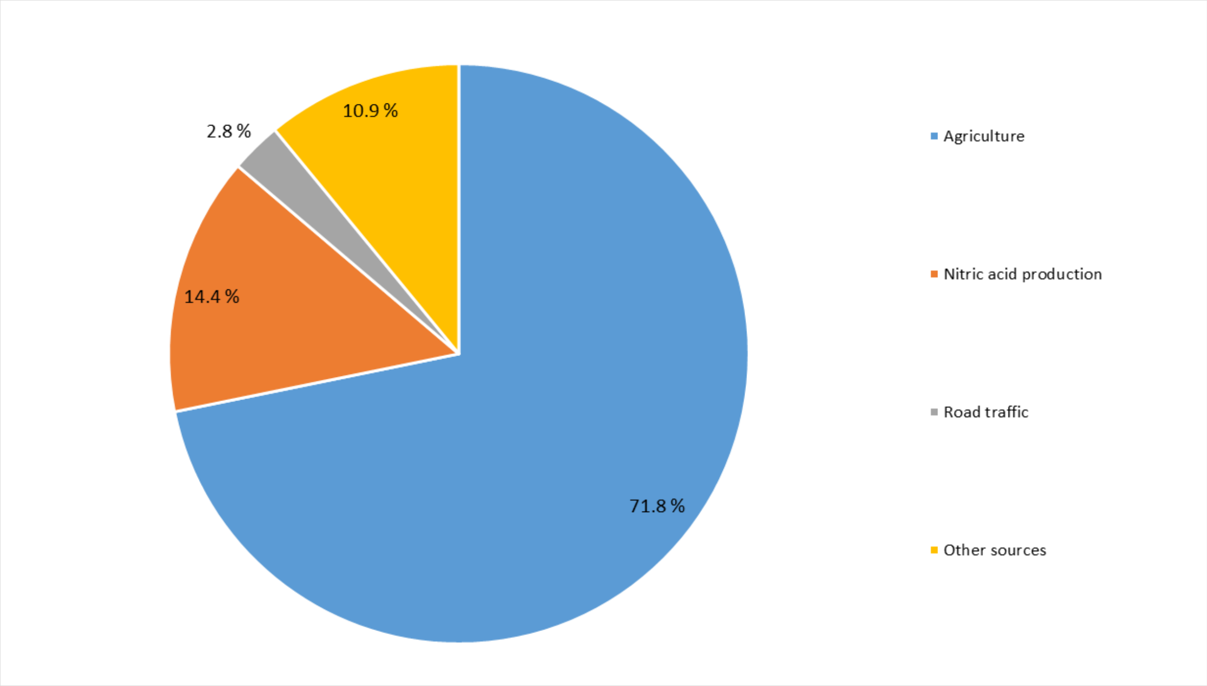


Source: Statistics Norway/ Norwegian Environment Agency

3.1.4 Emissions of nitrous oxide (N_2O)

The total emissions of N_2O amounted to 8.8 ktonnes (2.6 million tonnes of CO_2 equivalents) in 2015. Figure 3.8 shows that 72 per cent of Norwegian emissions of N_2O are of agricultural origin, with agricultural soils as the most prominent contributor. Production of nitric acid takes place at two plants and is one step of the fertiliser production. This production accounts for about 14 per cent of the total N_2O emissions. The contribution from road traffic amounted to almost 3 per cent in 2015. The category "other sources", which amounted to almost 11 per cent of N_2O emissions in 2015, includes emissions from e.g. fuel combustion, manure management, biological treatment of waste and wastewater handling.

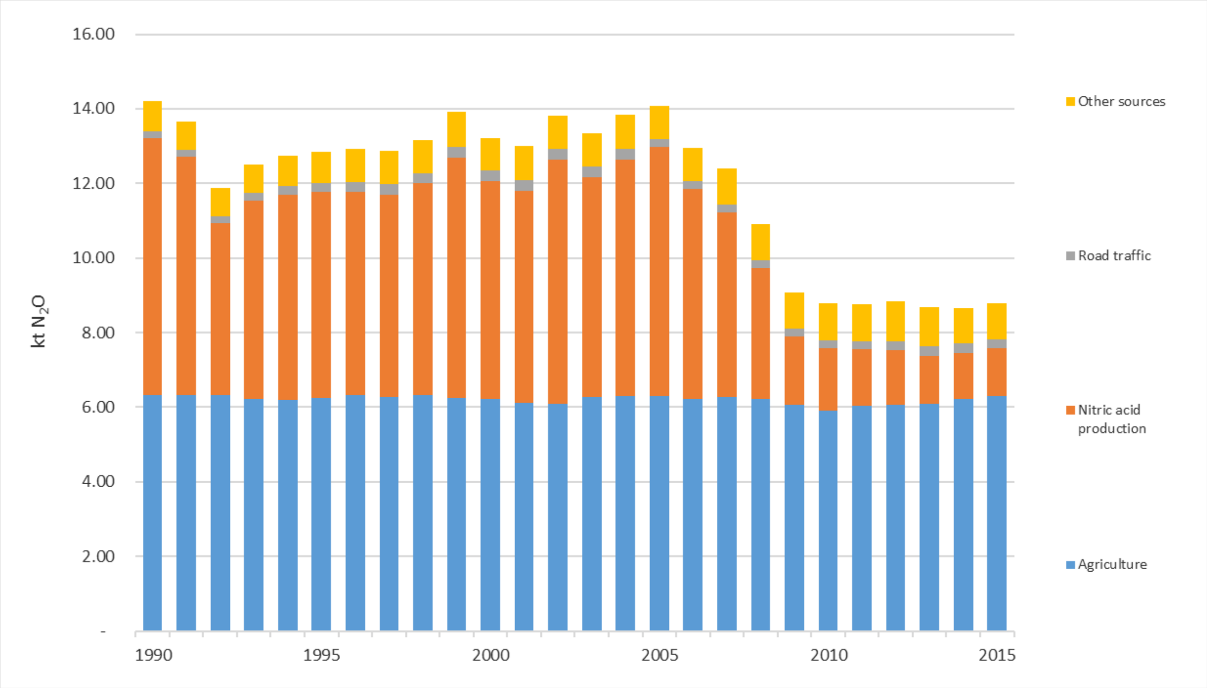
Figure 3.8 *Distribution of Norwegian N_2O emissions by major sources in 2015*



Source: Statistics Norway/ Norwegian Environment Agency

The emissions of N_2O were reduced by about 38 per cent from 1990 to 2015. The emissions were fairly stable through the 1990s, and the major part of this reduction took place after 2005. This was mainly caused by reductions in emissions from nitric acid production, from which emissions were reduced by 82 per cent from 1990 to 2015. Decreased emissions at the beginning of the 1990s were caused by changes in the production processes, while there was a moderate increase in emissions during the following years owing to increased production volumes. Improvements in the production process brought the emissions down again in 2006. Emissions of N_2O from production of nitric acid decreased by 78 per cent from 2006 to 2015.

Figure 3.9 *N_2O emissions for major Norwegian sources, 1990-2015*



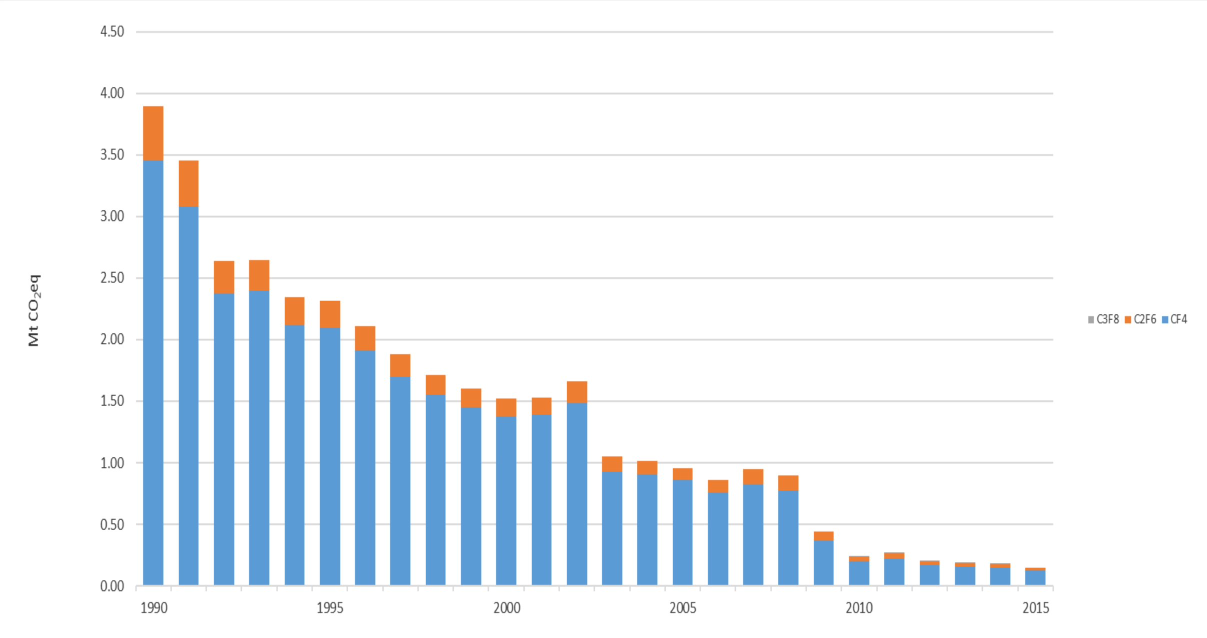
Source: Statistics Norway/ Norwegian Environment Agency

3.1.5 Emissions of perfluorochemicals (PFCs)

Aluminium production is the main source of PFC emissions and contributed to 99.99 per cent of the total PFC emissions in Norway. In 2015, perfluorcarbons tetrafluoromethane (CF4) and hexafluoroethane (C2F6) emissions from Norwegian aluminium plants were reported at 16.7 and 1.9 tonnes respectively, corresponding to a total of 0.15 million tonnes of CO_2 equivalents. Total PFCs total emissions have decreased by 96.2 per cent since 1990 following a steady downward trend as illustrated in Figure 3.10.

Improvement of technology and process control in aluminium production led to a significant emissions decrease. In 1990, PFCs emissions were 4.48 kg CO_2 equivalents per tonne aluminium produced. It was reduced to 0.70 kg CO_2 equivalents per tonne aluminium produced in 2007 and to 0.12 kg CO_2 equivalents per tonne aluminium produced in 2015.

Figure 3.10 *Emissions (million tonnes CO_2-eq) of PFCs in Norway, 1990-2015*



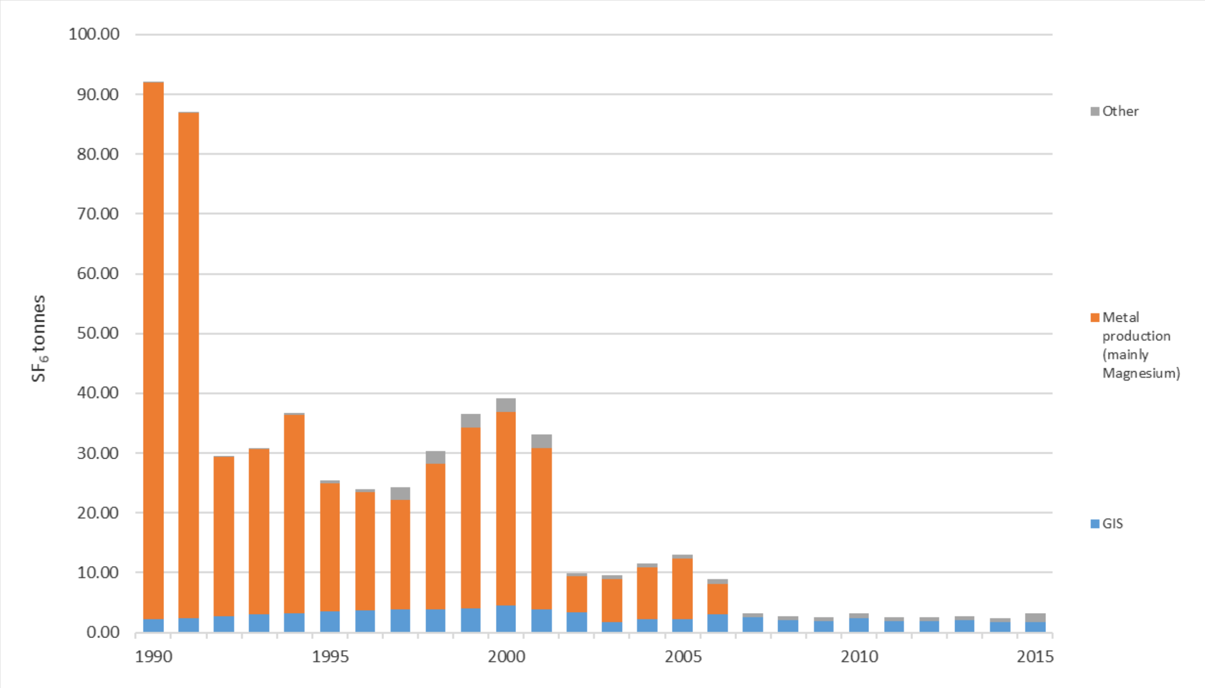
Source: Statistics Norway/ Norwegian Environment Agency

3.1.6 Emissions of sulfur hexafluoride (SF_6)

Until 2006, the largest source of SF_6 emissions in Norway was magnesium production. The consumption of SF_6 was reduced through the 1990s due to improvements in technology and process management, and to reductions in production levels. In 2015, the SF_6 emissions were 96.4 per cent lower than in 1990. Until 2002, SF_6 emission reductions were mainly due to the improved technology and process control within the metal industries. In 2002, production of cast magnesium closed down. In 2006, production of secondary magnesium closed down.

The main other use of SF_6 is in gas insulated switchgears (GIS) and other high-voltage applications. Since the signing of a voluntary agreement in 2002, emissions from these sources have decreased and were about 67.1 per cent lower in 2015 than in 2002.

***Figure 3.11** Emissions of SF_6 (tonnes) in Norway 1990-2015*



Source: Statistics Norway/ Norwegian Environment Agency

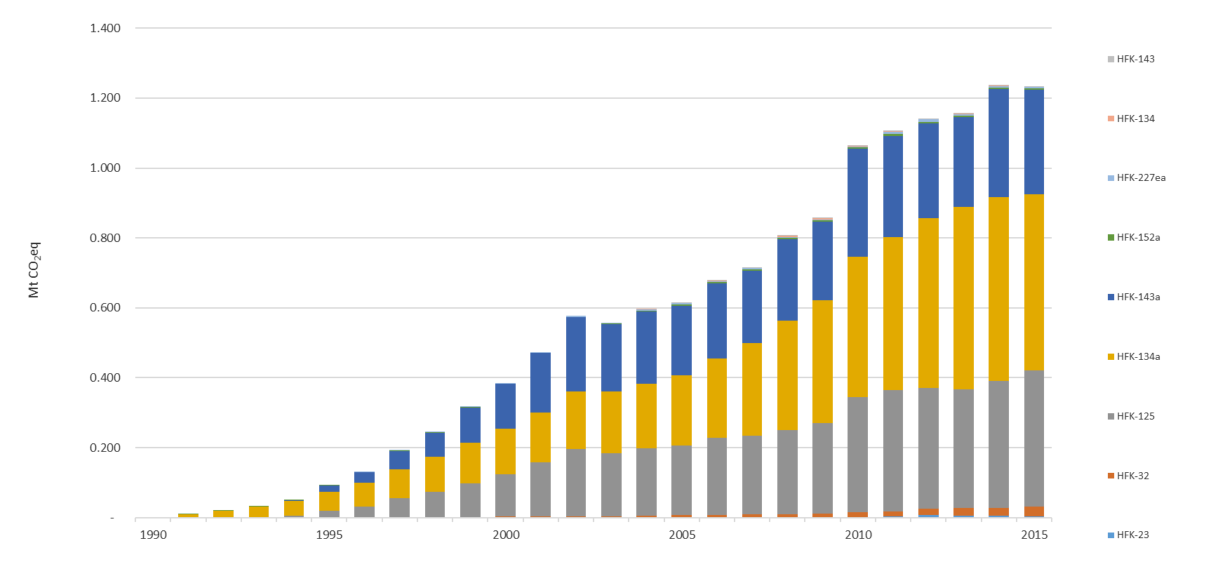
3.1.7 Emissions of hydrofluorocarbons (HFCs)

The total emissions from HFCs used as substitutes for ozone depleting substances amounted to 1.2 million tonnes of CO_2 equivalents in 2015. It is a decrease of 0.2 per cent compared to 2014. The emissions in 1990 were insignificant. Indeed, emissions have been multiplied by more than 13 since 1995.

The application category refrigeration and air conditioning contributes by far the largest part of the HFC emissions. The other categories am, foam blowing agents and fire extinguishers contribute to small amounts of the overall emissions.

Figure 3.12 displays the development of HFC emissions since 1990. The trend is due to the strong demand for substitution of ozone depleting substances. The increase in HFC emissions has been moderated by the introduction of a tax on HFCs in 2003.

***Figure 3.12** Actual emissions of HFCs (Mtonnes CO_2-eq.) in Norway, 1990-2015*



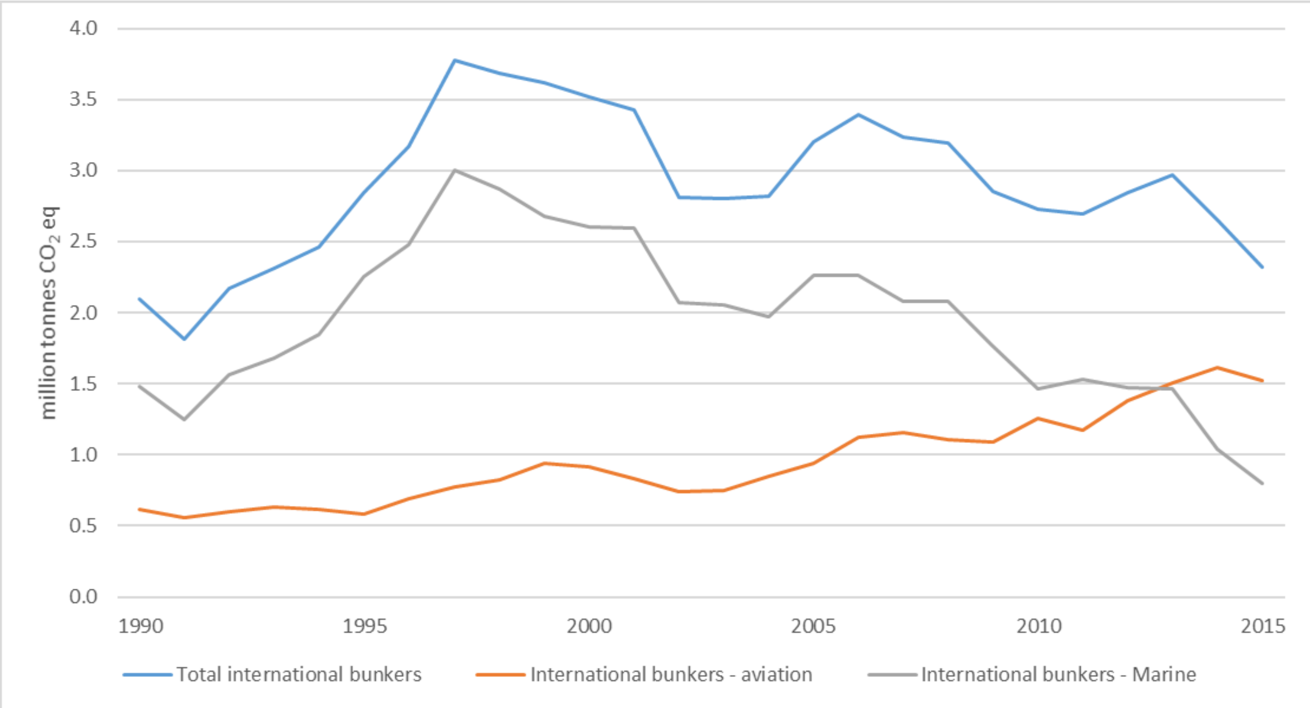
Source: Statistics Norway/ Norwegian Environment Agency

3.1.8 International bunkers

Norway reports emissions from international marine and aviation bunker fuels, but these emissions are not included in the national total, in accordance with the UNFCCC reporting guidelines. They are therefore reported separately as memo items in the NIR and in the CRF.

In 2015, CO_2 emissions from ships and aircraft in international traffic bunkered in Norway amounted to a total of 2.8 million tonnes, which corresponds to 5.2 per cent of the total Norwegian CO_2 emissions. The CO_2 emissions from bunkers have increased by 34 per cent from 1990 to 2015 and by 4.5 per cent in 2015.

Figure 3.13 *Emissions from international bunkers, given in million tonnes of CO_2 equivalents*



Source: Norwegian Environment Agency and Statistics Norway

During the period 1990-2015, emissions of CO_2 from marine bunkers decreased by 46 per cent. The emissions have varied greatly in this period and reached a peak in 1997. Thereafter there has been a descending trend in emissions and the emissions decreased by more than 73 per cent in the period 1997-2015.

The CO_2 emissions from international air traffic bunkered in Norway was in 2015 2.0 million tonne and this is all time high emissions. The emissions is more than tripled (224 per cent) in 2015 compared to 1990. In 2015, the emissions were almost 30 per cent higher than in 2014 and highest growth from one year to another ever. However, as aircraft engines are improving their fuel-efficiency, it follows that the increase in international air traffic has in fact been higher than that of the emissions.

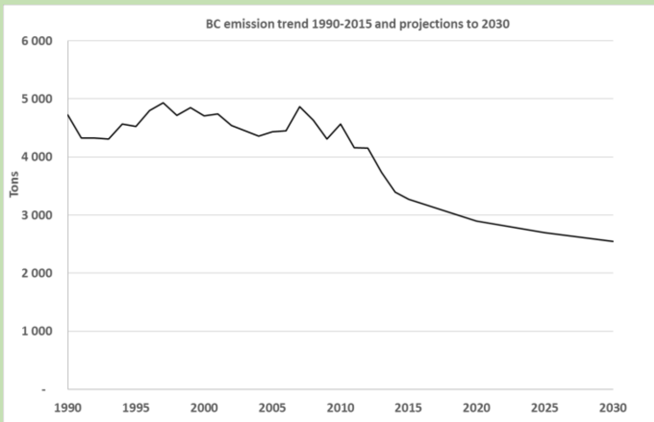
BOX 2: Black carbon and organic carbon

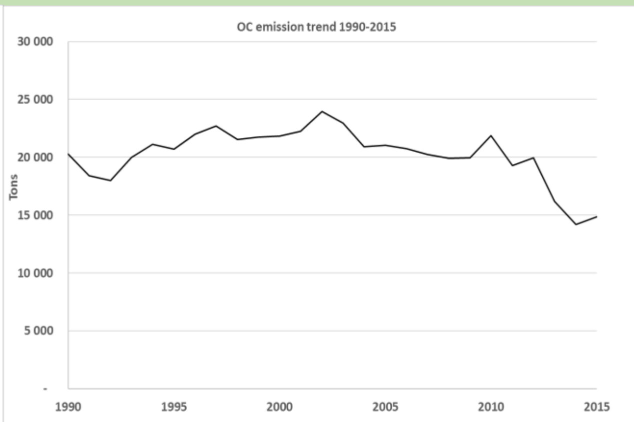
Black carbon and organic carbon are not regulated under the UNFCCC. On a voluntarily basis, Norway has reported BC annually under the Convention on Long-range Transboundary Air Pollution (LRTAP) since 2015. Norway has also reported BC biannually to the Arctic Council since 2015. In 2013, the Norwegian Environment Agency (NEA) published the first Norwegian emission inventories for black carbon (BC) and organic carbon (OC) in cooperation with Statistics Norway. The developed methodology is documented in the report "Emissions of black carbon and organic carbon in Norway 1990-2011. These climate forcers are always co-emitted, but have the opposite effect on climate. In general, BC warms the climate, while emissions of OC leads to a cooling. The emissions are primarily estimated based on shares of BC and OC of fine particulate matter (PM2.5). Specific emission factors are available for two sources, namely wood combustion in the residential sector and flaring of natural gas onshore and off-shore. Uncertainties have not been quantified, but are anticipated to be high relative to uncertainties in other more "mature inventories".

The largest single source of BC and OC in Norway is residential wood burning. NEA has therefore contracted experts to measure and analyse emissions from wood burning and suggest mitigation measures. The country specific emission factors are used to develop the inventories.

For flaring emission from off-shore petroleum activity and on-shore refineries, the emission factor was developed based on a study by McEwen and Johnson.

The emissions of BC and OC in 2015 were almost 3 300 and 14 900 tons respectively. The emission trends 1990-2015 and projections for BC up to 2030 are shown in the figures below.





Source: Norwegian Environment Agency and Statistics Norway

1: http://www.ssb.no/natur-og-miljo/artikler-og-publikasjoner/_attachment/107884?_ts=13dfd568678

2:http://www.miljodirektoratet.no/old/klif/nyheter/dokumenter/25042013(PM%20emission%20factors%20wood%20stoves_Rapport_Final_64-65).pdf

3:http://www.miljodirektoratet.no/no/Publikasjoner/2016/Mars-2016/Effect-of-maintenance-on-particulate-emissions-from-residential-woodstoves/

4:http://www.miljodirektoratet.no/no/Publikasjoner/2017/Februar-2017/Tiltaksutredning-vedrorende-utslipp-av-klimadrivere-fra-vedfyring/

5: James D.N. McEwen and Matthew R. Johnson (2012): Black Carbon Particulate Matter Emission Factors for Buoyancy Driven Associated Gas Flares. Journal of the Air & Waste Management Association, Volume 62, 2012, Pages 307-321. http://dx.doi.org/10.1080/10473289.2011.650040

3.2 National systems in accordance with Article 5, paragraph 1, of the Kyoto Protocol

The Norwegian national system for greenhouse gas inventories is based on close cooperation between the Norwegian Environment Agency[10], Statistics Norway and the Norwegian Institute of Bioeconomy Research (NIBIO). Statistics Norway is responsible for the official statistics on emissions to air. NIBIO is responsible for the calculations of emission and removals from Land Use and Land Use Change and Forestry (LULUCF).

The Norwegian Environment Agency was appointed by the Ministry of Climate and Environment as the national entity pursuant to the Norwegian government`s Parliament budget proposition for 2006. This appointment was renewed in 2015 through the budget proposition from the Ministry of Environment and Climate to the Norwegian parliament. The budget proposition stated that "*The Norwegian system will build on existing organization and cooperation between the Norwegian Environment Agency, Statistics Norway and the Norwegian Institute of Bioeconomy Research. These three institutions are held individually responsible that their own contributions to the national system are in line with the guidelines from the climate convention on the calculation and archiving of emissions and removals of greenhouse gases. The Norwegian Environment Agency is still appointed as a national entity with overall responsibility for the inventory and reporting*". (St. prop. Nr. 1 (2014-2015)). As the national entity, the Norwegian Environment Agency is in charge of approving the inventory before official submission to the UNFCCC.

To ensure that the institutions comply with their responsibilities, Statistics Norway and NIBIO have signed agreements with the Norwegian Environment Agency as the national entity. Through these agreements, the institutions are committed to implementing Quality Assurance/Quality Control (QA/QC) and archiving procedures, providing documentation, making information available for review, and delivering data and information in a timely manner to meet the deadline for reporting to the UNFCCC.

The most updated information about the methods and framework for the production of the emission inventory, as well as changes performed since the previous emission inventory, are given in the Norwegian Inventory Report "Greenhouse Gas Emissions 1990-2015, National Inventory Report" (Norwegian Environment Agency Report M-724).

The main emission model has been developed by - and is operated by - Statistics Norway. Emissions from road traffic, methane from landfills and emissions of HFC, PFC and SF_6 from products and some agriculture emissions are calculated by side models, and are incorporated into the main model along with emissions from point sources collected by the Norwegian Environment Agency.

NIBIO is in charge of estimating emissions and removals from LULUCF for all categories where area statistics are used for activity data. The National Forest Inventory (NFI) database contains data on areas for all land uses and land-use conversions as well as carbon stocks in living biomass, and are, supplemented by some other activity data, the basis for the LULUCF

[10] Former names are "Climate and Pollution Agency" and "Norwegian Pollution Control Authority".

calculations. The NFI utilizes a 5-year cycle based on a re-sampling method of the permanent plots.

Norway has implemented the formal QA/QC plan, according to which all three institutions prepare a QA/QC report annually. On the basis of these reports, the three institutions collaborate on which actions to take to further improve the QA/QC of the inventory.

In the Norwegian greenhouse gas emission inventory key categories are identified by means of approach 1 and approach 2 methods. A description of the methodology as well as background tables and the results from the analyses are presented in the annual National Inventory Report.

The Norwegian greenhouse gas emission inventory has in 2017 been routinely recalculated for the entire time series 1990-2014 for all components and sources, in order to account for new knowledge on activity data and emission factors and to correct errors in the calculations. There is also a continuous process for improving and correcting the inventory and the documentation of the methodologies employed, based on questions and comments received in connection with the annual reviews together with needs of improvements recognised by the Norwegian inventory experts.

In general, the data contained in the Norwegian emission inventory are available to the public, both activity data and emission factors. In terms of spatial coverage, the emission reporting under the UNFCCC covers all activities within Norway's jurisdiction.

The data collection and data management is secured through three main acts, the Pollution Control Act, the Greenhouse Gas Emissions Trading Act and the Statistics Act.

Designated representative – contact information

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3.3 National registry

Directive 2009/29/EC adopted in 2009, which was incorporated in the EEA agreement in July 2012, provides for the centralization of the EU ETS operations into a single European Union registry operated by the European Commission as well as for the inclusion of the aviation sector. At the same time, and with a view to increasing efficiency in the operations of their respective national registries, the EU Member States who are also Parties to the Kyoto Protocol (26) plus Iceland, Liechtenstein and Norway decided to operate their registries in a consolidated manner in accordance with all relevant decisions applicable to the establishment of Party registries - in particular Decision 13/CMP.1 and Decision 24/CP.8. The consolidated platform which implements the national registries in a consolidated manner (including the registry of the EU) is called the Union registry. A complete description of the consolidated registry was provided in the common readiness documentation and specific readiness documentation for the national registry of EU and all consolidating national registries.

Terms of cooperation between the European Commission (Central Administrator) and the national administrators have been agreed by the administrators' working group. They include common operational procedures for the implementation of the Registry Regulation (Regulation (EU) No 389/2013) and change and incident management procedures for the Union Registry.

3.3.1 Information on the Union Registry

The Union Registry has been developed on the basis the following modalities:

- Each Party retains its organization designated as its registry administrator to maintain the national registry of that Party and remains responsible for all the obligations of Parties that are to be fulfilled through registries;
    a) The Norwegian Environment Agency is the responsible entity for the administration of the Norway's national emissions trading registry
- Each Kyoto unit issued by the Parties in such a consolidated system is issued by one of the constituent Parties and continues to carry the Party of origin identifier in its unique serial number;
- Each Party retains its own set of national accounts as required by paragraph 21 of the Annex to Decision 15/CMP.1. Each account within a national registry keeps a unique account number comprising the identifier of the Party and a unique number within the Party where the account is maintained;
- Kyoto transactions continue to be forwarded to and checked by the UNFCCC Independent Transaction Log (ITL), which remains responsible for verifying the accuracy and validity of those transactions;
- The transaction log and registries continue to reconcile their data with each other in order to ensure data consistency and facilitate the automated checks of the ITL;
- All registries reside on a consolidated IT platform sharing the same infrastructure technologies. The chosen architecture implements modalities to ensure that the consolidated national registries are uniquely identifiable, protected and distinguishable from each other, notably:
- With regards to the data exchange, each national registry connects to the ITL directly and establishes a secure communication link through a consolidated communication channel (VPN tunnel)
    a) The ITL remains responsible for authenticating the national registries and takes the full and final record of all transactions involving Kyoto units and other administrative processes such that those actions cannot be disputed or repudiated;
    b) With regards to the data storage, the consolidated platform continues to guarantee that data is kept confidential and protected against unauthorized manipulation;
    c) The data storage architecture also ensures that the data pertaining to a national registry are distinguishable and uniquely identifiable from the data pertaining to other consolidated national registries;
    d) In addition, each consolidated national registry keeps a distinct user access entry point (URL) and a distinct set of authorisation and configuration rules.

e) The detailed security measures cannot be shared in detail, as that would compromise security.

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

In the following table, we provide an update on any changes to the national registry that have occurred since the last National Communication report. Any changes are reported annually in the National Inventory Report.

Table 3.3 *Changes to the Union Registry*

Reporting Item	Description
15/CMP.1 Annex II.E paragraph 32.(a) Change of name or contact	Changes have occurred since 2014, see annual submissions of NIRs. The current registry administrators are Tor Egil Tønnessen Kjenn, Mona Marstrander Rødland, Helga Soppeland Larsen, Åshild Færevåg and Carina Heimdal Waag.
15/CMP.1 Annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	In 2016 new tables were added to the database for the implementation of the CP2 functionality. Versions of the Union registry released after 6.1.6 (the production version at the time of the last NC submission) introduced other minor changes in the structure of the database. These changes were limited and only affected EU ETS functionality. No change was required to the database and application backup plan or to the disaster recovery plan. No change to the capacity of the national registry occurred during the reported period,.
15/CMP.1 Annex II.E paragraph 32.(d) Change regarding conformance to technical standards	Each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and were successfully carried out prior to each release of a new version in Production. Annex H testing is carried out every year. The test reports are provided to the UNFCCC as part of the annual inventory submissions. No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 Annex II.E paragraph 32.(e) Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.

Reporting Item	Description
15/CMP.1 Annex II.E paragraph 32.(f) Change regarding security	The mandatory use of hardware tokens for authentication and signature was introduced for registry administrators.
15/CMP.1 Annex II.E paragraph 32.(g) Change to list of publicly available information	Publicly available information is provided via the Union registry homepage for each registry e.g. https://ets-registry.webgate.ec.europa.eu/euregistry/XX/public/reports/publicReports.xhtml
15/CMP.1 Annex II.E paragraph 32.(f) Change regarding security	The mandatory use of hardware tokens for authentication and signature was introduced for registry administrators.
15/CMP.1 Annex II.E paragraph 32.(i) Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 Annex II.E paragraph 32.(j) Change regarding test results	Both regression testing and tests on the new functionality are carried out prior to release of the new versions in Production. The site acceptance tests are carried out by quality assurance consultants on behalf of and assisted by the European Commission. The latest site acceptance test report was provided to the UNFCCC in the 2017 inventory submission. Annex H testing is carried out on an annual basis.

3.3.2 Registry administrators – contact information

The Registry administrator is still within the Norwegian Environment Agency.

Postal address: Postboks 5672 Torgarden, 7485 Trondheim, Norway

Phone number: +47 95 20 46 67

Functional mailbox: kvoteregister@miljodir.no

The current registry administrators are Tor Egil Tønnessen Kjenn, Carina Heimdal Waag, Mona Marstrander Rødland, Åshild Færevåg and Helga Soppeland Larsen.

3.3.3 Publicly available information

The requirements of paragraphs 44 to 48 of the Annex to Decision 13/CMP.1 concerning making non-confidential information accessible to the public is fulfilled by Norway through a publically available web page hosted by the Union registry. In addition, the Standard Electronic Format reports are available on the national website of the Norwegian registry (http://www.kvoteregister.no/Public-reports/), which also provides links to the web page hosted by the Union Registry containing publicly available information.

In line with the data protection requirements of Regulation (EC) No 45/2001 and Directive 95/46/EC and in accordance with Article 110 and Annex XIV of Commission Regulation (EU) No 389/2013, the information on account representatives, account holdings, account numbers, legal entity contact information, all transactions made and carbon unit identifiers, held in the EUTL, the Union Registry and any other KP registry (required by paragraph 45 and paragraph 48) is considered confidential. This information is therefore not publicly available.

More information on the accounts in the Norwegian registry, and the account holders of the different accounts, can be found on the search pages of EUTL: http://ec.europa.eu/environment/ets/account.do?languageCode=en&account.registryCodes=NO&identifierInReg=&accountHolder=&search=Search&searchType=account&currentSortSettings

3.3.4 Internet address

The internet address of the Norwegian registry has changed since the last National Communication, and the current address is the following:

https://ets-registry.webgate.ec.europa.eu/euregistry/NO/index.xhtml

At the same time, Norway's registry administrators continue to use the dedicated registry website Kvoteregister.no for sharing information with users and publishing the publicly available information.

4 Policies and measures

4.1 Policymaking process

4.1.1 Overview

Norway's climate policy is based on the objective of the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement. The scientific understanding of the greenhouse effect set out in the reports from IPCC is an important factor in developing climate policy. Thus, the policies and measures reported are seen as modifying long-term trends in anthropogenic greenhouse gas emissions and removals.

Climate change and emissions of greenhouse gases have featured on the policy agenda in Norway since the late 1980s. Today, Norway has a comprehensive set of measures covering almost all emissions of greenhouse gases as well as removals.

Norway has ratified the Paris Agreement and is working towards its overall objectives, including by:

- Contributing to efforts to hold the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change
- increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production
- making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development

Norway has ambitious climate targets that are set out in various policy documents: the updated cross-party agreement on climate policy from 2012 (published as a recommendation to the Storting (Innst. 390 S (2011–2012)) in response to the white paper on Norwegian climate policy from the same year (Meld. St. 21 (2011–2012)); the white paper *New emission commitment for Norway for 2030 – towards joint fulfilment with the EU* (Meld. St. 13 (2014–2015)) and a subsequent recommendation to the Storting (Innst. 211 S (2014–2015)); the documents relating to the Norwegian Parliaments consent to ratification of the Paris Agreement (Innst. 407 S (2015–2016) and Prop. 115 S (2015–2016)); and the Climate Change Act that the Norwegian Parliament adopted in June 2017. Most recently the targets were reiterated in the White Paper on the Solberg Government's strategy for fulfilling the 2030 climate target (Meld St. 41 (2016-2017) issued in June 2017.

BOX 3: Norway's climate targets:

1. Reduce emissions by 30 % by 2020
2. Reduce emissions by at least 40 % by 2030
3. Climate neutrality by 2030
4. Low-emission society by 2050

Reduce emissions by 30 per cent by 2020

In 2012, this target was made operational through the legally binding commitment for 2013-2020 under the Kyoto Protocol. The commitment means that Norway must ensure that annual greenhouse gas emissions for the period 2013–2020 does not exceed an average of 16 per cent lower than in 1990. This establishes an emission budget for Norway for the period 2013–2020 under the Protocol consistent with Norway’s 2020 target of cutting global greenhouse gas emissions by the equivalent of 30 per cent of its 1990 emissions by 2020. Norway ratified the Doha amendments 12 June 2014. Thus, compliance with the commitment under KP will also imply that the 30 per cent target for 2020 is achieved.

Within the framework of the Kyoto Protocol, Norway has long experience of using flexibility mechanisms, particularly project-based cooperation in developing countries under the Clean Development Mechanism (CDM). By using these mechanisms, Norway can fund reductions in greenhouse gas emissions in developing countries, and be credited for these reductions in its greenhouse gas inventory under the Kyoto Protocol. Since climate change is a global problem, it does not matter whether emissions are reduced in Norway or in other countries. What matters is the overall reduction in global emissions. By using these international mechanisms, Norway has been able to assume targets that are more ambitious than if it had to do all reductions domestically and so far more than met its commitments under the Kyoto Protocol. This is done through contributions reflecting flows of units in the European Emissions Trading System and the Norwegian carbon unit purchase program (see box 6).

Norway's cross party agreement on climate policy from 2008 sets out the ambition for domestic reductions by 2020. The Norwegian Parliament later operationalised the target to be that the 2020 emission shall not be higher than 46.6-48.6 mill. tonnes CO_2 equivalents.

Reduce emissions by at least 40 per cent by 2030

Norway has through its National Determined Contribution (NDC) under the Paris Agreement committed to a conditional target of at least 40 per cent emissions reduction by 2030 compared to 1990. Norway's NDC is economy wide, covering all sectors and greenhouse gases[11]. The 2030 target has been established by law in the Norwegian Climate Change Act. Norway's intention is to fulfil this target jointly with the EU.[12] In June 2017, the Solberg Government presented a White Paper on its strategy for fulfilling the 2030 climate target, see box 4.

If it is not possible to achieve joint fulfilment with the EU, the target of reducing emissions by at least 40 per cent by 2030 compared with 1990 will still be Norway’s nationally determined contribution under the Paris Agreement. This target is conditional on the availability of flexibility mechanisms under the Paris agreement and on Norway being credited for participation in the EU emissions trading system (EU ETS) so that this counts towards fulfilment of the commitment.

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[11]Greenhouse gases not covered by the Montreal Protocol.

[12]New emission commitment for Norway for 2030 – towards joint fulfilment with the EU (Meld. St. 13 (2014–2015)) and the subsequent recommendation to the Storting (Innst. 211 S (2014–2015)).

BOX 4: Strategy for fulfilling the 2030 climate target

The Solberg Government's strategy for fulfilling the 2030 climate target was presented in a White Paper (Meld St. 41 (2016-2017) in June 2017on it's strategy for fulfilling the 2030 climate target. The strategy has not yet been debated by the Norwegian Parliament. The Solberg Government is working towards an agreement with EU on joint fulfilment of its 2030 commitment. Norway is already cooperating with the EU to reduce emissions from ETS sectors. Given an agreement on joint fulfilment of the 2030 target, Norway would also cooperate with the EU on reducing non-ETS emissions covered by the proposed Effort Sharing Regulation. In the Commission's proposal for the Effort Sharing Regulation Norway is mentioned with a preliminary target for reduction of non-ETS emissions of 40 per cent below the 2005 level in 2030. . Based on the Commission's proposal, Norway would probably be given the possibility to use 5.5-11 million EU ETS units to comply with the budget. The Solberg Government will use this flexibility. The remaining need for emission reductions is, in the period 2021-2030, estimated to about 20-25 million tonnes. This estimate is uncertain.

The Solberg Government intends to achieve its 2030 target with main emphasis on domestic emission reductions, and with the use of EU flexibility mechanisms as necessary. The Solberg Government will facilitate that the 2030 commitment can be met by cost efficient emission reductions. The Solberg Government's strategy for 2030 is intended to facilitate substantial domestic emission reductions. Before the commitment period starts in 2021, the details of the EU legislation will be known and the consequences for Norway will be clearer. However, well into the commitment period 2021–2030 there will be considerable uncertainty related to emission trajectories, the effects of climate policy, technological developments and the costs of emission reductions. This is why the strategy needs to be both ambitious and flexible. The Solberg Government is allowing for uncertainty by strategic planning to ensure the necessary flexibility to achieve the emission budget. Use of the EU flexibility mechanisms will contribute to emission reductions elsewhere in Europe within the common overall emission ceiling, and thus contribute to real global reductions in the same way as emission reductions in Norway. To ensure that the targets are achieved by 2030, the Solberg Government's strategy incorporates sufficient flexibility to allow for adjustments as new knowledge becomes available and conditions change, for example as a result of technological advances. The Solberg Government has already implemented a range of mitigation measures and strengthened national climate policy together with the parties with which it is cooperating in the Norwegian parliament. In addition, decisions made by the Norwegian Parliament and ambitions and goals that have been formulated will play a part in bringing about emission reductions in the years ahead. This applies in particular to the targets for zero-emission vehicles set out in the Norwegian National Transport Plan 2018–2029 (Meld. St. 33 (2016–2017*)*); the decision to increase the biofuel quota obligation (the required proportion of biofuels in annual sales of road traffic fuels) to 20 per cent in 2020;

BOX 4 continues: Strategy for fulfilling the 2030 climate target

In the strategy described in the present white paper, the Solberg Government shows that the estimated emissions gap of 20–25 million tonnes can be closed by means of domestic emission reductions. The white paper presents mitigation measures that the Norwegian Environment Agency estimates have the overall potential to reduce emissions by more than is needed to close the emissions gap. The Solberg Government considers it appropriate to consider a broad range of mitigation measures because estimates of the emission reduction potential and costs of measures are highly uncertain. This strategy takes into account the possibility that some of the emission reduction potential may not be realised. The strategy does not present a final list of mitigation measures or policy instruments to achieve emission reductions by 2030. It will be important to be able to adjust the use of policy instruments throughout the period, for example to take into account technological developments and the costs of deploying zero- and low-emission technology. The strategy therefore charts a course for the use of policy instruments in the years ahead and indicates mitigation opportunities within each sector.

Climate neutrality by 2030
In connection with its consent to ratification of the Paris Agreement, the Norwegian Parliament asked the Government to work on the basis that Norway is to achieve climate neutrality from 2030. This means that from 2030, Norway must achieve emission reduction abroad equivalent to remaining Norwegian greenhouse gas emissions..

The Solberg Government will provide the Norwegian Parliament with an account of its follow-up at a suitable time.

Low-emission society by 2050
In June 2017, the Norwegian Parliament adopted an Act relating to Norway’s climate targets (Climate Change Act), which establishes by law Norway’s target of becoming a low-emission society by 2050. The purpose is to promote the long-term transformation of Norway in a climate-friendly direction. The Act describes a low-emission society as one where greenhouse gas emissions, on the basis of the best available scientific knowledge, global emission trends and national circumstances, have been reduced in order to avert adverse impacts of global warming, as described in the Paris Agreement. In quantitative terms, the target is to achieve emissions reductions of the order of 80–95 per cent from the level in the reference year 1990. The effect of Norway’s participation in the EU ETS is to be taken into account in assessing progress towards this target. The interval specified above is the same as that used in the EU’s conditional goal for reduction of EU-wide emissions by 2050. As a small open economy, Norway is dependent on a similar shift in other countries if it is to maintain its ability to make full, effective use of labour and other resources and achieve its climate and environmental policy goals.

Norway’s target of becoming a low-emission society is set out in the 2012 cross-party agreement on climate policy (recommendation to the Storting (Innst. 390 S (2011–2012)) and the white paper New emission commitment for Norway for 2030 – towards joint fulfilment with the EU (Meld. St. 13 (2014–2015)). In the cross-party agreement, the parliamentary majority also pointed out that an ambitious national policy must also be rational in an international situation where the overall goal is to reduce global greenhouse gas emissions. This means that policy development needs to take into account the consequences of the emissions trading system, the risk of carbon leakage and the competitiveness of Norwegian industry. This will have a bearing on the use of policy instruments to reduce domestic emissions in the period up to 2030 and 2050. To become a low-emission society, Norway will need support from a similar shift in global developments.

4.1.2 Policy instruments

The polluter pays principle is a cornerstone of the Norwegian policy framework on climate change. The policy should be designed to yield the greatest possible emission reductions relative to cost, and should result in emission reductions both in Norway and abroad.

General policy instruments are a key element of domestic climate policy. Cross-sectoral economic policy instruments (i.e. CO_2 tax) form the basis for decentralised, cost-effective and informed actions, where the polluter pays. In areas subject to general policy instruments, additional regulation should as a main rule be avoided. At the same time, the possibility of employing other policy instruments in addition to emission trading and taxes is to be continued, also in these sectors. In it's White Paper on the 2030 climate strategy the Government states that it will promote the use of cost-effective mitigation measures to meet the 2030 commitment. If the CO_2 tax is not considered to be an adequate or appropriate instrument, other instruments that provide equally strong incentives to reduce emissions will be considered, including direct regulation under the Pollution Control Act and voluntary agreements.

The broad political agreement on climate of 2012, measures that are cost-effective in the light of expectations of rising emission prices over the lifetime of the investments, and which are not necessarily triggered by current policy instruments, should be given special consideration. This applies particularly to measures that promote technology development and to measures that mobilise earlier adoption by the population of consumer patterns that yield lower emissions. More than 80 per cent of domestic greenhouse gas emissions are from 2013 either covered by the emissions trading scheme, subject to a CO_2 tax or other taxes directed to reduce greenhouse gas emission. Certain sources of emissions may be difficult to incorporate into the emissions trading scheme or to make subject to a CO_2 tax. In such cases, other instruments to reduce greenhouse gas emissions may be more appropriate.

In addition to demand-side instruments like emission trading and taxes, support to research on and innovation of climate-friendly technologies will provide complementary support where markets do not provide the solutions.

4.1.3 Responsibilities for the different institutions

The overall national climate policy is decided by the Storting, and the government implements and administers the most important policies and measures, such as economic instruments and direct regulations. Most policies and measures in the area of climate policy are developed through interministerial processes before the political proposals are tabled. The Ministry of Climate and Environment has the overarching cross-sectoral responsibility for co-ordination and implementation of the Norwegian climate policy. It also operates the Norwegian carbon credit procurement program (see box 6). The Ministry of Finance is responsible for the tax schemes. The other ministries are responsible for policies in their respective sectors.

Local governments are responsible for implementing policies and measures at the local level, for example through waste management, local planning and some transport measures. In 2009, guidelines were introduced for climate and energy planning in the municipalities. New guidelines describing how the municipalities and counties can incorporate climate change adaptation work into their planning activities are currently being developed.

The Norwegian Environment Agency is a government agency under the Ministry of Climate and Environment. The Environment Agency implements government pollution and nature management policy. Important fields of work in relation to pollution control include climate, hazardous substances, water and the marine environment, waste management, air quality and noise. The Environment Agency manages and enforces the Pollution Control Act, the Product Control Act and the Greenhouse Gas Emission Trading Act, and the Nature Diversity Act, among others.

The Environment Agency grants permits, establishes requirements and sets emission limits, and carries out inspections to ensure compliance.

The Environment Agency also monitors and informs about the state of the environment. The Environment Agency has an overview of the state of the environment and its development. Together with other expert agencies, the Environment Agency provides environmental information to the public. The main channel is State of Environment Norway: www.environment.no

The Environment Agency supervises and monitors the County Governors' work on pollution, coordinates the County Governors' inspection work and organises joint inspections. The Environment Agency provides guidelines for the County Governors and also deals with appeals against decisions made by the County Governors.

The Environment Agency participates in a series of international processes, to promote regional and global agreements that reduce serious environmental problems. Moreover, the Environment Agency also cooperates with the environmental authorities in other countries, sharing competence and furthering environmental improvements.

The Norwegian Water Resources and Energy Directorate (NVE) is a directorate under the Ministry of Petroleum and Energy. NVE's mandate is to ensure an integrated and environmentally sound management of the country's water resources, promote efficient energy markets and cost-effective energy systems and promote efficient energy use. For more information, see: www.nve.no/en . Pursuant to changes in the Solberg Government in January 2018, the Minister for Climate and Environment is responsible for the state owned enterprise Enova www.enova.no/about-enova, which plays an important role in the development of Norway's future energy system and the transition to a low-emission society. Sustainable development

Norway has actively addressed sustainable development since the World Commission on Environment and Development submitted its report Our Common Future in 1987. In 2015 UN presented new and ambitious sustainable development goals. There are 17 main goals and 169 intermediate objectives. Through Agenda 2030 the international community has made a commitment that no people are left behind in the implementation of the goals. The goals are global, and all countries must do their part. In 2016 Norway was among the first countries to report to the UN on status for their follow up of the goals. A new Norwegian status report ("One Year Closer") was presented this year.

The Government underscores that the follow-up of the sustainable development goals shall be integrated in the ordinary government decision-making processes. Each of the 17 sustainable development goals has been assigned to one responsible Ministry. All ministries shall report on the follow-up of their responsibilities in the budget documents. The Ministry of Finance sums up the main points in the yearly National Budget. The Foreign Ministry coordinates the processes at international level.

4.1.4 Minimisation of adverse impacts in accordance with Articles 2.3 and 3.14 of the Kyoto Protocol

Norway has striven to follow a comprehensive approach to climate change mitigation from policy development started around 1990, addressing all sources as well as sinks, in order to minimise adverse effects of climate policies and measures of climate policies and measures on the economy. In developing environmental, as well as the economic and energy policy, Norway strives to formulate the policy on the polluter pays principle and to have a market-based approach where prices reflect costs including externalities. As regards emissions of greenhouse gases, costs of externalities are reflected by levies and by participation in the European Emissions Trading Scheme (EU ETS). These instruments place a price on emissions of greenhouse gases. Norway believes that the best way to reduce emissions on a global scale, in line with the two degree target and striving for 1.5 degree limit, would ideally be to establish a global price on emissions. Pursuing a global price on emissions would be the most efficient way to ensure cost-effectiveness of mitigation actions between different countries and regions, and secure equal treatment of all emitters and all countries. This will help minimise adverse impacts of mitigation. For more information about levies on energy commodities and the design of the EU ETS, see Chapter 4.3.2.4.

The government presented a national strategy for green competitiveness in October 2017. The aim of the strategy is to provide more predictable framework conditions for a green transition in Norway, while maintaining economic growth and creating new jobs. In October the government also appointed an expert commission to analyze Norway's exposure to climate risk.

Carbon capture and storage (CCS) is one of five priority areas for enhanced national climate action. Norway strives to disseminate information and lessons learned from projects in operation in the petroleum sector, new large scale projects under planning and from research, development and demonstration projects. The information and lessons learned are shared both through international fora, and through bilateral cooperation with developing and developed countries. See chapter 7 for further information.

Norway has also initiated cooperation with developing countries related to fossil fuels: Oil for Development (OfD). This initiative is aimed at responding to requests for assistance from developing countries, in their efforts to manage petroleum resources in a way that generates economic growth and promotes the welfare of the whole population in an environmentally sound way, see more information about this in chapter 7. The rationale behind the OfD is to improve the economic resilience in petroleum producing countries through resource, revenue and environmental management. Furthermore, Norway has since 2007 supported initiatives fostering technology development and transfer, as well as capacity building efforts in developing countries, to increase access to renewable energy, and to reduce dependence of fossil fuels, thus enhancing their resilience to social and economic effects of response measures taken.

Norway has issued Instructions for Official Studies and Reports (Utredningsinstruksen), laid down by Royal Decree. These Instructions deal with consequence assessments, submissions and review procedures in connection with official studies, regulations, propositions and reports to the Storting. The Instructions are intended for use by ministries and their subordinate agencies. The Instructions form part of the Government's internal provisions and deviation may only be allowed pursuant to a special resolution. The provisions make it mandatory to study and clarify financial, administrative and other significant consequences in advance.

In addition, Norway has a legal framework that deals specifically with environmental impact assessments. The purpose is to promote sustainable development for the benefit of the individual, society and future generations. Transparency, predictability and participation for all interest groups and authorities involved are key aims, and it is intended that long-term solutions and awareness of effects on society and the environment will be promoted.

4.2 Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures

4.2.1 Domestic and regional legislative arrangements and enforcements

Norway has several legislative arrangements in place in order to help reduce emissions of greenhouse gases,such as the Pollution Control Act, the Greenhouse Gas Emissions Trading Act, the CO_2 Tax Act, and the Petroleum Act, as well as requirements under the Planning and Building Act. The relevant arrangements will be discussed in more detail in 4.3.

The Climate Change Act
In June 2017, the Norwegian Parliament adopted the Climate Change Act, which establishes by law Norway's emission reduction targets for 2030 and 2050. The purpose of the act is to promote the long-term transformation of Norway in a climate-friendly direction. See further description of Norway's climate targets in 4.1.

The act will have an overarching function in addition to existing environmental legislation. The Climate Change Act introduces a system of five-year reviews of Norway's climate targets, on the same principle as the Paris Agreement. In addition the act introduces an annual reporting mechanism. The Government shall each year submit to the Parliament updated information on status and progress in achieving the climate targets under the law, and how Norway prepares for and adapts to climate change. Information on the expected effects of the proposed budget on greenhouse gas emissions and projections of emissions and removals are also compulsory elements of the annual reporting mechanism.

4.2.2 Provisions to make information publicly accessible

Norway has undertaken extensive provisions to make climate information public available. This issue is discussed further in chapter 9.

4.3 Policies and measures and their effects

4.3.1 Introduction

This chapter describes some of the most important policies and measures (PaMs) for reducing greenhouse gas emissions in Norway. The chapter consists of textual descriptions of cross-sectoral and sectoral PaMs, and each sector has a summary table for the PaMs. Through these summary tables, the reporting of the PaMs is clearly subdivided by gases. The summary tables present the effects on greenhouse gas emissions of many PaMs and the total aggregated effects are summed up in chapter 5.3.

4.3.2 Cross-sectoral economic policies and measures

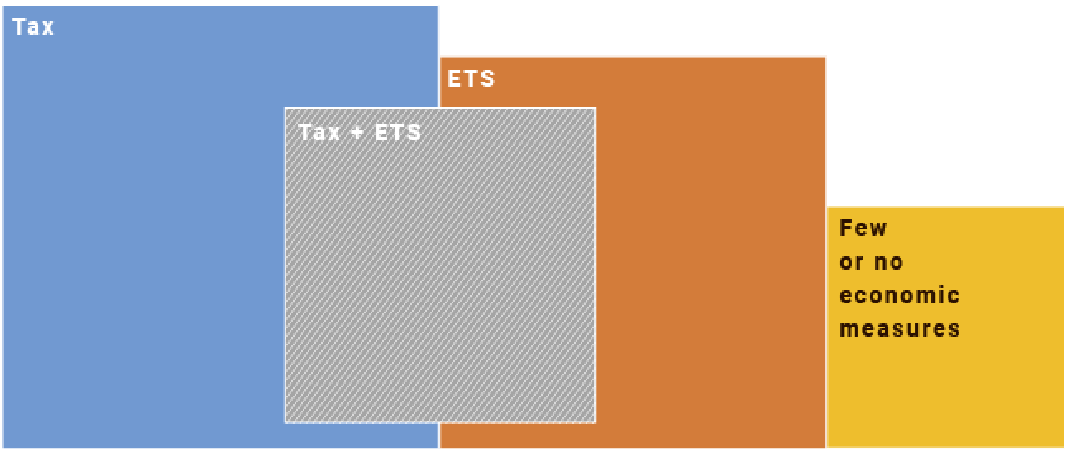
4.3.2.1 Introduction

In Norway, effectiveness and cost-effectiveness are two key criteria in environmental policy development, as in other policy areas. The polluter-pays principle is another key element of the Norwegian environmental policy. The principle implies that the polluter should bear the costs of environmental damage. Furthermore, policy will be based on the responsibility to help safeguard the planet and on the precautionary principle. General policy instruments are a key part of the domestic climate policy. Cross-sectoral economic policy instruments (i.e. CO_2-tax) form the basis for decentralized, cost-effective and informed actions, where the polluter pays.

In areas subject to general policy instruments, additional regulation should as a main rule be avoided. At the same time, the possibility of employing other policy instruments in addition to emission trading and taxes is to be continued, also in these sectors. In it's White Paper on the 2030 climate strategy (Meld St. 41 (2016-2017) the Government states that it will promote the use of cost-effective mitigation measures to meet the 2030 commitment. For non-ETS emissions tax on greenhouse gases would be the main mitigation measure. If the carbon tax is not considered to be an adequate or appropriate instrument, other instruments that provide equally strong incentives to reduce emissions will be considered, including direct regulation under the Pollution Control Act and voluntary agreements. This applies particularly to measures that promote technology development.

Cost-effective policy instruments result in the implementation of measures that give the greatest possible emission reductions relative to the resources used. If policy instruments are not cost-effective, society must accept an unnecessary loss of welfare in other areas in order to achieve environmental goals. In the assessment of policies and measures, cross-sectoral effects and long term effects on technology development and deployment should be taken into consideration.

Figure 4.1 *Emissions covered by economic measures by instrument type*



Source: Statistics Norway /The Norwegian Environment agency /Ministry of Finance, 2018

4.3.2.2 **Green taxes**

Green taxes are imposed on activities that are harmful for the environment so that businesses and individuals must take into account the environmental cost of their activities to society. Some of these taxes are levied on products that result in CO_2 emissions and have a climate motivation. There are also green taxes directed at other emissions and environmental effects, which have an indirect impact on greenhouse gas emissions. Table 4.1 gives an overview of the green taxes in Norway in 2017.

__Table 4.1__ Norwegian green taxes. 2017. NOK

Tax	Tax rate	Introduced
CO_2 tax	varies, see table 4.2	1991
Tax on CO_2 emissions in petroleum activities on the continental shelf	varies, see table 4.2	1991
Tax on NO_X emissions in petroleum activities on the continental shelf, NOK/kg	17.33	2007
Road usage tax on petrol, NOK/litre		1933
Sulphur-free	5.19	
Low sulphur	5.23	
Bioethanol[1]	0/5.19	
Road usage tax on auto diesel, NOK/litre		1993
Sulphur-free	3.80	
Low sulphur	3.86	
Biodiesel[1]	0/3.80	
Lubricating oil tax, NOK/litre	2.17	1988
Sulphur tax, NOK/litre per 0.25 weight per cent sulphur content above 0.05 weight per cent	0.136	1970
Tax on health- and environmentally damaging chemicals		2000
Trichloroethene, NOK/kg	71.15	
Tetrachloroethene, NOK/kg	71.15	
Tax on HFC and PFC, NOK/tonne CO_2 –equivalents	450	2003
Tax on emissions of NO_X, NOK/kg	21.59	2007
Environmental tax on pesticides	varies	1998
Environmental tax on beverage packaging[2]		1973
Carton and cardboard, NOK/unit	1.41	

Plastics, NOK/unit	3.44	
Metals, NOK/unit	5.70	
Glass, NOK/unit	5.70	
Electricity tax		1951
Standard rate, NOK/kWh	0.1632	
Reduced rate (manufacturing, etc.), NOK/kWh	0.0048	
Base-tax on mineral oils, etc.		2000
Standard rate, NOK/litre	1.603	
Reduced rate (pulp and paper, dyes and pigments industry), NOK/litre	0.147	
Motor vehicle registration tax	varies	1955
Annual tax on motor vehicles	varies	1917
Annual weight-based tax on vehicles	varies	1993

Source: Ministry of Finance

[1] Biodiesel and bioethanol included in the blending obligation are subject to the same tax rate as sulphur-free petrol and auto diesel, respectively. Other biofuels are not subject to road usage tax.

[2] These rates are reduced according to the amount of packaging collected for recycling.

In Norway, CO_2 taxes and quotas (EU ETS) cover more than 80 per cent of greenhouse gas emissions. The average price on Norwegian greenhouse gas emission is about NOK 340 per tonne CO_2, which is much higher than the price in the EU ETS NOK 50. The standard CO_2 tax is 450 NOK and is levied on mineral oils, petrol and diesel. The tax on HFC and PKC is also NOK 450 per tonne CO_2 equivalents.

The price on greenhouse gas emissions varies considerably between sectors and sources. The price on emissions is highest in the petroleum sector and in domestic aviation, which are also part of EU ETS. Both sectors are subject to CO_2 tax in addition to the EU ETS, and the total price on emissions is about NOK 500 and NOK 480, respectively. See chapter 4.3.2.3 below for more details on the Norwegian CO_2 tax system. Agriculture is not a part of the EU ETS, nor is it subject to tax on emissions of methane or nitrous oxide. However, standard rates of CO_2 tax and base tax on mineral oils apply to agriculture.

4.3.2.3 **The Norwegian CO_2 tax scheme**

CO_2 taxes on mineral oil, petrol and emissions from petroleum extraction on the continental shelf were introduced in 1991 to cost-efficiently limit greenhouse gas emissions. In addition to being subject to CO_2 taxes, emission from extraction of petroleum were also included in European emission trading system (EU ETS) in 2008. CO_2 taxes on natural gas and LPG were introduced in 2010.

In 2017, the standard rate of CO_2 taxes is about NOK 450 per tonne of CO_2 (petrol, diesel, natural gas, LPG, and mineral oil). Some sectors and activities are exempt from carbon tax or pays a reduced tax, see below.

The standard CO_2 tax on *natural gas and LPG* amounts to about NOK 450 per tonne CO_2. If the gasses are used in land based manufacturing production covered by EU ETS, the tax will either be reduced or exempted. For the time being, other sectors and activities exempted from the CO_2 tax on natural gas and LPG include (list not conclusive) fishery, freight and passenger transport in domestic shipping and offshore supply vessels.

The standard CO_2 tax on *petrol and mineral oil* amounts to about NOK 450 per tonne CO_2. Undertakings in the pulp and paper and the herring meal and fishmeal industries outside the EU ETS scheme as well as fishery in inshore waters pay a reduced tax on mineral oil that correspond to some NOK 100 per tonne. Manufacturing is not exempted the base tax on mineral oils.

In the budget for 2018, the Government repealed most exemptions and reduced rates. Agriculture and fishery has temporarily been excluded, awaiting assessments from government appointed committees on the possibility of gradually increasing greenhouse taxes or proposing alternative measures in these sectors.

Some taxes that do not target greenhouse gas emissions directly nevertheless increase the total tax burden companies and households face and therefore indirectly affect their emissions, also see below. The road usage tax on fuels is levied to internalise the costs inflicted on the society in terms of accidents, congestion, noise, road wear and tear as well as health and environmentally harmful emissions other than CO_2. Moreover, there is a base tax on mineral oil, which objective is to avoid substitution of electricity due to the electricity tax.

Tables 4.1 contains all green taxes while table 4.2 shows all current CO_2 taxes. Below follows a description of the effect of green taxes on mainland emissions. Chapter 4.3.4 discusses in more detail the CO_2 tax on petroleum activities and its effects on emissions off shore.

Estimated effect on national emissions (mainland)
Together with the base tax on mineral oil, the CO_2 tax on mineral oil constitutes a significant proportion – about 35 per cent – of the consumer price of heating oils. Emissions from heating purposes in households and industrial buildings under the CO_2 tax, account for about 2 per cent of the total national emissions of greenhouse gases. The taxes motivate households and industry to implement alternative heating systems, apply better insulation and use energy more efficiently. Since 1990, emission from heating in households and industrial buildings has declined by 40 per cent. Reductions in recent years may also reflect expectations that use of mineral oil for heating of building will be banned from 2020, see chapter 4.3.6.5.

For some products such as petrol, other tax elements (road usage tax) constitute a larger proportion of the price than the CO_2 tax. For example, in 2017 the road usage tax on sulphur free petrol is NOK 5.19 per litre, whereas the CO_2 tax is NOK 1.04 per litre. On mineral oils there is a base tax and also a sulphur tax on mineral oil with a sulphur content above 0.05 weight per cent. The total tax on such goods must be taken into account when comparing tax levels with other countries. While the total tax pressure will influence the effect on emissions, the estimates of the effect of the CO_2 tax only look at this element of the total taxes. To the extent that the CO_2 tax has increased the price of transport fuels, it is reasonable to assume that it must also have limited the increase in the volume of transport somewhat, resulted in some changes in choice of transport medium and encouraged the purchase of more fuel-efficient vehicles.

Norway's Sixth National Communication presented the estimated mitigation impact of the CO_2 tax in mainland sectors to be 0.9 tonnes of CO_2 equivalents both in 2020 and 2030, compared with a scenario without CO_2 tax.

Since these calculations in January 2014, CO_2 taxes on mineral oil, natural gas and LPG have increased towards the level of petrol, cf. Norway's second Biennial Report and Norway's third Biennial Report. This is in line with the recommendations of the Green Tax Commission (NOU 2015:15), see box 5. The tax increases are estimated to have strengthened the mitigation impact on CO_2 emissions to about 1.1 tons in 2020 and 2030, again compared with a scenario without CO_2 tax. All in all, the sectoral and cross-sectoral measures that have been put in place since 1990 are estimated to have reduced greenhouse gases by 21.3 – 25.7 million tons CO_2 equivalents in 2030. The CO_2 tax is the single measure that has contributed most to the reduction.

These estimates are uncertain. In the longer run, emission reductions may become larger if the higher taxes stimulate a shift toward more environmentally friendly technologies.

Table 4.2 *Norwegian CO_2 taxes 2017*

	Tax rate NOK/litre, NOK/kg or NOK/Sm^3	Tax rate NOK/tonne CO_2
Petrol	1.04	449
Mineral oil		
- Standard rate, light fuel oil	1.20	451
- Standard rate, heavy fuel oil	1.20	383
- Domestic aviation	1.10	431
- Pulp and paper industry and fishmeal industry, light fuel oil	0.32	120
- Pulp and paper industry and fishmeal industry, heavy fuel oil	0.32	102
- Fishing and catching inshore waters	0.29	109
Domestic use of gas		
- Natural gas	0.90	452
- LPG	1.35	450

- Reduced tax natural gas[1]	0.057	29
Petroleum activities on the continental shelf[1]	1.04	
Light fuel oil		398
Heavy fuel oil		338
Natural gas		453
- natural gas emitted to air	7.16	444

Sources: Ministry of Finance and Statistics Norway

[1] Most of these emissions are also covered by the EU ETS.

BOX 5: Official Norwegian Report NOU 2015: 15 Environmental pricing – Report from the Green Tax Commission

The Green Tax Commission was appointed by the Solberg Government on 15 August 2014. The Commission was mandated to evaluate, inter alia, whether and how the increased use of climate and environmental taxes, in conjunction with reductions in other direct and indirect taxes, can secure lower greenhouse gas emissions, improved environmental conditions and sound economic growth. The Commission submitted its report on 9 December 2015, cf. Official Norwegian Report NOU 2015: 15 Environmental pricing – Report from the Green Tax Commission.

The Green Tax Commission noted that it is necessary, in order to solve the environmental challenges in an efficient manner, for the polluter to take account of the damage inflicted by pollution on society. A tax on environmentally harmful inputs, products or activities implies that the polluter pays for such damage. This will provide incentives to reduce emissions, whilst at the same time making it more profitable to develop and utilise new and more environmentally friendly technologies. The Commission noted that taxes are the most cost-efficient instrument for reducing environmental impacts if the tax rate either reflects the marginal environmental damage or contributes to Norway meeting its international commitment. The Commission assumed that Norway will conclude an agreement with EU on joint fulfilment on the climate target for 2030.

For greenhouse gas emissions, the cost efficiency principle suggests that all non-EU ETS emissions should be subject to the same CO_2 tax per tonne of CO_2 equivalents. The Commission therefore proposed to abolish exemptions and reduced rates and to put the level of the CO_2 tax at NOK 420 in 2016. Non EU ETS emissions that do not currently carry a price tag should be introduced to the new climate taxes. For the period after 2020, the Commission recommended that the general CO_2 tax in the non-EU ETS sector be put at the level necessary to meet the emission target for the non-EU ETS sector in a cost efficientmanner. This implies that the CO_2 tax should be equal to the price of EU internal flexible mechanisms or, alternatively, at the level necessary to meet the national target for non-EU ETS emissions. The Commission states in its summary that «whether it is the price of EU internal flexible mechanisms or the cost of emission reductions in Norway that will be binding remains uncertain, and will depend among others on whether there is a sufficient market for EU internal mechanisms».

Since emissions covered by the EU ETS already carry a price tag (determinded in the market), the Commission believes that such emissions should not, in principle, be subject to CO_2 tax in addition thereto. The Commission is nonetheless proposing to retain the CO_2 tax for those emissions in the EU ETS that already has a CO_2-tax and to reduce the tax level in line with increases in the emission allowance price.

BOX 5 continues: Official Norwegian Report NOU 2015: 15 Environmental pricing – Report from the Green Tax Commission

On other climate-related taxes, the Commission notes that the CO2 component of the motor vehicle registration tax contributes to the overall carbon price for road transport being much higher than in other sectors. This gives cause to ask whether the climate policy is structured in a cost-efficient manner. As the Commission considers direct pricing of emissions to be the primary means of achieving a cost-efficient climate policy across sectors, the Commission's view was that the CO_2 component should be smaller than at present, although arguments relating to present bias and network externalities suggest that CO_2 differentiation should remain significant. The Commission noted that the CO_2 component of the motor vehicle registration tax has contributed to a considerable reduction in average CO_2 emissions from new passenger cars.

The Commission notes, moreover, that direct regulation will not normally deliver cost-efficient emission reductions across businesses or sectors. This is because the authorities do not know the costs individual decision makers would incur in achieving specific emission reductions, or the costs of alternative emission-reduction measures. Nor is direct regulation in conformity with the polluter pays principle, since the damage costs associated with any residual emissions are not charged to the polluter.

The Commission notes that economic policy instruments (such as taxes and emission allowances) are essential in providing incentives for the development of environmental technology in all phases, from the research phase to the dissemination phase. Such measures generate continuous demand for new low-emission technologies, cleaner production from existing technologies, as well as emissions clean-up. Direct regulations, such as emission or technology requirements, also provide incentives for the development of environmental technologies, and may be effective where the use of taxes is not viable. Other non-economic measures, such as information campaigns, can also contribute to price signals being registered and to new technologies being disseminated in markets. Grants for the development of environmental technologies in particular, especially during the research phase, are necessary to correct for positive knowledge externalities. Positive learning effects and network externalities may be arguments in favour of offering temporary grants for environmental technologies during the dissemination phase.

4.3.2.4 **Emission trading**

Coverage

Norway established a national emissions trading scheme in 2005. The scheme closely resembled the EU's emissions trading scheme (ETS) and covered 11 per cent of total Norwegian greenhouse gas emissions, mainly from industry. Emissions already subject to CO_2 tax were not included in the scheme.

From 2008 Norway became part of EU ETS phase II, which broadened the scheme to cover nearly 40 per cent of Norwegian greenhouse gas emissions. The petroleum sector and emissions from industries that had previously been subject to CO_2 taxes were included in the ETS at that stage. In addition to the sectors included in the ETS, Norway decided unilaterally in February 2009 (effective from 1 July 2008) to include nitrous oxide emissions from the production of nitric acid in Norway. Such emissions constituted about 4 per cent of Norwegian greenhouse gas emissions in 2005.

Starting from 2012, the aviation sector was also included in the scope of the ETS. From 2013, phase III (2013-2020), the coverage of the ETS was further expanded, covering both new sectors (production of aluminium, petrochemical industry, mineral wool, ferroalloys, CCS) and gases (PFCs). From 2013, about 50 per cent of the Norwegian emissions are covered by the ETS.

Cap
Norway participates in the EU ETS. The aggregated future emissions covered by the scheme can not exceed the EU-wide cap, which is set 21 per cent lower in 2020 compared with the emissions in 2005 from the covered sectors. Norwegian installations represent about 1 per cent of the total emissions. Norway's participation in the ETS from 2008 led to a tightening of the system, as Norwegian installations have had a higher demand for allowances than the amount of allowances added pursuant to this expansion of the system. The reduction rate for the cap is further increased from 2020 so that overall reduction of the cap in 2030 will be 43per cent compared to 2005. To tighten the market allowances have been withheld through so called backloading in which Norway participates, and there is also agreement on the working of a market stability reserve from 2019.

Legal basis
The legal basis for emissions trading in Norway is the Greenhouse Gas Emissions Trading Act which was adopted on 1 January 2005. The Act has been amended several times, notably in June 2007, February 2009 and May 2012. The amendments in 2007 and 2009 provided the basis for the emissions trading scheme in the Kyoto Protocol first commitment period (2008-2012). In July 2012, Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the EU ETS was incorporated in the EEA Agreement.

Allocation and emissions
In the first (2005-2007) and second (2008-2012) phases of the ETS, allowances were allocated based on rules developed nationally (see NC6). The average amount of Norwegian emissions covered by ETS was 6 and 19.1 Mt/year in the respective phases. The ETS entails acquisition of Kyoto units, and a total volume of about 15 million CERs and ERUs are surrendered directly from the installations for their compliance from 2008 through 2014, and there is also a net transfer of AAUs between EU and Norway, which has been used for compliance in the first commitment period under the Kyoto Protocol. A similar situation is assumed in the second commitment period under the Kyoto Protocol (see chapter 5.4).

Installations in sectors that are considered to be at risk of carbon leakage receive some or all of their allowances free of charge. For phase III (2013-2020), the allocation methodology is harmonized across Europe. The general rule for allocation in phase III is based on performance benchmarks rather than historical emissions levels. From 2013, total free allocation to Norwegian installations will represent about 75 per cent of their 2012 emissions. Another measure aiming at preventing carbon leakage is that specific industries affected by higher electricity prices caused by the allowance price, since 2013 can be granted economic compensation (see chapter 4.3.8.4).

Compliance and reporting requirements
Operators included within the scope of the emissions trading scheme must report their verified emissions yearly to the Norwegian Environment Agency by 31 March the following year. If an operator does not submit an emission report in accordance with the provisions on reporting by 1 April, the Norwegian Environment Agency may suspend the operator’s right to transfer allowances to other account-holders. From the compliance year 2013, emissions reports from Norwegian installations must be verified by an accredited third party (verifier). Prior to 2013, the Norwegian Environment Agency performed the verification of the reports itself.

The Norwegian Environment Agency may impose coercive fines and even penal measures in the event of serious contravention of the provisions in the Greenhouse Gas Emissions Trading Act. A fine for failure to comply is imposed if an insufficient amount of allowances is surrendered by 30 April. In addition, the operator must surrender an amount of allowances equivalent to the deficit the following year.

Estimated effect on emissions
Because emission allowances in the EU ETS can be sold across borders between installations in the scheme, the effect of the scheme on national emissions depends on several factors in addition to the level of ambition of the EU-wide cap. A crucial factor is Norwegian industry's abatement cost relative to the abatement cost in industry located in other countries covered by the scheme, and relative to the carbon price. For this reason, in contrast to the Europe- wide effect, the scheme's effect at the national level is difficult to assess and quantify.

However, earlier estimates made by Statistics Norway show that the emission trading scheme in phase II may have led to overall national emission reductions of up to 0.3 million tonnes of CO_2 eq. per year.

Norway is an integral member of the EU ETS through the EEA Agreement. Norway's participation increases the overall tightness of the European scheme. The number of allowances in Europe attributed to Norwegian participation (excluding aviation) is about 18Mt for the trading period 2013-2020, while demand from Norwegian installations is estimated to be about 25 Mt/year. The increased demand due to Norwegian participation will result in additional emission reductions within the scheme. These reductions may take place anywhere in the EU/EEA area.

4.3.2.5 **The Norwegian Carbon Credit Procurement Program**

The Norwegian Carbon Credit Procurement Program was set up in 2007 to ensure that Norway would be able to meet its target in the first commitment period of the Kyoto protocol (2008-2012). The responsibility for the program was initially assigned to the Ministry of Finance, but was transferred to the Ministry of Climate and Environment on 1 January 2014.

In the first commitment period of the Kyoto Protocol (2008-2012), KP1, Norway signed agreements with total deliveries of about 23 million carbon credits, of which some 21 million were needed to meet the target of overachieving Norway's unilateral pledge by 10 per cent. Renewable projects, including hydro and wind projects, made up the largest share of the portfolio in KP1.

In the second commitment period of the Kyoto Protocol (2013-2020), KP2, Norway will need to procure carbon credits in order to meet the target of 30 per cent emission reductions by 2020. The Ministry is authorized by the Parliament to procure up to 60 million emission reductions (CERs) generated through 2020. Final procurement target is yet to be determined, inter alia pending Norway's contribution of AAUs to cover emissions in the EU ETS.

The Ministry has a mandate to procure CERs from new, not yet commissioned, projects and from vulnerable projects. Vulnerable projects are registered and commissioned projects that are either stranded or on the verge of shutting down due to the lack of revenues from the sales of emissions reductions.

BOX 6 Projects for KP2 compliance under the Norwegian Carbon Credit Programme

Destruction of methane from landfill gas projects constitute more than half of the KP2 portfolio. Small scale programmes, like cook stoves and water purification, is the second largest group. The majority of the small scale programmes are located in Africa, whereas the majority of the landfill projects are located in Latin America, especially in Brazil. Altogether, the Norwegian procurement program is involved in 62 projects in 25 countries (bilaterally and through carbon funds).

JN 0171 Caieiras landfill gas emission reduction project (Sao Paulo area);

BOX 6 continues: Projects for KP2 compliance under the Norwegian Carbon Credit Programme

A vulnerable project that was at risk of closing down due to the lack of revenues to cover operational cost. With the help of revenues from Norway's purchase of emission reductions (CERs) the project has been upgraded from a flaring only project (left picture) to a project generating electricity from 21 generators with a total installed capacity of 29.4 MW. The project is expected to deliver more than 6 mill. CERs to Norway.

JN 7997 Improved cook stove programme (Kenya, Uganda and India);

A relatively advanced cook stove where the heat from the flame is converted into electricity through a thermoelectric generator. This electricity powers an internal fan, which force-feeds oxygen into the flame, eliminating the smoke, and leading to the near complete and clean combustion of the fuel. The stove generates surplus electricity – enough to charge a mobile phone and provide an evening’s worth of LED light. Compared to a traditional "three stone" stove (left picture) this cook stove reduces the use of firewood by 50 per cent. This is the basis for crediting of emission reductions. Important co-benefits include the reduction of smoke by 90 per cent (particular matters and carbon monoxide), health benefits and reduced deforestation. The programme is expected to deliver up to 1.75 mill emissions reductions (CERs) to Norway.

Table 4.3 *Summary of policies and measures, Cross-sectoral*

Name of mitigation action [a]		*Sector(s) affected* [b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument* [c]	*Status of implementation* [d]	*Brief description* [e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	2000	2005	2010	2015	2020	2030
CO2 tax (except CO2 tax off shore)	*	Cross-cutting	CO2	Cost-effective reductions of emissions	Economic	Implemented	Coverage and rates changed since 1991	1991	Ministry of Finance	NE	800	800	850	1100	1100	1100
Emissions trading (2008-2012) onshore (h)	*	Industry, energy	CO2, N2O	Reduce emissions	Economic	Implemented	Part of the EU Emissions Trading Scheme, see text in NC for further details.	2008	Norwegian Environment Agency	NA	NA	NA	0-300	0-300	0-300	0-300
Emissions trading (2013-2020) onshore (g,h)	*	Industry, energy	CO2, N2O, PFCs	Reduce emissions	Economic	Implemented	Part of the EU Emissions Trading Scheme, see text in NC for further details.	2013	Norwegian Environment Agency	NA	NA	NA	NA	IE	IE	IE

Note : The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations : GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom Footnotes

g: ETS 2013-2020: The ETS may have contributed to some of the estimated effects for industry.

h: Effects of ETS in the petroleum sector are included in the estimates for petroleum and not here.

4.3.3 Other Cross-sectoral policies and measures

4.3.3.1 Regulation by the Pollution Control Act

The Pollution Control Act lays down a general prohibition against pollution. Pollution is prohibited unless one has a specific permission to pollute according to law or a decision made by the relevant authority. The Pollution Control Act applies also to greenhouse gas emissions. Greenhouse gas emissions are therefore regulated in the permit which industrial installations are need to obtain pursuant to the Pollution Control Act.

The relevant authority may lay down technology requirements relevant to emissions as conditions in the permit issued in accordance with the Pollution Control Act, for instance a requirement to implement carbon capture and storage. This is currently a prerequisite for any new gas-fired power plants.

Several provisions have the objective of ensuring efficient enforcement of the Act, or regulations or decisions issued pursuant to the Act. For example, violation of provisions may result in closure, coercive fine or criminal liability.

Greenhouse gas emissions are to a large extent covered by other specific policy instruments such as the CO_2 tax, the EU ETS and specific agreements with the industry on reduction of emissions.

In the waste sector, regulations under the Pollution Control Act are used to ensure minimum environmental standards of landfills and incineration plants, and to regulate the handling of certain waste fractions. The EU directives on waste are implemented through the Pollution Control Act and through different parts of the Waste Regulation under the Pollution Control Act. The Waste Regulation includes the following measures:

- Requirement to collect methane from landfills (gradually introduced from 1998).
- Prohibition of depositing biodegradable waste (introduced 1 July 2009 with an opening for exemptions until 2013).
- Requirement to utilise energy from incineration from incineration plants.

From 2002 landfilling of wet-organic waste has been prohibited. This prohibition was replaced by the wider prohibition of depositing (2009) that applies to all biodegradable waste.

The Waste Regulation includes a formulation that incineration plants should be designed and operated with a view to energy utilisation. This is normally followed up in the concessions of the plants by a condition that at least 50 per cent of the energy from the incineration should be utilised. For the effects of these measures, see 4.3.11.

4.3.3.2 Enova

Enova is a state-owned enterprise, which plays an important role in the development of Norway's future energy system and the transition to a low-emission society. It provides support to overcome market barriers to the development and deployment of energy-efficient, climate-friendly solutions.

Enova [https://www.enova.no/about-enova] provides funding and advice for energy and climate projects, and support both companies and individual households, as well as local and regional governments. It is wholly owned by the Ministry of Petroleum and Energy. Pursuant to the changes in government 17 January 2018, the Minister for Climate and Environment is responsible for Enova. Funding for projects is drawn from the Climate and Energy Fund, which Enova manages on the basis of four-year rolling agreements with the Ministry. Financing, totalling about NOK 2.8 billion in 2018. These financial arrangements make it possible for Enova to be a predictable and flexible source of funding for projects.

From 2017, Enova's focus has been shifted more towards climate-related activities and innovation, in line with the new agreement for the period 2017–2020. This means that there will be a greater emphasis on reducing emissions from the transport sector and other sectors which are not part of the emissions trading system, and on innovative solutions adapted to a low-emission society. The new agreement between Enova and the Ministry of Petroleum and Energy gives higher priority to reducing and eliminating barriers to new technologies and to promoting permanent market change. This means that in the long term, energy-efficient and climate-friendly solutions should succeed in the market without government support.

The agreement grants Enova a wide degree of freedom to develop tools, set priorities for different sectors and allocate support to individual projects. Enova makes use of its expertise and experience from various markets to design its programmes to address the most important barriers to the introduction and deployment of energy and climate solutions and bring about permanent change.

Enova's support falls into one of two main categories: technology development and market change. Enova's programs deal with technologies and solutions at various stages of maturity. During the innovation process from technology development to market introduction, the goal is to reduce costs and the level of technological risk. Once a solution is technologically mature and ready for market roll-out, the goal is to achieve widespread deployment and market take-up. It is always necessary to overcome various market barriers as a solution proceeds through technology development and market introduction. Enova seeks to identify the most important of these, and designs its programmes for the introduction and deployment of energy and climate solutions to lower such barriers.

New energy and climate technology developed in Norway can also play a part in reducing greenhouse gas emissions at global level when deployed widely enough. Investment in new technology and innovation often carries a high level of investment risk. Using public funding to reduce risk is an important strategy, because a new technology often provides greater benefits for society than for individual investors. Enova therefore supports pilot and demonstration projects and full-scale introduction of energy and climate technologies. This helps to lay the basis for a more energy-efficient and climate-friendly business sector in the transition to a low-emission society.

It generally takes time for a new technology or solution to become established and diffuse through the market. The reasons for the delay may vary. New technology that will bring about cuts in greenhouse gas emissions or make energy use more efficient should be deployed as soon as possible, in the widest possible range of applications and by as many people as possible. Possible barriers to the spread of new technology and products include a lack of information, scepticism to new and relatively untried solutions, and prices. Enova's programmes for market change are designed to reduce these and other barriers and thus promote permanent market change.

Estimated effect on national emissions

Enova supports projects aiming to reduce non-ETS emissions, develop new energy and climate technology and improve the security of supply of energy, in line with its three main goals. As Norwegian electricity production is almost entirely renewable, the projects aimed at improved security of supply are not necessarily relevant in the context of reduced greenhouse gas emissions.

The technology projects Enova supports are not intended to have significant immediate climate implications, but rather a long-term effect through dissemination and adoption of the new technologies also outside Norway. It is not possible to calculate these effects, but the potential impacts are vast. For example Enova supported the aluminium producer Hydro in developing a more energy efficient aluminium production technology which decreases energy use to 12,3 kWh per kilo aluminium, 15 per cent below the world average. Enova also supported NorMag in the building of a pilot facility for the production of magnesium and silica, which aims to reduce greenhouse gas emissions by over 95 per cent and 20 per cent respectively and energy consumption by 60 per cent and 35 per cent respectively. If such technologies become widespread, the impact on national and global greenhouse gas emissions would be significant.

Enova does not support projects in a policy vacuum. There are a variety of other policy instruments in Norway, which directly or indirectly aim to reduce domestic greenhouse gas emissions, support for R&D, taxes, regulations and various other instruments. In such a context it is hard to say which instrument contributed to which development or reduction. Enova estimates the direct reductions from each supported project, but these numbers will not represent the entire effect, nor can they be wholly attributed to Enova because the individual business cases build on and incorporate the incentives provided by other instruments. The reductions Enova calculate reflect the effects compared to the baseline in each project and only take into account the reduction of greenhouse gas emissions due to reduced consumption of fossil fuels such as coal, oil and natural gas. The reductions come as a result of improved efficiency of fossil sources and conversion from fossil to renewable energy.

Enova estimates that the project portfolio from 2016 will contribute to reducing greenhouse gas emissions by about 619,000 tonnes of CO_2 equivalents, including just below 400,000 tonnes of CO_2 equivalents in facilities subject to EU ETS allowances in 2016. As a result of the bottom-up method of calculation and the use of individual baselines there is no direct link between this number and the national environmental accounts. It is important also to note that Enova works by reducing the barriers to adoption of energy and climate technologies with an aim to facilitating a lasting market shift towards such technologies. It is not practical to attempt to attribute such wider changes to Enova or any other policy instrument, so it is important to bear this in mind when contemplating the effects of Enova's support.

BOX 7: Examples of projects supported by Enova

- Fast-charging infrastructure for electric vehicles: NOK 50.5 million allocated through three rounds of competitive bidding. So far funding has been provided for 230 charging stations along Norway's main roads. Enova has designed the scheme so that it supports the market for charging services and reduces the barriers that have been identified. In 2017 Enova launched a program for fast charging infrastructure in municipalities that currently have less than two fast charging points.
- Zero- and low-emission ferries: NOK 526 million allocated to Hordaland, Møre og Romsdal and Sør-Trøndelag counties for the development of charging infrastructure for ferries. This is expected to result in an increase in the number of battery electric and plug-in hybrid ferries, which have considerably lower emissions than conventional ferries.
- Near zero-emission magnesium production: NOK 19.5 million to NorMag. The pilot facility for production of magnesium and silica aims to reduce greenhouse gas emissions by over 95 per cent and 20 per cent respectively and energy consumption by 60 per cent and 35 per cent respectively. Energy-efficient production processes are vital in the transition to a low-emission society.
- Zero-emission autonomous freighter: NOK 133,6 million. The fertilizer producer Yara is planning to replace 40 000 lorry trips form the factory in Herøya to the ports of Porsgrund and Larvik with an autonomous container vessel running on batteries.

4.3.3.3 **Klimasats**

In 2016, the Solberg Government introduced a new policy instrument to promote emissions reduction projects in Norwegian municipalities and counties[13]. The financial support scheme is called Klimasats and is administered by the Norwegian Environment Agency that assesses and prioritises the applications based on given criteria. The objective of Klimasats is to reduce emissions at the local level and contribute to the transition to a low emission society. Klimasats can provide financial support and strengthen the municipalities in their efforts to reduce emissions within the areas they control. Examples of supported projects are the use of climate friendly building materials in public buildings, reduction of food waste, emission free construction sites, reduction of methane emissions from former landfills and installing chargers for electric vehicles. The municipalities can also apply for funding to strengthen the climate perspectives in urban planning, for instance planning that reduces the need for transport. It is also possible to apply for support to form networks of at least four municipalities for learning and sharing experiences on emission reduction.

[13] Norway is divided into 19 counties and 426 municipalities. Municipalities are the lowest level of government.

In 2016, Klimasats allocated NOK 100 million to around 140 different projects, including support for local climate networks. In 2017, another NOK 150 million was allocated to around 190 projects.

Estimated effect on national emissions

The municipalities that have received funding will have to report on the results and effects of the projects as well as their experiences from the implementation. The supported projects are in a wide range of different areas and have different timeframes. It is therefore difficult to quantify the effect at the current stage.

The intended effects of the support scheme are emission reductions within the different areas where municipalities can contribute to emission reductions, such as transport, waste handling, buildings and public procurement. Some of the projects are expected to result in more long-term effects, such as changes related to urban planning. The effects of these projects are hard to quantify, because they depend on many other factors and will occur a long time after the implementation of the projects.

The Environment Agency aims to use the reported results and effects from the projects funded by Klimasats as an input to other work related to emission reductions at the local level, such as an ongoing three-year project on improving local level emission statistics.

Table 4.4 *Summary policies and measures, other cross-sectoral*

Name of mitigation action [a]		*Sector(s) affected* [b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument* [c]	*Status of implementation* [d]	*Brief description* [e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	2000	2005	2010	2015	2020	2030
Regulation by the Pollution Control Act		Industry, energy	CO2, CH4, N2O, SF6, PFCs, HFCs	Reduce emissions	Regulatory	Implemented	The Act lays down a general prohibition against pollution. Pollution is prohibited unless one has a specific permission. See text in NC for further details.	1983	Norwegian Environment Agency	NE	NE	NE	NE	NE	NE	NE
The Norwegian energy fund, Enova	*	Cross-cutting	CO2	Contribution to an environmental friendly change in the consumption and production of energy and development of energy and climate technologies	Economic	Implemented	Enova provides investment support for climate measures in all sectors	2002	Enova, Ministry of Petroleum and Energy	NE	NE	NE	600	1100	1800	1800
Klimasats		Cross-cutting	CO2, CH4, N2O, SF6, PFCs, HFCs	Reduce emissions	Economic	Implemented	Reduce emisisons at local level and contribute to the transition to a low carbon society.	2016	Norwegian Environment Agency	NA	NA	NA	NA	NA	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

4.3.4 Petroleum Sector

4.3.4.1 General policy instruments

Emissions from Norwegian petroleum activities, including facilities on the continental shelf and from onshore facilities that come within the scope of the petroleum legislation, are regulated through several acts, including the Petroleum Act, the CO_2 Tax Act on Petroleum Activites, the Sales Tax Act, and the Greenhouse Gas Emission Trading Act. Emissions from the petroleum sector are directly regulated through requirements on the use of the best available techniques (BAT) and specific emission limits in permits under the Pollution Control Act.

Requirements for impact assessments and approval of plans for new developments (PDOs/PIOs) are cornerstones of the petroleum legislation. Facilities onshore and within the baseline are also subject to the provisions of the Planning and Building Act.

Emissions from the petroleum sector in Norway are well documented. The industry's own organisation, the Norwegian Oil and Gas Association, has established a national database for reporting all releases from the industry, called EPIM Environment Hub (EEH). All operators on the Norwegian continental shelf report data on emissions to air and discharges to the sea directly in EEH.

4.3.4.2 Climate policies that affect the petroleum sector

The CO_2 tax and the Greenhouse Gas Emission Trading Act are Norway's most important cross-sectoral climate policy instruments for cost-effective cuts in greenhouse gas emissions. Both of these instruments apply to the petroleum industry, as opposed to most other sectors. A small part of emissions from the sector that is not covered by the CO_2 tax or ETS.

The CO_2 tax
The CO_2 tax is levied on all combustion of natural gas, oil and diesel in petroleum operations on the continental shelf and on releases of CO_2 and natural gas, in accordance with the CO_2Tax Act on Petroleum Activites. For 2017, the tax rate is NOK 1.04 per standard cubic metre of gas or per litre of oil or condensate. For combustion of natural gas, this is equivalent to NOK 444 per tonne of CO_2. For emissions of natural gas to air, the tax rate is NOK 7.16 per standard cubic metre, also equivalent to NOK 444 per tonne of CO_2.

Emission Trading
Norwegian installations in the petroleum industry are included in the EU ETS, and are subject to the same rules for emissions trading as those within the EU.

Emission allowances are allocated by auctioning or given free of charge. Sectors that are considered to be at risk of carbon leakage receive some or all of their allowances free of charge, following harmonised allocation rules. This applies to a certain proportion of petroleum-sector emissions to which the ETS applies. Allowances for emissions from electricity generation on offshore installations are not allocated free of charge.

The combination of the CO_2 tax and the emissions trading system means that emissions covered by the ETS on the Norwegian shelf, in 2017, face a price of approximately NOK 500 per tonne for their CO_2 emissions, which is very high compared with emission prices in most other countries.

Permits and other requirements
Before the licensees can develop a discovery, their plan for development and operation (PDO) must be approved by the Ministry of Petroleum and Energy. The PDO contains information on how the licensees intend to develop and operate the field. When proposals are made for new field developments or large-scale modification of existing facilities, the operator must as part of the PDO include an overview of energy needs and an assessment of the costs of using power from onshore electrical grid rather than gas turbines to supply electricity.

Flaring of natural gas is only permitted when it is necessary for safety reasons. Permits for flaring are issued by the Ministry of Petroleum and Energy.

A permit under the Pollution Control Act is required for greenhouse gas emissions to air from petroleum operations.

Estimated effect on national emissions
The CO_2 tax have a significant effect on emissions in the offshore petroleum sector. The combination of strict regulations of the petroleum sector and the price on CO_2 emissions have resulted in many CO_2-reducing measures in the sector.

In box 8 we give reference to solutions that have been applied, to meet the conditions/permits and the price on CO_2 emissions. In table 4.5, these measures are attributed to the high Norwegian CO_2 price facing the sector; by the CO_2 tax and the ETS-system. It is emphasised that forecasts of the future effects of the CO_2 tax and the EU ETS are very uncertain. Based on reports from companies operating on the Norwegian Continental Shelf (NCS), it was reported in Norway's 5th and 6th National Communication, an estimate that emissions of CO_2 from the sector in year 2000 were 2 million tonnes lower than they would have been in the absence of the CO_2 tax. Measures such as energy efficiency measures, reduced flaring and supply of power from the onshore electricity grid is further assumed to have reduced emissions by 1.5 millions tonnes annually from 2004- 2007.

BOX 8: Examples of measures implemented in the petroleum sector

Energy efficiency
Energy efficiency measures, including the introduction of energy management systems and the installation of more energy-efficient equipment such as compressors and pumps, have helped to reduce emissions from petroleum activities. Combined-cycle gas turbines (CCGT) are one technological solution, in which waste heat from the turbines is used to produce steam, which in turn is used to generate electricity. CCGT plants improve energy efficiency and reduce emissions. They have been installed on the fields Oseberg, Snorre and Eldfisk.

CCS
Since 1996, about 1 million tonnes of CO2 per year has been separated during processing of natural gas from the Sleipner Vest field, and stored in the subsea Utsira Formation. Since 2014, CO2 has also been separated from natural gas from the Gudrun field and stored in the Utsira Formation together with the CO2 from Sleipner. The Snøvhvit facility on Melkøya has since 2008, separated CO2 from the natural gas before the gas is chilled to produce liquefied natural gas (LNG). The CO2 is transported back offshore, injected and stored.

Power from the onshore electrical grid
The Storting (parliament) resolved in 1996 that power from the onshore electricity grid should be explored by developers and followed up by the government for each new project on the NCS. The abatement cost of installing power from the onshore grid on facilities varies considerably between different developments. Features which make this approach more cost-effective include closeness to shore, a limited need for process heat, a substantial demand for power, a well developed onshore electricity grid at the shore point, and a long lifetime for the field.

The fields Ormen Lange, Snøhvit, Troll 1, Gjøa, Goliat and Valhall are already supplied with power from shore, and the same solution will be used on Martin Linge and Johan Sverdrup when they come on stream. A joint solution for supplying power from shore to the Utsira High region will be in place by 2022 at the latest, and the fields Edvard Grieg, Ivar Aasen and Gina Krog will all be connected to it. In addition, the onshore facilities Kårstø, Kollsnes, Melkøya LNG and Nyhamna are supplied partly or wholly with power from the grid. At present, these fields and facilities account for the majority of Norwegian gas production.

The CCS projects from natural gas on the Sleipner, Gudrun and Snøhvit petroleum fields are the only CCS projects currently in operation in Europe and the only projects in the offshore industry. See description in chapter 4.3.5.

In total, there are indications that annually the CO_2 tax and the ETS contribute to emission reductions of approximately 5 million tonnes CO_2 (2010). Furthermore, new or planned measures such as power from the onshore electricity grid, energy efficiency improvements, and technological advancements might raise this estimate to almost 7 million tonnes of CO_2 in 2020. The ban on flaring of natural gas may have contributed to further reductions. From 2008, the petroleum industry has been included in the EU ETS.

4.3.4.3 **Indirect CO_2 emissions from offshore and onshore NMVOC regulation**

Emissions of non-methane volatile organic compounds (NMVOC) lead to indirect CO_2 emissions since NMVOC oxidises to CO_2 in the atmosphere. Measures taken to reduce the NMVOC emissions therefore also reduce CO_2 emissions.

In 2015, the petroleum sector accounted for 31 per cent of the total NMVOC emissions, a decline from 65 per cent in 2001. The solvent industry contributed to 30 per cent of totals in 2015. Since the all time high in 2001 total national NMVOC emissions has decreased with 61 per cent until 2015.

The NMVOC emissions in the petroleum sector are mainly from storage and loading of crude oil offshore. The petroleum sector's share of total NMVOC emissions has decreased as a result of the phasing in of vapour recovery units technology (VRU) to vessels loading and storing crude oil and because oil production has been reduced by 50 per cent from 2001 to 2015. Starting from 2001, emissions of NMVOC linked to offshore loading and storage of crude oil have been governed under the emission permit system, pursuant to the Pollution Control Act.

In 2015, 19 VRU-units were operating on 19 vessels. The VRU technologies in use are absorption (2), condensation (7), KVOC alone (1) and KVOC with increased tank pressure (9). The different vapour recovery units (VRU) technologies reduced emissions from loading and storage offshore by 63 per cent in 2015. In the years 2009-2013 the reductions were about 80 per cent.

From 1 January 2003, it has been required that all vessels be fitted with equipment for recovering NMVOCs, and ships are not normally granted access to the installation without the necessary equipment.

Several of the newer fields on the Norwegian Continental Shelf employ floating storage installations. This type of installation may produce higher emissions of NMVOCs than is the case on fields where the oil is stored in the base of the platforms (Statfjord, Draugen and Gullfaks). This is due to the fact that, in the case of floating storage installations, emissions will also occur between production and storage.

Norway has also regulated NMVOC emissions at land terminals in the Pollution Control Act. A recovery installation for NMVOCs was in operation at the crude oil terminal at Sture in 1996. The vapour recovery unit (VRU) at Mongstad crude oil terminal came into operation in June 2008.

Estimated effect on national emissions

The regulation offshore of loading and storage of crude oil has, compared to no regulation, reduced the indirect CO_2 emissions of NMVOC by nearly 0.3 million tonnes CO_2 in 2010 and almost 0.2 million tonnes CO_2 in 2015. The estimated effects are based on reported data from the oil fields operators to the Norwegian Environmental Agency. In 2020 and 2030 the projected effects is 0.13 and 0.11 million tonnes CO_2 respectively. The latter estimates is based on the assumption that it is the same relationship between oil production and emissions without VRU as in 2015 and VRU has an efficiency of about 60 per cent.

For NMVOC regulation land terminals, the emissions from the two terminals are estimated with and without measures. The emissions in 2020 and 2030 without measures have been back-calculated from the projected amount of crude oil loaded and an IEF equal to the latest year ahead of the implementation. The emissions in 2020 and 2030 with measures have been calculated with an IEF equal to 2011, which is the most recent year with historical emissions data from the installation. The effect of the regulations is approximately 0.02 million tonnes of CO_2 equivalents.

Table 4.5 *Summary policies and measures, petroleum*

Name of mitigation action[a]		*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	*2000*	*2005*	*2010*	*2015*	*2020*	*2030*
CO2 tax offshore, EU ETS and regulations* 1)	*		CO2	Reduce emissions	Economic and regulatory	Implemented	Coverage and rates changed since 1991, see text in NC for further details.	1991	Ministry of Finance	600	3000	3000	>5000	6000	7000	7000
NMVOC regulation offshore	*	Energy	NMVOC and CH4, i.e. indirect CO2 emissions	Reduce emissions	Regulatory	Implemented	Phase in of vapour recovery units technology, see text in NC for further details.	2002	Norwegian Environment Agency	NA	NA	220	260	160	130	110
NMVOC regulation land terminals	*	Energy	NMVOC i.e. indirect CO2 emissions	Reduce emissions	Regulatory	Implemented	Installation of vapour recovery units.	1996	Norwegian Environment Agency	NA	10	20	20	20	20	20

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).
Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom Footnotes

1) CCS projects implemented since 1996 at the Sleipner field and later also on Snøhvit are included. These yield 933 kt reductions in 2000, 858 in 2005, 1203 in 2010 and 1386 in 2015.
The estimate also includes effects of utilising electricty from the onshore grid.

4.3.5 Carbon Capture and Storage

Carbon capture and storage (CCS) is one of five priority areas for enhanced national climate action. Norwegian CCS activities span a wide range of activities, from research, development and demonstration to large-scale projects and international work promoting CCS.

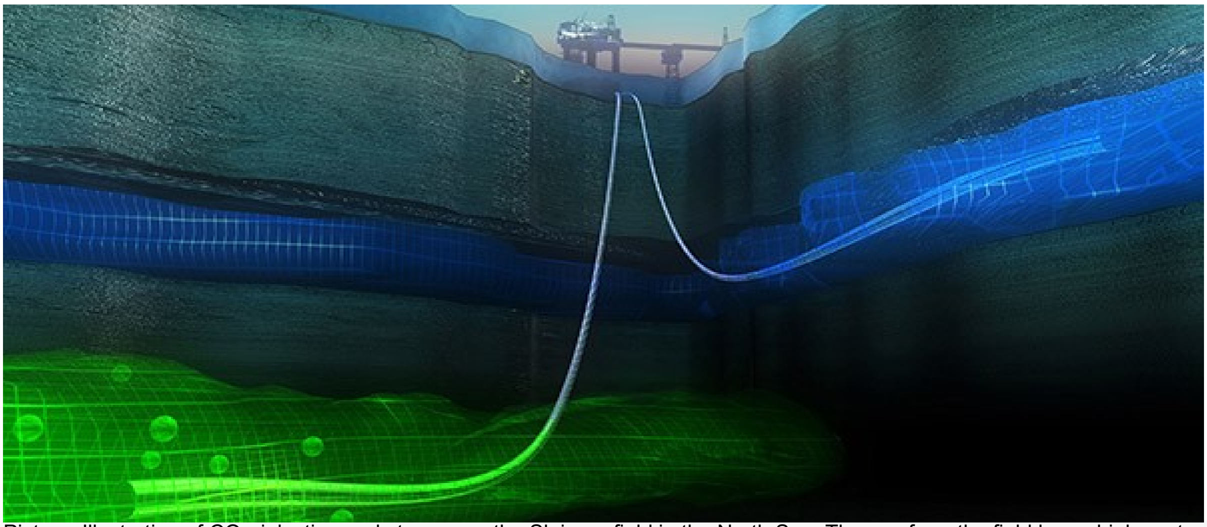
Carbon capture and storage, or CCS, comprises the capture, transport and storage of CO_2 emissions from fossil-fuel combustion and industrial production. According to the Intergovernmental Panel on Climate Change (IPCC), CCS is a key measure for reducing global greenhouse gas emissions. Even though there are CCS projects in operation in the world today, CCS is still a relatively immature technology. Hence, the Norwegian work focus on the development of technology and ways of reducing costs.

Norway has a long experience with CCS. Since 1996, CO_2 from natural gas production on the Norwegian shelf has been captured and reinjected into sub-seabed formations. The CCS projects from natural gas on the Sleipner, Gudrun and Snøhvit petroleum fields are the only CCS projects currently in operation in Europe and the only projects in the offshore industry.

Nearly one million tonnes of CO_2 per year has since 1996 been separated during processing of natural gas from the Sleipner Vest field, and stored in the Utsira formation.

Since 2014, CO_2 from natural gas production at the Gudrun field has also been separated out at the Sleipner Vest platform and stored in the Utsira formation.

The Snøhvit facility on Melkøya has since 2008 been separating CO_2 from the well stream before the gas is chilled to produce liquefied natural gas (LNG). The CO_2 is transported back to the Snøhvit field by pipeline and injected into a subsea formation. During normal operations, up to 700 000 tonnes of CO_2 is stored here annually.



Picture: Illustration of CO_2 injection and storage on the Sleipner field in the North Sea. The gas from the field has a high content of CO_2. During processing of the gas on the platform, CO_2 is separated and injected into the Utsira formation far below the seabed. Since 1996, up to 1 million tonnes of CO_2 a year has been stored here. Statoil is the operator for Sleipner (Photo: Alligator film/BUG, Statoil).

CO_2 Technology Centre Mongstad (TCM)

The Technology Centre Mongstad (TCM) is the world's largest facility for testing and improving CO_2 capture technologies. TCM has been operating since 2012, providing an arena for targeted development, testing and qualification of CO_2 capture technologies on an industrial scale. It is a collaborative project between the Norwegian Government, Statoil, Shell and Total. From 2012 to 2017 the South African Company Sasol was also a partner. It was designed for long-term operation, with two plants testing two different CO_2 capture technologies:

- Amine technology, in which CO_2 is captured by scrubbing flue gas with a water-based solution of amines.
- Ammonia technology, which uses chilled ammonia as the solvent for absorbing CO_2 from the flue gas.

The TCM facility was designed to be versatile enough to test CO_2 capture using flue gas either from the combined heat and power (CHP) plant or from the refinery at Mongstad. So far, the companies Aker, Alstom, Shell Cansolv, Carbon Clean Solutions and IoN Engineering have all used the test facility.

Picture: Technology Center Mongstad (TCM) Photo: Helge Hansen/Statoil

Research and technology development

In Norway, funding for CCS research is provided through the CLIMIT programme. The CLIMIT programme is a national programme for research, development and demonstration of technologies for capture, transport and storage of CO_2 from fossil-based power production and industry. The programme supports projects in all stages of the development chain, from long-term basic research to build expertise to demonstration projects for CCS technologies. Projects under the CLIMIT programme have yielded important results for the development of CCS in Norway and internationally.

In addition, a Centre for Environment-friendly Energy Research for CCS, NCCS, has been established. The centre is co-financed by the Research Council of Norway, industry and research partners.

Large-scale CCS demonstration facility

The Norwegian Government has an ambition to realize at least one new full-chain CCS demonstration facility. This is a challenging task in Norway, partly because there are relatively few suitable large-scale point sources of CO_2 emissions from fossil-fuel combustion. However, there are medium sized CO_2 emissions from some industrial facilities, sources that are part of the emissions trading system.

Feasibility studies of possible demonstration projects in Norway was completed in 2016. The aim was to identify at least one technically feasible CCS chain with corresponding cost estimates. Three industrial players have completed feasibility studies of CO_2 capture; Norcem

Brevik (cement production), Yara Porsgrunn (ammonia production) and Fortum Oslo Varme (a waste-to-energy plant). Gassco has carried out a study on transportation by ship and Statoil has completed feasibility studies of CO_2 storage at three different sites on the Norwegian Continental Shelf.

The results from the feasibility studies[14], presented in July 2016, show that it is technically feasible to realize a CCS chain in Norway, but that the costs are relatively high compared to the current quota price in the EU ETS. A flexible transport solution and ample storage capacity can contribute to realising capture from further sources. That way, the initial investment on CO_2 infrastructure can be utilised by several projects. The government has continued the planning of a large scale CCS project in Norway, and concept studies are being conducted in 2017 and early 2018. The Norwegian Parliament will decide whether to continue the project into a Front End Engineering and Design (FEED) phase during the first half of 2018.

International support and activities
In order for CCS to play an effective role in climate change mitigation, international cooperation on developing and commercialising new technology is essential. Norway collaborates with other countries through a number of regional and international forums. Examples of such forums are North Sea Basin Task Force, Clean Energy Ministerial, Mission Innovation and The Carbon Sequestration Leadership Forum. Norway furthermore provides funding for CCS projects abroad in cooperation with other countries and through existing programmes and institutions. For example, Norway is currently supporting a CCS project in South Africa.

Estimated effect on national emissions
The Norwegian CCS-policy will help to develop and demonstrate CO_2 capture and storage technologies with a potential for technology transfer. The most important goal of a new full chain project in Norway is to contribute with knowledge and lessons learned which in turn can lead to deployment in industry across the world. The Norwegian government's policy includes research, development and demonstration, an ambition to realize a full chain demonstration facilities, transportation, storage and alternative use of CO_2 and international work for the implementation of CCS as a mitigation measure. It is not possible to quantify the emission reductions that might be realized through this policy as it will for most parts take place in industry covered by the EU ETS. Additional measures for sectors subject to EU ETS may reduce national emissions, but will not reduce total emissions since emissions from other installations within the scheme will increase correspondingly, as long as the EU ETS emissions cap is not reduced.

[14] https://www.regjeringen.no/globalassets/departementene/oed/pdf/summary.pdf

Table 4.6 *Summary policies and measures, CCS*

Name of mitigation action [a]		*Sector(s) affected* [b]	*GHG(s) affected*	*Objective and/or activity*	*Type of instrument* [c]	*Status of implementati*	*Brief description* [e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	2000	2005	2010	2015	2020	2030
Carbon capture and storage (CCS)		cross cutting: industry/industrial processes, waste management/waste, energy	CO2	Reduce emissions	research	planned	CCS is a key tool for reducing global greenhouse gas emissions. CCS is still a relatively immature technology. Hence, work in this field is focusing on the development of technology and ways of reducing costs (g)	2005 (j)	Ministry of Petroleum and Energy	NA	NA	NE (h,i)	NE	NE	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom Footnotes

g. The most important goal of a full-scale project in Norway is to contribute with knowledge and learning so CCS can be deployed in industry across the world.

h. It is not possible to quantify the emission reductions that might be realized through this policy

i. Exisiting CCS-projects in the petroleum sector is included in the table for petroleum

j. Start of the CLIMIT research programme

4.3.6 Energy and transformation industries

Taxes and emission pricing through participation in the EU emissions trading system (ETS) are key tools of Norwegian climate policy. They raise the price of energy use that results in greenhouse gas emissions and encourage low-emission energy production. More than 80 per cent of Norway's emissions are taxed and/or regulated through the EU ETS.

The EU ETS also influences Norwegian electricity prices because Norway trades electricity with the rest of Europe. The effect of the EU ETS is to raise the cost of fossil electricity production in Europe, thus pushing up electricity prices. This has an effect on electricity prices in Norway as well, even though production is based on hydropower.

4.3.6.1 Electricity tax

A tax on electricity consumption was introduced in 1951. At present, an excise duty is levied on electricity supplied in Norway no matter if the power is generated domestically or imported. Households, agriculture, service industries and the public sector pay the ordinary rate, in 2017 NOK 0.1632 per kWh. Electricity used for chemical reduction and in electrolytic, metallurgical and mineralogical processes, greenhouses and rail transport as well as households and the public sector in the action zone (Finnmark county and seven municipalities in Troms county) are exempt electricity tax. Other manufacturing industries, mining and quarrying, and district heating pay a reduced rate, in 2017 NOK 0.0048 per kWh.

Estimated effect on national emissions

The objective of the excise duty on electricity is mainly fiscal, but the tax is also meant to reduce energy consumption. Electricity supply in Norway is based primarily on hydroelectric power generation. Consequently, reduced electricity consumption will not directly affect greenhouse gas emissions in Norway.

4.3.6.2 Base tax on mineral oils etc.

An excise duty on mineral oils, comprising mostly fuel oils, was introduced in 2000. The intention was to avoid substitution of electricity in the heating market when the electricity tax was raised. Subsequently the base tax was raised to the same level as the electricity tax measured by the heat content of the fuel. In 2014 the base tax on mineral oils was raised further by approximately 50 per cent. Since this hike, energy taxation of mineral oils has exceeded that of electricity. As well as mineral oil for heating, the base tax applies to diesel used in agriculture, construction and other non-road machinery. Use of mineral oils in the transport sector and fisheries is exempted, but not leisure boats running on diesel. In 2017 the base tax is NOK 1.603 per litre, equal to approximately NOK 600 per tonne of CO_2. Reduced rate (in 2017 NOK 0.147 per litre) applies to the pulp and paper industry and dyes and pigment industry.

Estimated effect on national emissions

CO_2 tax is levied on mineral oils in addition to the base tax. Manufacturing and other onshore undertakings covered by the EU ETS are not exempted the base tax. The mitigation effect of the increase in the base tax on mineral products in 2014 is estimated to 50-100 kt. CO_2-eq in 2020 and 2030.

Table 4.7 *Norwegian green taxes. 2017*

Tax	Tax rate	Introduced
Electricity tax		1951
Standard rate, NOK/kWh	0.1632	
Reduced rate (manufacturing, etc.), NOK/kWh	0.0048	
Base-tax on mineral oils, etc.		2000
Standard rate, NOK/litre	1.603	
Reduced rate (pulp and paper, dyes and pigments industry), NOK/litre	0.147	

Source: Ministry of Finance

4.3.6.3 Other relevant policies and measures in the energy and transformation industries

Electricity Certificate Act

1st January 2012 Norway and Sweden established a common market for electricity certificates. The goal of the two countries was to develop new energy production based on renewable energy sources amounting to 28.4 TWh by the end of 2020. Sweden will finance 15.2 TWh and Norway 13.2 TWh. The power producers will determine when and where the new production will take place. Sweden has established an additional goal of 18 TWh in 2030 which will be financed by Sweden. Norway will not take part in the increased ambition from 2022. The electricity certificate market is a constructed market in the sense that the demand for certificates arises from a statutory obligation for specified electricity users to purchase them. Sales of electricity certificates give power producers a supplementary income in addition to that derived from sales of electricity. For more information about the electricity certificate scheme, see The Norwegian Water Resources and Energy Directorate's annual report for 2016[15].

Estimated effect on national emissions

The electricity certificate system is a market based support scheme to promote new electricity production based on renewable energy sources. The support scheme is technology neutral, which means that all energy sources defined as renewable energy sources in accordance with Directive 2009/28/EC on the promotion of the use of energy from renewable sources qualifies for the right to certificates. For Norway most of the electricity were already produced from renewable energy sources. The effects on national emissions are indirect, and not possible to calculate.

[15] http://publikasjoner.nve.no/diverse/2017/elsertifikat2016engelsk.pdf.

4.3.6.4 Energy use in buildings

Norway introduced energy requirements for buildings as long ago as 1949. They have been revise and made stricter a number of times, most recently in 2016. Energy performance certificates are mandatory for buildings that are to be sold or rented out.

Energy requirements in the building code

The building code is the main legal instrument for improving energy efficiency. It was revised in 2015. The new and stricter requirements (passive house level) entered into force on 1 January 2016. The 2016 requirements was tightened such that dwellings became 26 per cent more energy efficient and office buildings 38 per cent more energy efficient compared to previous requirements.

The new energy requirements specify that installation of fossil fuel heating installations are not permitted and that larger buildings (more than $1000m^2$ heated usable floor space) must have flexible heating solutions.

New buildings and buildings subject to major rebuilds must meet either a total net energy need for space heating, cooling and hot water lower than specified in the regulation (kWh per m2 of heated floor area per year) for 13 different building categories, as shown in table 4.8:

Table 4.8: *Total net energy requirements for various buildings according to the new building code of 2016*

Building category	*Total net energy requirement* *[kWh/m^2 heated gross internal area per year]*
Small houses and leisure homes with more than 150 m^2 of heated gross internal area	100 + 1.600/m^2 heated gross internal area
Block of flats	95
Kindergarten	135
Office building	115
School building	110
University/university college	125
Hospital	225 (265)
Nursing home	195 (230)
Hotel building	170
Sports building	145
Commercial building	180
Cultural building	130
Light industry/workshop	140 (160)

Residential buildings can also use a set of energy efficiency measures for individual building components to meet the energy efficiency requirements, as shown in table 4.9:

Table 4.9 *Energy efficiency measures for individual building components*

	Energy-saving measures	*Small house*	*Block of flats*
1.	U-value outer walls [W/(m^2 K)]	≤ 0.18	≤ 0.18
2.	U-value roof [W/(m^2 K)]	≤ 0.13	≤ 0.13
3.	U-value floors [W/(m^2 K)]	≤ 0.10	≤ 0.10
4.	U-value windows and doors [W/(m^2 K)]	≤ 0.80	≤ 0.80
5.	Proportion of window and door areas of heated gross internal area	≤ 25%	≤ 25%
6.	Annual mean temperature efficiency ratio for heat recovery systems in ventilation systems (%)	≥ 80%	≥ 80%
7.	Specific fan power (SFP) in ventilation systems [kW/(m^3/s)]	≤ 1.5	≤ 1.5
8.	Air leakage rate per hour at 50 Pa pressure difference	≤ 0.6	≤ 0.6
9.	Normalised thermal bridge value, where m^2 is stated as heated gross internal area [W/(m^2 K)]	≤ 0.05	≤ 0.07

Regardless of which option is chosen, all new buildings must meet minimum requirements for windows (U-value ≤ 1.2) roofs and floors facing free air (U-value ≤0.18), exterior walls (U-value ≤0.22) and air tightness (air change per hour at 50 Pa pressure difference ≤1.5).

Estimated effect on national emissions
As elaborated in chapter 2.6 Norway is in a special position in relation to renewable energy use. Nearly all of Norway's electricity production is based on hydro power, hence the effect on emissions from the changes in energy use is moderate and will not directly affect greenhouse gas emissions in Norway. Over time, regulations of fossil fuel heating installations have become stricter. In 2016, a ban on installation of fossil heating in new buildings and after lager renovation was introduced. The gradual development, and stricter requirements on fossil fuel heating installations have limited the opportunity to use fossil fuel heating in new buildings. The impact on national CO_2 emissions are however limited, because estimations indicate that

very few new buildings did install heating solutions for fossil fuels even before the ban. Ban on the *use* of fossil fuels for heating of buildings from 2020 are elaborated in 4.3.6.4.

BOX 9: Ecodesign and labelling

Ecodesign rules are intended to improve the environmental performance of products. Energy labelling rules give consumers information on the energy efficiency of products. Guarantees of origin confirm that energy has been produced from renewable sources. Consumers can choose contracts under which suppliers guarantee that they have bought a corresponding amount of electricity produced from renewable sources.

As from 1 July 2010, the energy certification scheme requires buildings to have an energy certificate when built, leased, or sold. The objective of the scheme is to provide basic information about the energy performance of buildings and the possibilities for improvements. The energy certification scheme is part of the follow-up of the EU Directive on energy performance in buildings (Directive 2002/91/EC).

BOX 10: The Low-energy Program

The Low-energy Program (Lavenergi-programmet) was established in 2007. It is a ten-year collaboration program between government agencies and the building and construction industry to increase competence on energy efficient building and the use of renewable energy in buildings. To achieve the goal of increasing the competence on energy efficient buildings, the Low-energy Program has completed a number of courses, information campaigns and projects in the construction sector. The Program ended in 2017. An evaluation shows that the competence on energy efficiency in the construction industry has largely raised due to the efforts by the Low-energy Program.

4.3.6.5 **Ban on the use of mineral oil for heating of buildings from 2020**

In June 2017, the Solberg Government put forward a regulation on the banning of use of mineral oil (fossil oil) for heating of buildings from 2020. The ban covers the use of mineral oil for both main heating (base load) and additional heating (peak load), in residential buildings, public buildings and commercial buildings. The purpose of the ban is to reduce greenhouse gas emissions.

Estimated effect on national emissions

Use of mineral oils for heating of buildings is regulated through different measures such as CO_2-tax, mineral oil tax, standards in the building code and support schemes from Enova and municipalities. Emissions from the consumption of fossil oils in the heating of households and businesses have thus declined by almost 60 per cent since 1990. If this development continues, emissions will be around 1 million tonnes of CO_2 equivalents in 2020 and ¾ million tonnes in 2030. The ban on the use of mineral oil for heating of buildings from 2020 means that residential, public and commercial buildings already in 2020 will have phased out emissions from such use, although there will still be emissions from the use of gas and from wood burning. The ban will also accelerate the decline in the use of oil for heating in service industries. However, for energy security reasons the projection assume emissions at 0.6

million tonnes in 2020 and 0.5 million tonnes of CO_2 equivalents in 2030. It is difficult to separate the emission effect of different measure, but on the basis of assumption mentioned above the effect of the ban can be estimated to 0.4 million tonnes in 2020 and 0.2-0.3 million tonnes in 2030.

4.3.6.6 **Bioenergy Scheme**

The Ministry of Agriculture and Food offers funding for investments in small scaled bioenergy primarily based on forest biomass. Funding is provided through grants for investments, studies and training measures. The main objective is to encourage farmers and forest owners to produce, use and supply feedstocks for bioenergy or heating.

Estimated effect on national emissions
In 2016, installations funded through The Bioenergy Scheme had a production capacity of 383 GWh. This is estimated to have reduced emissions from fossil fuels by 72 000 CO_2 eq. pr. year by 2016.

Table 4.10 *Summary policies and measures, energy and transformation industries*

Name of mitigation action [a]		*Sector(s) affected* [b]	*GHG(s) affected*	*Objective and/or activity*	*Type of instrument* [c]	*Status of implementatio*	*Brief description* [e, 1]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	*2000*	*2005*	*2010*	*2015*	*2020*	*2030*
Electricity certificates	*	Cross-sectoral	No direct effect	New renewable energy	Economic	Implemented	Norway and Sweden will increase their renewable electricity generation by 28.4 TWh from 2012 to the end of 2020 (an average of 3.2 TWh yr).	2012	Ministry of Petroleum and Energy	NA	NA	NA	NA	NE	NE	NE
Electricity tax	*	Cross-sectoral	No direct effect	Reduce electricity consumption	Economic	Implemented	Tax on electricity consumption	1951	Ministry of Finance	NE	NE	NE	NE	NE	NE	NE
Base tax on mineral oils	*	Cross-sectoral	CO2	Avoid substitution	Economic	Implemented	Excise duty on mineral oils	2000	Ministry of Finance	NA	NE	NE	IE 2)	IE 2)	IE 2)	IE 2)
Energy requirement in the building code	*	Energy	CO2	Reduce use of fossil fuels and energy demand in new buildings	Regulatory	Implemented	Energy requirments in buildings to ensure more energy efficient buildings.	2007	Ministry of Local Government and Modernisation	NA	NA	NA	NE	NE	NE	NE
Ban use of mineral oil for heating in households and for base load in other buildings	*	Energy use in buildings	CO2	Reduce emissions from heating of buildings	Regulatory	Planned	The ban covers the use of mineral oil for both main heating (base load) and additional heating (peak load), in residential buildings, public buildings and commercial buildings.	2020	Ministry of Climate and Environment/ Ministry of Petroleum and Energy	NA	NA	NA	NA	NA	400	200 - 300
Bioenergy Scheme		Energy	CO2	Replace fossil energy with bioenergy	Economic	Implemented	Monetary support scheemes for converting to bioenery	2003	Ministry of Agriculture and Food	NA	NA	NE	NE	66	>0	>0

Note : The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations : GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom Footnotes

1) Actions may build on and enhance previous initiatives incentivising renewables, efficiency and emissions reductions.

2) Estimated effect included in Enova in other cross-sectoral measures

4.3.7 Transport

4.3.7.1 Introduction

In April 2017, the Solberg Government submitted the white paper National Transport Plan 2018–2029 (Meld. St. 33 (2016–2017)) to the Norwegian Parliament. One of the main goals of this plan is *"Reducing climate emissions in line with the transition to a low-carbon society and reducing other negative environmental impacts"*, and for the 12-year period, the following goal has been adopted: *"Reducing climate emissions in line with the Norwegian climate targets"*.

Several measures are affecting greenhouse gas emissions from the transport sector. The tax policy is central, and the most important measure is the CO_2-tax, which is a cross-sectoral measure (see chapter 4.3.2). In addition, the vehicle tax policy contributes to shifting vehicle demand towards low and zero emission vehicles. Norway also have a quota obligation for biofuels for road traffic, see chapter 4.3.7.3.

4.3.7.2 The Norwegian CO_2 tax scheme for the transport sector

The tax system (CO_2 tax, motor vehicle registration tax, etc.) is the main instrument for limiting CO_2 emissions from the transport sector. As of 2017, the CO_2 tax rate on petrol is NOK 1.06 per litre. The tax on auto diesel is NOK 1.20 per litre, which equals the general tax on mineral oil. These rates corresponds to a tax rate of about NOK 450 per ton CO_2. In addition, road usage tax is levied on fuel for road transport; see chapter (4.3.2). Domestic aviation pays a CO_2 tax of NOK 1.10 per litre jet kerosene, just below the general rate. Most domestic aviation is also included in the EU ETS. Owing to international regulations, international aviation is exempted from CO_2 tax. Use of mineral oil in domestic shipping is subject to a CO_2 tax at the general level, while fishing and catching inshore waters pay a lower rate, see 4.1.1.1. Use of LNG in both shipping and fishing is, in 2017, exempt from CO_2 tax.

4.3.7.3 Vehicle taxes and other incentives

The motor vehicle registration tax was introduced in 1955. The registration tax in Norway was high compared to other countries and has been a substantial source of tax revenue. Prior to the introduction of environmental differentiation in 2007 the purpose of the tax was mainly fiscal, and the tax base was weight, engine power and cylinder volume. From 2007 CO_2 emissions was introduced in the tax base. The main reason for including CO_2 emissions in the calculation of the registration tax was to reduce CO_2 emissions from new cars. In the years from 2009 to 2017, the registration tax has been shifted to place greater weight on CO_2 emissions. The registration tax on cars now depends on the weight, CO_2 and NOx emissions of the car. Changes in the motor vehicle registration tax towards a system that rewards vehicles with low CO_2 emissions and penalises vehicles with high emissions have contributed to reduced emissions from new cars.

In a review of the taxation scheme for cars, that was presented in the revised budget for 2015, the Solberg Government decided to put more emphasis on emissions in the registration tax in the future. This was followed by changes in the budgets for 2016 and 2017 that phased out engine power as tax base, reduced the taxation of weight and increased the taxation of emissions of CO_2 and NO_X. In the review, it was also decided to prolong the tax exemptions for VAT and registration tax for electric vehicles.

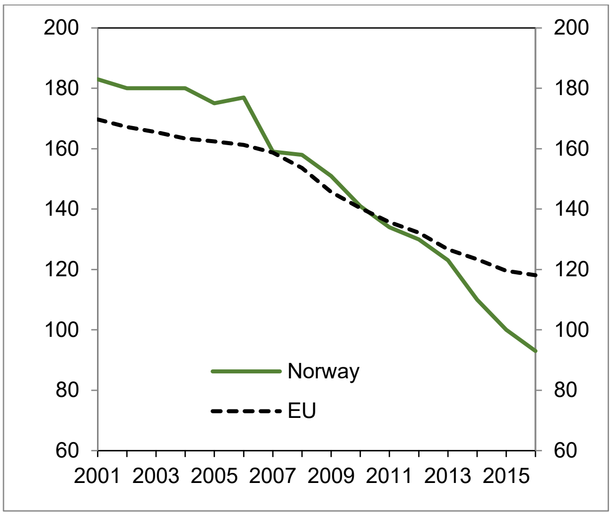
The tax incentives for low and zero emission cars over the years has contributed to a reduction in the average CO_2 emission from new cars, from 177 g/km in 2006 to 93 g/km during 2016.

In 2017, the average CO_2 emissions was about 82 g/km. The target, adopted in the white paper on Climate Policy (Meld.St. 21 (2011-2012)) to the Norwegian Parliament, that average emissions from new passenger cars in 2020 on average should not exceed 85 grams CO_2/km, was reached already in 2017.

EU emission standards for motor vehicles have contributed positively to the reduction of CO_2 emissions. An analysis by a social science consultancy found, however, that the changes in the Norwegian motor vehicle registration tax favouring low emission vehicles may explain most of the reduction in emissions during the period 2006-2011.[16] In recent years, the increased numbers of EVs and PHEVs has been the most important factor explaining the reduction in the type approved average CO_2 emission from new passenger cars, see figure 4.2. In 2017, around 50 per cent of all new cars registered were EVs, PHEVs or regular hybrids. It is reasonable to assume that the positive trend with lower emissions will continue.

The White Paper on Transportation (NTP) (Meld. St. 33 (2016–2017)) set new targets for the sales of zero emission vehicles. For instance, all new passenger cars and light vans should be zero emission in 2025. Improvements of technological maturity in the vehicle segment that makes zero emission cars competitive with fossil solutions is a prerequisite for the target figure.

Figure 4.2 *Development in average CO_2-emissions from new passenger cars in Norway and the EU (2001 - 2016). Gram per km.*



Sources: EEA and Norwegian Road Federation

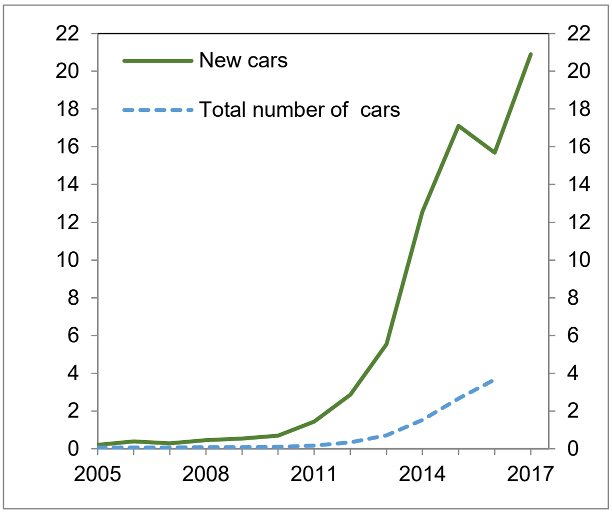
Norway provides strong incentives for zero emission vehicles, both tax advantages and other user incentives. Electric cars, battery and fuel cell, (EV) are exempted from the motor vehicle registration tax and the road usage tax. Electric cars also have a reduced rate in the annual tax on motor vehicles. Moreover, the purchase of EVs and equipment are exempt from value

[16] Report (in Norwegian) by Vista Analyse: http://www.regjeringen.no/pages/38231042/vista_rapport2012.pdf

added tax (VAT) and electric cars are also exempt from the road usage tax since electricity is not subject to this tax. In addition to the tax benefits, electric cars can have other benefits, like access to bus lanes, free toll passage, a rebate on car ferry crossings and free access to public parking spots.[17] More than 10 000 charging points have also been established. Enova has provided support to a network of fast charging infrastructure along the main highway corridors and has launched a support program for fast charging in municipalities with less than two fast charging points.

The incentive scheme, together with support for infrastructure, has had a major effect on the sale of electric vehicles. The share of new zero emission cars in the sales of new cars in 2017 was about 20 per cent, and currently Norway has around 130 000 electric cars. About 4 per cent of the Norwegian passenger car fleet is battery electric. This is the largest share of electric cars as percentage of the entire passenger car fleet in the world.

Figure 4.3 *Zero emission vehicles, share of new passenger cars and total number of passenger cars. Per cent.*

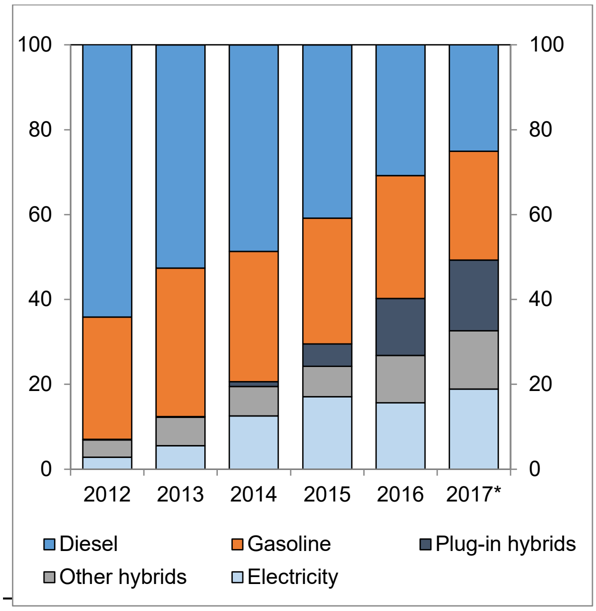


Source: Norwegian Ministry of Finance.

Hybrid electric vehicles have a weight deduction in the motor vehicle registration tax set at 5 per cent of the vehicle weight. For plug-in hybrid vehicles (PHEVs) the deduction is set at 26 per cent. Hybrid electric cars are not levied road usage tax since electricity is not subject to this tax. Furthermore, they have relatively low CO_2 emissions and are therefore subject to a lower registration tax than comparable conventional cars. The share of hybrid electric vehicles as share of new first time registered cars increased from 4 per cent in 2012 to around 31 per cent in 2017.

[17] There is a degree of local autonomy with regard to these user benefits, in particular they can be revised in light of the traffic development in the large urban areas.

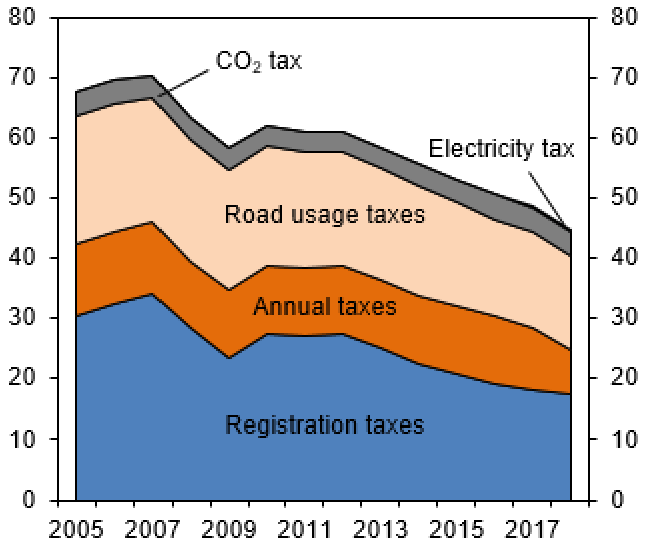
Figure 4.4 *Distribution of engine technology among new passenger cars. Per cent. 2012-august 2017**



Source: Norwegian Road Federation.

On average, the motor vehicle registration tax for a new passenger car (including electric cars) is reduced by appx. 35,000 NOK since 2013. In the same period, the average annual total tax on owing and using a car is reduced by approximately NOK 2,000. Tax on purchase, ownership and use of a car have traditionally been an important source of income for the government. The shift in taxation towards emissions has reduced the tax for cars with low emissions. Combined with exemptions for zero emission vehicles and the progress in the development of new low and zero-emission cars this has reduced government revenues. In the peak year 2007, the car-related taxes contributed to financing the state's expenses corresponding to NOK 70 billion, see figure 4.5. After a temporary fall during the financial crisis, revenues increased again. In 2013, revenues from car-related taxes amounted to NOK 58 billion. After that, revenues from car-related taxes have fallen, and can be estimated at approximately NOK 44.5 billion in 2018, about NOK 13.5 billion lower than in 2013. This corresponds to an average annual decline of approximately NOK 2.7 billion. This figure does not include loss of revenue from the VAT exemption for zero-emission cars and revenue loss due to lower road tolls and ferry rates for zero-emission cars than other cars.

Figure 4.5*Revenues from car related taxes Bill. 2018-NOK.*



Source: Norwegian Ministry of Finance.

Estimates for the value of the special tax advantages and user incentives for EVs in place are provided below (not including parking measures, where a national minimum cost reduction of 50 per cent compared to fossil vehicles is to be introduced, but which is otherwise set locally, and use of bus lanes by electric vehicles). The numbers given are yearly value of each advantage based on estimates for 2017, unless stated otherwise:

- zero VAT rating for electric vehicles, including the leasing of electric vehicles and supply and import of batteries for electric vehicles: around NOK 3.2 billions per year
- exemption from the registration tax: around NOK 700 millions per year.
- reduced annual vehicle tax: around NOK 300 millions per year.
- favourable income tax calculation for employees using corporate electric vehicles: around NOK 155 millions per year.
- revenue loss from road tolls: around NOK 700-800 millions in 2017.
- free boarding on classified national road ferries: around NOK 20,9 millions in 2017

Estimated effect on national emissions

When estimating the effect on emissions of the design and changes in the taxation scheme on vehicle (and other advantages) Statistic Norway's road model (see Annex III for a brief description) is used. The estimated effects are consistent and in accordance with the emission account and the projections. The calculations are done by altering the parameters in the model. The uncertainty is still however significant as both the without policies and measure and the reference scenario (with policies and measures) are uncertain.

In the projections, sale of electric vehicles (EV) is projected to increase from about 16 per cent in 2016 to 50 per cent of new total car sales in 2030. Continued strong incentives to choose EV will in the short run drive the increase, in the longer run technical improvements is assumed to make such cars competitive with fossil cars. Sales of plug-in hybrid vehicles (PHEV) are estimated to constitute about 20 per cent of new car sales. The high share of PHEV can be explained by the strong incentives in the vehicle registration tax to choose low emission cars and additional weight rebate for PHEVs. These assumptions imply that the share of new diesel and petrol cars (including non-plug-in hybrid cars) will decrease from about 70 per cent in 2016 to 30 per cent of new car sales in 2030. Traffic activity is assumed to trace population developments. Emissions from new cars per kilometre driven on the basis of fossil energy carriers are assumed to decline by about 1 per cent per year.

Electric vehicles
Norway is on top when it comes to EVs in the world. Without the incentives, EVs share would probably be more in line with what is observed in countries without incentives. We estimate the stock of EVs in Norway to be about 120 000 in 2030 without incentives as opposed to 820 000 in our projections. Emissions would thus have been about 0.1 million tonnes higher in 2015, 0.4 million tonnes higher in 2020 and 1.2 million tonnes higher in 2030 without the measures. The estimate is based on the following. Sweden, with a population about twice as high as Norway, had a stock of 8000 vehicles in 2016. If we assume that Norway would have had about 4000 EVs in 2016 and we further follow IEA[18] in their Reference Technology Scenario (RTS) and project that electric cars in circulation will increase by 28 times the 2016 stock by 2030, the stock of EVs would have been around 120 000. This is about 700 000 lower than in the reference scenario.

Vehicle registration tax
In 2006, average type approved CO_2-emissions from new cars in Norway were higher (180 g/km) than in the EU (160 g/km), cf. figure 4.2. In 2007, CO_2-emissions was included as tax base in the vehicle registration tax and emissions from new cars fell. In the subsequent years more emphasis has been put on emission in the tax. In the analysis by Vista Analyse, see reference above, they find that the changes in vehicle registration tax could explain more than half of the observed emission reductions in the period 2006-2011. Part of the effect can be explained by the significant increase in the number of diesel cars. Based on the findings in the Vista report we estimate that emissions would then have been about 0.5 million tonnes higher in 2015 in a without policies and measure scenario than is observed. The impact is about 0.5 million tonnes in 2020 too, and somewhat lower in 2030, due to the increase in low emission cars also in a without policies and measure scenario. Based on the IEA report we have also tried to estimate the impact of the registration tax on plug-in hybrid vehicles (PHEVs). In 2016, about 13 per cent of new cars sold were PHEVs. The impact on emissions is modest, in the interval 0-0.005 in 2020 to about 0.1-0.2 million tonnes in 2030. This stems from the assumption that PHEVs are about 40 per cent more efficient than an average gasoline car. In addition, the impact on emissions is a comparison to the projections where PHEVs constitute about 20 per cent of new car sales in 2030.

4.3.7.4 **Biofuels**

In order to increase the use of biofuels, there is a mandatory biofuels turnover in Norway. A quota obligation was introduced in 2009, committing the economic operators to sell at least 2.5

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[18] Global EV Outlook 2017.
http://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf'

per cent biofuels as a share of the total yearly amount of fuel sold for road transport. The quota obligation has since been increased several times. As from October 1st 2017 the obligation is 8 per cent, increasing to 10 per cent from January 1st 2018 including double counting of advanced biofuels. It is planned to increase the content of biofuels in fuels even more. As of January 1st 2014, sustainability criteria must be met by all biofuels and bioliquids included in renewable energy obligations or government support schemes. The sustainability criteria are the EU criteria implemented in the Fuel Quality Directive and the Renewable Energy Directive. Norway aims to promote development of the value chain for advanced biofuels. Since January 1st 2014 advanced biofuels are double counted towards the quota obligation. In addition, a subtarget was introduced in the quota obligation on January 1st 2017, requiring at least 1.5 percentage points of the quota obligation to be met by the use of advanced biofuels. This sub target was increased to 2.5 per cent from October 1st 2017 and to 3.5 per cent from January 1st 2018.

The CO_2 tax is levied on mineral products. This entails that petrol and diesel are subject to CO_2 tax, whereas bioethanol, biodiesel and hydrogen are not. Before October 1st 2015, biodiesel that met the sustainability criteria was subject to a reduced road usage tax, corresponding to half of the rate for autodiesel. Bioethanol was exempt from the road usage tax in blends containing more than 50 per cent bioethanol. In lower blends, bioethanol had the same road usage tax as petrol. Since October 1st 2015 biodiesel and bioethanol are subject to a road usage tax at the same level as autodiesel and petrol when used to fulfil the quota obligation for biofuels. However, volumes of biodiesel and bioethanol sold beyond the level of the sales mandate are exempted from the road usage tax since the same date.

Estimated effect on national emissions

The use of bio fuels, blended or pure, has led to reduced CO_2 emissions from road vehicles. The content of bio fuels in petrol and auto diesel sold has increased since 2005, cf. Table 4.11.

The estimated CO_2 effect is based on the consumption of bio fuel until 2015[19] and for 2020 and 2030 the projected consumption of bio fuels that was included in the national CO_2 projection published in March 2017.

In the calculation of the CO_2 effect it is taken into account that the energy content in bio fuel is lower than in fossil fuel i.e. 1 litre of bio fuel replaces less than 1 litre of fossil fuel. The CO_2 effect is increasing to 0.6 million tonnes CO_2 in 2020 and is then decreasing to 0.5 million tonnes CO_2 in 2030. This is due to the rapid increase in the number of electric vehicle from 2020 to 2030 that is assumed in the national emission projections.

The estimated effect has not taken into account the latest adopted requirements to content of biofuel in fuels for road traffic, and the effect of the tax incentives introduced in October 2015. It is not sure in what way the dealers of fuels will meet the new requirements. The double counting of advanced biofuels can possibly reduce the total amount of biofuels consumed, as the suppliers will be able to meet the sales mandate with a lower volume. The tax incentives

[19] Numbers for 2016 show that the content of biofuels in petrol and auto diesel was 5.9 per cent and 11.7 per cent respectively.

will make biofuels volumes sold beyond the level of the sales mandate able to compete with fossil fuels. Probably the estimated CO_2 effects of biofuels are underestimated.

Table 4.11 *Content of biofuels in petrol and auto diesel. 2005-2015. Per cent by volume.*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020-30
Petrol	0.0 %	0.0 %	0.0 %	0.1 %	0.1 %	0.7 %	1.2 %	1.5 %	1.1 %	1.8 %	1.9 %	4.0 %
Auto diesel	0.2 %	0.4 %	1.8 %	4.5 %	5.1 %	5.6 %	5.2 %	5.7 %	5.3 %	5.2 %	5.5 %	7.0 %

Source: Statistic Norway, The Environmental Agency and The Ministry of Finance

4.3.7.5 **Zero growth in passenger traffic by car in major urban areas: Public transport, cycling, walking and traffic restrictions.**

The Solberg Government has increased its efforts to reach the goal that the growth in passenger traffic in urban areas shall be achieved through public transport, cycling and walking. Mobility in urban areas will be improved through targeted investments, better public transport and future-oriented solutions. The nine largest urban areas either have urban environment agreements, urban growth agreements or a reward scheme for public transport, which all share the same common goal of zero growth in passenger traffic by car. This has contributed to stimulating zero growth and that the share of public transport has increased in general. The grants to urban environment agreements, urban growth agreements and the reward schemes for public transport have all been strengthened over the last years through increased funding. The distribution of the funds is subject to negotiation of the new agreements. The urban agreements and reward scheme for public transport was granted 1.78 billion NOK in 2016, 2 billion NOK in 2017 and 2.56 billion NOK in 2018.

The nine urban areas, comprising 13 cities, will soon be negotiating or re-negotiating urban growth agreements, which strengthens the efforts to reach the zero growth goal. The urban growth agreements are concluded between the government, the municipality and the County Council in urban areas. The agreements consist of specific measures and transport projects that are funded by contributions from both the national, regional and local government, as well as road tolls. Examples of measures included in these agreements are; infrastructure investments, increased availability and frequency for public transport, and restrictive measures for passenger cars. Land use measures are also important.

For 2017, there was a funding of 477 million NOK to walking and cycling through the Norwegian Public Roads Administration. In addition to this funding, a grant scheme for bicycle paths was established in 2014 to make grants available for local governments to invest in cycling infrastructure. The scheme was granted NOK 10 million in 2014, 95 million in 2015, 162.5 million in 2016, and 122.5 million in 2017. This funding is also aimed at measures outside major urban areas.

Estimated effect on national emissions

It is very difficult to single out the effect of each measure. The estimated effect is therefore aggregated for all measures. For instance, the effect of investments in railways will have better effect if bus-lanes and bike infrastructure around the station are improved at the same time. The effect will further increase with road pricing and toll roads in and around the city. The level of each measure may vary over time, as the local municipalities will alter road pricing, queue pricing and low emission zones due to the development in traffic and pollution in the cities. The complexity also increases as these restrictive measures in addition to reducing traffic also will influence on the market share of low- and zero-emission vehicles. Measures may vary between cities. Revisions of old agreements and new agreements between state and municipality are being negotiated, and details such as starting point and climate effect of each measure are not calculated. In this calculation of effects of zero growth, the number of zero emission cars in 2030 is about the same number as zero emission cars in traffic today. The estimates are based on calculations made by the Norwegian Environmental Agency, documented in the report M-782/2017 Beregningsteknisk grunnlag for Meld. St. 41, Klimastrategi for 2030 – norsk omstilling i europeisk samarbeid (White paper).

The Norwegian Environmental Agency has estimated that the zero traffic growth for passenger cars in the nine urban areas, comprising 13 cities, could reduce emissions by about 70 000 tonnes CO_2 equivalents in 2020 and about 200.000 tonnes CO_2-equivalents in 2030.

4.3.7.6 **Zero emission ferries**

In 2021 one third of ferries that operate domestic ferry routes, both national and regional routes, will have batteries installed, operating either as all-electric or as hybrid ferries. This number is based on signed contracts with ferry operators and requirements in issued public tenders. Such a development is largely a result of requirements for zero and low-emission technology in tenders for public ferries, both on the national highways and on the regional road network. Financial support through government funding agencies and funding schemes play an important role in stimulating emission reduction measures in the existing and new contracts. The National Public Road Administration (NPRA), the body responsible for the procurement of ferry services on the national highways, considers that in 2030, two-thirds of domestic car ferry routes will be possible to operate with ferries powered by electricity.

Due to longer crossing time and high energy demand, there are a number of ferry routes that are not suitable for all electric operation. In their analysis, the NPRA expects that ferries powered by hybrid solutions or exclusively on other energy carriers such as biogas, biodiesel, and hydrogen will operate the remaining one-third of the domestic ferry routes. The NPRA has announced a new development contract, with the ambition of an all-electric hybrid fuel cell battery powered car ferry in operation in 2021.The objective of the development contract is to make zero emission technology available for ferry routes that are not suitable for all-electric operation.

Estimated effect on national emissions
NPRA has estimated that the requirements for zero and low-emission technology in tenders for ferries on the national highways, on tenders that have been awarded and/or announced as of October 2017, will reduce the annual emission with approximately 90.000 tonnes CO_2 by 2020. Analysis by NPRA of which ferry routes that can be suited for zero- or low-emission technology show a potential annual reduction of approximately 400.000 tonnes CO_2 in 2030, including ferry routes both on national highways and on the regional road network.

4.3.7.7 **Reduced pilotage fees**

Pilotage fees were reduced by approximately 90 million NOK in 2016 in order to encourage modal shift of freight from road to sea and increase competitiveness of short sea shipping. This was enacted by exempting vessels up to 8.000 gross tonnes from the pilotage readiness fee.

Estimated effect on national emissions
Theoretically, the climate mitigation impact of this action could be calculated by observing changes in the modal distribution of freight transport in the years from 2016 which differ

significantly from trends in prior years. However, one would have to consider the impact of other actions which also affect modal shift of freight from road to sea, such as the aid scheme for short sea shipping, cf. 4.3.7.9 below, and the aid scheme for port cooperation. Nevertheless, the reduced pilotage fees were introduced in 2016, and the most recent statistics for freight transport are from 2015. Data from more recent years is a prerequisite for calculating the action's climate mitigation impact, and estimated effect has therefore not been calculated for the reduced pilotage fees.

4.3.7.8 **Discount in the pilotage readiness fee**

From January 1st 2015, ships with a score of 50 or more on the Environmental Ship Index (ESI) is awarded a 100 per cent discount in the pilotage readiness fee. The ESI identifies seagoing ships that perform better in reducing air emissions than required by the current emission standards of the International Maritime Organization (IMO). The ESI evaluates the amount of nitrogen oxide (NOx) and sulphur oxide (SOx) that is emitted by a ship, and it includes a reporting scheme on the greenhouse gas emission of the ship. However, the index score is predominantly due to reduced emissions of NOx and SOx. Hence, the ESI-based discount in the pilotage readiness fee is not primarily a climate mitigation action, but a reward to ships for their environmental performance and a broad incentive to promote clean ships.

Estimated effect on national emissions

The action was introduced in 2015 and first announced on October 30th 2014 when the Norwegian Coastal Administration (NCA) sent the pilotage fees for 2015 on consultation. The NCA considers it unlikely that this action alone should lead to the construction or retrofitting in 2015 of more climate and environment friendly vessels. The action's climate mitigation impact in 2015 is therefore considered to be non-existent.

In 2015 there were 91 vessels rewarded with an ESI discount in the pilotage readiness fee. However, in 2016 the number of discount rewarded vessels fell to 18 due to the abolition of pilotage readiness fee for vessels with a gross tonnage up to 8000 tonnes. Still, there is an increasing number of ships with an ESI score of 50 or more, and the NCA expects that there will be around 50-100 vessels which will be eligible for a discount in 2030 under the current regime. A method for calculating the climate mitigation impact of the discount in the pilotage readiness fee will have to be developed in the coming years.

BOX 11 Recycling scheme for short sea vessels

In 2016, the Government launched a recycling scheme for Norwegian short sea vessels, a sector where certain segments are characterized by older and more polluting ships. The aim of the scheme is to contribute to a faster renewal of the short sea sector by incentivising the scrapping of older vessels. By offering grants and innovation loans for this purpose, the scheme requires the scrapped vessels to be replaced by new builds or through acquisition of decidedly more environmentally friendly ships compared to the scrapped vessel. Innovation Norway administers the scheme.

Propel and Vista Analyse estimated in 2014 that the scheme could potentially reduce annual CO2-emissions from the short sea sector by somewhere between 217 000 and 239 000 tonnes, depending on whether all identified 90 vessels were to be replaced by decidedly more environmentally friendly vessels or newbuilds.

4.3.7.9 **Aid scheme for short sea shipping**

Starting in 2017, the Norwegian Coastal Administration (NCA) provides grants to projects that move freight from road to sea by establishing new short sea services between ports in the European Economic Area (EEA), or, under special conditions, the upgrading of existing services. The objective of the aid scheme is to transfer freight from Norwegian roads to maritime transport. The current aid scheme is a three year temporary pilot scheme for the years 2017-2019. After this period, the Norwegian Parliament will decide on the continuation and scope of the aid scheme in its annual decisions on the state budget.

Estimated effect on national emissions

By using factors for the emission of tonnes CO_2 per tonnes kilometre of, respectively, road transport and maritime transport, the net reduction in CO_2 emissions can be calculated. In order to estimate the climate mitigation impact in 2020 and 2030 we have made the following assumptions:

- The applications' estimations of the amount of freight to be transferred, will be realised 100 per cent according to the business plan.
- A project which is accepted for grants in 2017, may receive aid in a three year period. The aid scheme accepts new projects also in 2018 and 2019. We assume that the total amount of freight and the net transport work transferred from road to sea related to the project portfolio of 2017, will be representative for the projects receiving grants in 2018 and 2019. Hence, we expect the net reduction in climate gas emissions to be similar for accepted projects in 2017, 2018 and 2019.
- Grant is given to projects that are expected to be viable in the long run, and therefore the estimated amount of freight transferred in the fourth year of the project is assumed to be constant in the following years up to 2030.
- We assume a constant budget level for the aid scheme from 2017 up to the last budget year, which is 2019.

The table below illustrates net reduction in CO_2 emissions related to freight transport transferred from road to sea financed by the aid scheme, by calendar year (columns) and year of project acceptance (rows). The estimated effect from the aid scheme on emissions in 2030 is a reduction of approximately 97 000 tonnes CO_2.

Table 4.12 *Net emission reduction by year of project acceptance in 2018-2030. In tonnes CO_2.*

Application year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**...**	**2030**
2017	-21 769	-29 230	-32 272	-32 272	-32 272	-32 272		-32 272
2018	-10 615	-21 769	-29 230	-32 272	-32 272	-32 272		-32 272
2019		-10 615	-21 769	-29 230	-32 272	-32 272		-32 272
CO_2 **reductions**	-32 384	-61 614	-83 217	-93 774	-96 816	-96 816		-96 816

4.3.7.10 **Increased investments in railways**

The broad political agreement on climate gives high priority to developing a competitive railway transport system for passengers and freight. Emphasis is placed on improving the passenger rail network around the big cities and improving capacity for freight transport. There have been substantial increases in funding for investment in new railways maintenance of existing railways. The railway sector was granted NOK 19.4 billion in 2014,NOK 21.5 billion in 2015, and 23.1 billion in 2016. In 2018, it has been granted NOK 23.5 billion.

One of the main objectives for increased investments in railways is related to the goal “zero traffic growth for passenger cars” (see above 4.3.7.5) in the nine largest city-areas in Norway. All these cities are working towards urban growth agreements with national authorities, which obliges them to reduce growth in passenger car transport.

Railway has an important role in fulfilling the zero growth goal in the largest city areas (especially Oslo/Akershus, Buskerudbyen, and Nedre Glomma). At least 90 per cent of the travels by train have an end/starting point (or both) in an area of zero growth in passenger car transport (see 4.3.7.4 for the estimated effect of the measure "zero traffic growth for passenger cars in the largest cities").

Increased investments are also related to freight. The National Transport plan for 2018-2029 prioritises investing about 18 billion NOK in specific freight measures, such as crossings for trains on single track railway, electrification, and investments in terminals.

Estimated effect on national emissions

The specific rail freight measures from The National Transport Plan (2018-2029) may result in reduced emissions from freight transport by approximately 123 000 tonnes CO_2-eq in 2030.

The climate gas emission reduction of building Intercity infrastructure from Oslo to Tønsberg, Hamar and Hønefoss in the National Transport Plan 2018-2029 is estimated in the National Transport Plan 2018-2029 to be about 51 000 tonnes CO_2-eq as a consequence of reduced emissions from road traffic. The plan and implementation of the different projects have to be decided upon in the annual budgets. The ambition in the National Transport Plan is to extend the three first lines to Porsgrunn, Halden and Lillehammer in 2032/2034.

BOX 12: Electrification of railways

Roughly 80 % of the rail transport in Norway is carried out by electric trains.Electrification of the Trønder and Meråker line is included in the first period of the National Transport Plan. Trondheim–Storlien (Meråkerbanen) is a missing link for electric freight transport in the Scandinavian railway network. Both lower costs and easier logistics for the rail freight operators is a consequence of the electrification. Reduced emissions from the electrification project of Trønder and Meråker is estimated 14 000 tonnes CO_2-eq in 2030, due to reduced use of fossil fuels. This electrification project alone will reduce the emissions from railway operation by approximately 25 %.

4.3.7.11 **Enova**

Enova supports projects aiming to reduce non-ETS emissions including emissions from transport. In 2016, Enova provided more than 800 million NOK to transport projects such as fast charging infrastructure, infrastructure for electric car ferries, battery installation in ships, etc. For further description and estimated effect of this mitigation action in chapter 4.3.3.2.

4.3.7.12 **International transport**

Norway has for a number of years worked actively through the International Maritime Organisation (IMO) to pursue limitation of greenhouse gas emissions from international shipping. Since the last National Communication submitted by Norway, the IMO has adopted energy efficiency requirements which entered into force on 1 January 2013. This framework has been expanded further in 2014, and further tightening of the energy efficiency requirements is under consideration at the IMO. The IMO data collection system which will collect fuel consumption data was adopted in October 2016, and is expected to enter into force on 1 March 2018. At present Norway is contributing actively to the development of a comprehensive IMO strategy on the reduction of Greenhouse Gases from international shipping. The IMO is also addressing short-lived climate forcers through the ongoing work on Black Carbon emissions from shipping. The existing regulation on emissions on volatile organic compounds also address these emissions.

In 2014 the IMO updated the estimate of the global greeenhouse gas emissions from international shipping. Further update of these emissions are in the planning.

At the national level, Norway implements all relevant provisions of the IMO to limit or reduce emissions. In addition, Norway has promoted the introduction of battery-electric ferries through public procurement as a climate measure. Development of more energy-efficient technologies for shipping is also enhanced through research and development programmes under the Research Council of Norway, Innovation Norway and Enova.

The ICAO has decided that international aviation should achieve carbon neutral growth from 2020. The largest emission challenge in air traffic is related to large aircraft and long-distance flights and Norway therefore welcomes international regulations on international aviation.

Within the ICAO, Norway has as an observer in the Civil Aviation Environment Programme (CAEP) and has, as a member of the European Civil Aviation Conference (ECAC), participated actively with a view to limiting greenhouse gas emissions from international aviation. European Member States fully supported the work achieved in ICAO's Committee on Aviation Environmental Protection (CAEP), which resulted in an agreement on the new airplane CO_2 Standard at CAEP/10 meeting in February 2016, applicable to new airplane type designs from 2020 and to airplane type designs that are already in-production in 2023. ICAO's General Assembly decided in October 2016 on development of a global market-based measure. Norway actively supported this process. Norway will take part in the six year voluntary phase of the market based mechanism from 2021.

Norway participates in the EU Emission Trading Scheme (EU ETS) for aviation, through the implementation of EU Directive 2008/101/EC in the EEA Agreement.

Table 4.13 *Summary policies and measures, transport*

Name of mitigation action[a]		*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
										1995	2000	2005	2010	2015	2020	2030
CO2-dependent registration tax for new passenger cars including special rules for plug-in hybrid cars	*	Transport	CO2	Reduce emissions from new cars	Economic	Implemented	Registration tax is based on CO2 emissions, NOx emissions and weight. CO2 emissions included in 2007 - increasingly emphasised. Additional weight rebates for plug-in hybrids in the registration tax	2007	Ministry of Finance	NA	NA	NA	150	300-500	300-550	350-650
Tax exemptions and other advantages for electric vehicles	*	Transport	CO2	Reduce emissions from new cars	Economic and regulatory	Implemented	Exemption from registration tax and VAT for EVs. Reduced rate in annual motor vehicle tax. Other user advantage as free or low charges for toll roads, ferries and public parking.	2001	Ministry of Finance	NA	NA	NE	NE	100	400	1200
Requirement of 6.25 % bio fuels of fuel consumption in road transport	*	Transport	CO2	Reduce emissions	Regulatory	Implemented	The requirement is that 6.25% of total fuel consumption in road traffic is bio fuel and 4% of petrol is bioethanol	2017	Ministry of Climate and Environment	NA	NA	10	370	440	570	490
Zero traffic growth for passenger cars*		Transport	CO2	Reduce emissions from passenger cars	Economic and regulatory	Implemented	The 9 largest urban areas either have urban environment agreements, urban growth agreements or a reward scheme for public transport, which all share the same common goal of zero growth in passenger traffic by car.	2012	Ministry of transport and communication	NA	NA	NA	NA	>0	>0	0 - 200
Use low or zero emission car ferries		Transport	CO2	Reduce emissions from ferries	Economic/regulatory	Planned/ Implemented	Requirements for zero and low emission technology on ferries	2015	Ministry of transport and communication	NA	NA	NA	NA	2	90	90
Reduced pilotage fees		Transport	CO2	Reduce emissions from freight transport	Economic	Implemented	In order to encourage a modal shift of freight from road to sea, vessels up to 8.000 gross tonnes are exempted from the pilotage readiness fee.	2016	Ministry of transport and communication	NA	NA	NA	NA	NA	NE	NE
Aid Scheme for Short Sea Shipping		Transport	CO2	Reduce emission from freight transport	Economic	Implemented	Shipowners may receive financial aid for operational costs or for investments costs over a three-year period in order to establish a sustainable maritime transport route.	2017	Ministry of transport and communication	NA	NA	NA	NA	NA	83	97
Discount in the Pilotage Readiness Fee		Transport	CO2	Reduce emission from freight transport	Economic	Implemented	Vessels scoring 50 or more on the Environmental Ship Index (ESI) are eligible for a 100 per cent discount on the Pilotage Readiness Fee.	2015	Ministry of transport and communication	NE	NE	NE	NE	NE	NE	NE
Investments in railways		Transport	CO2	Reduce emissions from transport	Economic	Implemented, Planned	1) Investment in railway infrastructure in the larger capital area, the so called InterCity-project. 2) Investment in specific infrastructure measures for freight transport.	2011, 2018	Ministry of transport and communication	NA	NA	NA	NA	>0	>0	174

Custom Footnotes

*This includes reward scheme for public transport, stimulate walking and the use of bicycle and urban growth agreements. It is very difficult to single out the effect of each measure. The estimated effect is therefore aggregated for the zero traffic growth goal

4.3.8 Industry

4.3.8.1 **Introduction**

From 2013, emissions from processes in the manufacturing industries are to a large extent covered by the EU Emissions Trading Scheme (EU ETS). A number of agreements concerning the reduction of greenhouse gas emissions have been concluded between the industry and the Norwegian Government in specific sectors of industry not covered by the EU ETS or other economic incentives.

4.3.8.2 ***Arrangement to reduce emissions in the processing industry, 2004***

In 2004, the Ministry of Climate and Environment entered into an arrangement with the processing industry, with the exception of gas refineries and landing facilities, on the reduction of greenhouse gas emissions. Sources included were the aluminium, ferro-alloy, carbon, mineral fertiliser and silicon carbide industries that accounted for approximately 30 per cent of total Norwegian greenhouse gas emissions. This arrangement also included some installations covered by the EU emissions trading scheme, but for gases other than CO_2. According to the arrangement, total emissions of greenhouse gases in the process industry were not to exceed 13.5 million tonnes of CO_2 equivalents by the end of 2007.

Estimated effect on national emissions
The Norwegian industry has for many years reported their emissions to the Norwegian Environment Agency and these are reflected in Norway's GHG inventory. The emissions in 2007 from the industries covered by the arrangement were reduced by 1.11 million tonnes of CO_2 equivalents. The reduction in N2O emissions from the production of nitric acid was enough to fulfil the arrangement, but the effect is included under the PaM N2O reduction, production of nitric acid.

4.3.8.3 ***Arrangement to reduce emissions in the processing industry, 2009***

In September 2009, the Ministry of Climate and Environment entered into an agreement with the processing industry that was not covered by the EU ETS. This agreement set a limit for total emissions of 6.2 million tonnes CO_2-equivalents per year for the years 2008-2012. The limit equalled a reduction of 44 per cent compared with the emissions in 1990.

Estimated effect on national emissions
In 2007, the emissions from the processing industry were 6.4 million tonnes CO_2-equivalents. The target of 6.2 million tonnes CO_2-equivalents was met, thus resulting in a reduction in emissions of 0.2 million tonnes of CO_2 equivalents from when the agreement was made. From 2013 onwards, nearly all the emissions from the processing industry are included in the emissions trading scheme.

4.3.8.4 **CO_2 compensation scheme**

In 2013, Norway established a CO_2 compensation scheme for the manufacturing industry. The purpose of the scheme is to prevent carbon leakage resulting from increased electricity prices due to the EU Emissions Trading System (EU ETS), and affected companies can apply for such compensation to the Norwegian Environmental Agency. Norway is part of the integrated Nordic electricity market and there are electricity cables linking our system to both Germany and the Netherlands. Hence, increased electricity prices in Europe, due to the EU ETS, result in increased electricity prices in Norway too. The result is a competitive disadvantage for the electricity intensive manufacturing industry in Norway, compared with businesses outside of Europe. The CO_2 compensation scheme is intended to partly counteract this disadvantage.

The compensation scheme is based on the EFTA Surveillance Authority's state aid guidelines. The scheme is governed by the Norwegian Ministry of Climate and Environment, and administered by the Norwegian Environment Agency. The scheme applies from 1 July 2013 to 31 December 2020. The scheme includes all 15 sectors listed in the EU Guidelines, among others aluminium, ferro alloys, chemicals and pulp and paper.

Esteimated effect on national emissions
Since the purpose of the scheme is to prevent carbon leakage, it is not relevant nor possible to estimate the effect on national emissions.

4.3.8.5 Use of bio carbon in the production of cement and ferroalloys

In the production of cement and ferroalloys, the sectors have replaced some of the coal consumption with bio carbon.

Estimated effect on national emissions
The estimated effects on the emissions from cement production were estimated by the producers and reported in Norway's fifth National Communication. The effect for 2010 (130 000 tonnes CO_2) has also been used for the years 2015, 2020 and 2030.

The estimated effects on the CO_2 emissions from the production of ferroalloys are based on the plants' reported CO_2 emissions from use of biocarbon to the Norwegian Environment Agency. The consumption of biocarbon fluctuates between years but since 2013 the consumption of biocarbon has increased substantially, equal to 0.3 million tonnes CO_2 in 2014-2016. The production in the sector is in the national emission projection anticipated to be at approximately same level as today. The CO_2 effect of the use of biocarbon in 2020 and 2030 is set equal to the estimated emissions from biocarbon in 2015 (330 000 tonnes CO_2).

4.3.8.6 N_2O reduction, production of nitric acid

In 2015, the N_2O emissions from the production of nitric acid equalled about 0.25 million tonnes of CO_2 equivalents. The emissions from the production of nitric acid decreased by 87.4 per cent from 1990 to 2015. This is partly explained by the fact that one of the production lines was restructured in 1991, but mainly because more and more of the production from 2006 and onwards has been equipped with a new technology – N_2O decomposition by extension of the reactor chamber. As a result of the new technology, the implied emission factor (IEF) for nitric acid production decreased from 5.0 kg N_2O per tonne nitric acid in 1990 to 0.5 kg N_2O tonne of nitric acid in 2015.

Estimated effect on national emissions
The estimated effects on national emissions have been estimated by assuming a ”business-as-usual” scenario from 1990 with no change in emission intensity since 1990, but with actual production levels. For historical years (1995, 2000, 2005, 2010 and 2015), the resulting emissions are compared with actual reported emissions in the GHG inventory. The same scenario has been used to estimate the effects in 2020 and 2030, but where the production levels and emissions are consistent with the latest GHG projections. The estimates of effects are shown in table 4.14 where it for instance can be seen that the effect for 2015 is estimated

to about 2.3 million tonnes CO_2-equivalents. The increase in effect from 2015 to 2020 and 2030 reflects an expected increase in the production of nitric acid and a slightly lower IEF.

The reduction in N_2O emissions from the production of nitric acid was enough to fulfil the 2004 arrangement between the Ministry of Climate and Environment and the processing industry, (see separate description of this arrangement in section 4.3.8.2 and 4.3.8.3 and Norway's sixth national communication). The production of nitric acid was opted-in to the EU ETS in 2008 and this has provided incentives for further emissions reductions.

4.3.8.7 **Agreement with the aluminium industry**

In 1997, the major aluminium producers signed an agreement with the Ministry of Climate and Environment to reduce emissions of greenhouse gases (CO_2 and PFCs) per tonne of aluminium produced by 50 per cent in 2000 and 55 per cent in 2005, compared with 1990 levels. The agreement was followed by a new agreement with the industry for the years 2005-2007. In 2005 the CO_2 equivalent emissions of PFCs per tonne of aluminium produced were 85 per cent lower than in 1990 and 84 per cent lower in 2007. The emissions covered by this agreement were included in the 2009 agreement with the processing industry, see description 4.3.8.2 and 4.3.8.3, and from 2013 they are covered by the EU emission trading scheme. The emission intensity has continued to decrease and was 97 per cent lower in 2015 than in 1990.

Estimated effect on national emissions

The reduced emission intensity is a result of the sustained work and the strong attention on reduction of the anode effect frequency and time in all these pot lines and the shift from the Soederberg production technology with high emission intensity to prebaked technology with considerably lower emission intensity. The emphasis on reducing anode effect frequency started to produce results from 1992 for both technologies.

Since it is somewhat difficult to separate the effects of the agreement from other effects, two scenarios have been applied. The upper range of effects assumes a “business-as-usual” scenario from 1990, with no change in emission intensity since 1990 but with actual production levels. The lower range of effects assumes a “business-as-usual” scenario from 1997, with no change in emission intensity since 1997 but with actual production levels. For historical years (1995, 2000, 2005, 2010 and 2015), the resulting emissions in these two scenarios are compared with actual reported emissions in the GHG inventory. The same scenarios have been used to estimate the effects in 2020 and 2030, but where the production levels and emissions are consistent with the latest GHG projections. The estimates of effects are shown in table 4.16 where it for instance can be seen that the effects for 2015 ranges from 2.0 to 4.7 million tonnes CO_2-equivalents.

4.3.8.8 **Agreement on SF_6 reductions from use and production of GIS**

In June 2001, a non-profit trust, which by an agreement with the Government is in charge of the collection, recirculation and destruction of discarded electric and electronic equipment, established a SF_6 recovery facility. In March 2002, this was followed up by a voluntary agreement between the Ministry of Climate and Environment and the business organisations representing most users of gas-insulated switchgear (GIS) and the single producer. According to this agreement, emissions were to be reduced by 13 per cent by 2005 and 30 per cent by 2010 relative to base year 2000. By the end of the agreement period in 2010, emission were 45 per cent lower than the base year emissions in 2000. Although the formal agreement was terminated in 2010 the intentions and practical implications of the agreement are still in place, since the emission reduction measures and close cooperation between the trust and the Government has continued uninterruptedly up until this day. Although the installed amount of gas in GIS has increased, the emissions from GIS in use has decreased.

Estimated effect on national emissions
Emission estimates from the Norwegian inventory have been used to calculate the emission reductions resulting from the agreement. For 2005, 2010 and 2015, emission estimates are compared to the emission estimates for the base year 2000. For 2020 and 2030, projections are compared to the emission estimates for the base year 2000.

4.3.8.9 SF_6 reduction, production of magnesium

Since 1985, the company Norsk Hydro voluntarily reduced its consumption of SF_6 as a blanket gas used in the production of magnesium. The reduction was largest from 1987 to 1989, before SF_6 was known to be a greenhouse gas with a very high global warming potential. The emissions were also reduced at the beginning of the 1990s and the specific emissions (emissions per tonne of magnesium produced) were reduced considerably from 1990 to 1995. There was a weak increase in emissions from 1995 to 2001 owing to increased production, but in 2002, the primary production of magnesium in Norway was closed down. In 2006, recycling of magnesium was also closed down.

Estimated effect on national emissions
Emission estimates from the Norwegian inventory have been used to calculate the emission reductions resulting from this voluntary reduction. For 1995, 2000 and 2005, emissions are compared to the emissions in 1990. Estimates of emission reductions are not included after 2005 because the plant was closed down in 2006.

4.3.8.10 Tax and reimbursement scheme of HFC

To curb the expected exponential growth in HFC emissions due to the phase-out of ozone-depleting substances, a tax on import and production of HFCs was introduced in 2003 (the tax also includes PFCs, but the use of these gases is insignificant). In 2004, this tax was supplemented with a refund scheme, which prescribes a similar refund when gas is destroyed. The tax was initially NOK 180 (appr. 19 Euro) pr. GWP-tonnes, but is in 2017 NOK 450 (appr. 45 Euro) after relatively large increases in 2014 and 2017. The tax now approximately equals the CO_2 tax rate on mineral oil. Combined and over time, the tax- and refund schemes amount to a proxy tax on emissions of HFC.

The tax and reimbursement scheme has resulted in better maintenance and improved routines for discarding old equipment. It also provides a strong incentive for choosing HFCs with the lowest GWP possible and has resulted in the increased use of natural refrigerants and alternative processes (for example indirect systems) in new installations. The tax has had very significant effects on new, bigger installations, where low-GWP alternatives are often available and the tax might represent a significant share of the investment costs. On smaller mass-produced units the development in international legislation (such as the EU F-gas regulation and the Montreal Protocol) is likely the main driving force influencing emissions and choice of refrigerant.

Estimated effect on national emissions
The tax has significantly reduced growth in emissions compared with pre-tax scenarios,

which forecasted very strong growth due to substitution of CFCs and HCFCs with HFCs. Estimates show that the tax has reduced the HFC emissions in 2005, 2010 and 2011 by 0.3, 0.6 and 0.7 million tonnes of CO_2 -equivalents, respectively.

The emissions of HFCs in 2014 were approximately twice as high as in 2004. However, since 2010 the growth rate has decreased significantly. From 2014 to 2015 emissions decreased for the first time. This is likely due to the combined effect of the tax- and refund scheme and the F-gas regulation.

4.3.8.11 **F-gas regulation**

Norway implemented EU Regulation No. 842/2006 on certain fluorinated greenhouse gases in 2010. Owing to delays in the establishment of the certification scheme, enforcement of the certification and leakage checking requirements of the regulation was delayed until 2011.

Norway has prepared the implementation of the revised EU regulation No. 517/2014, and this is now under consideration in the EFTA and EEA bodies. Norway's position is to implement the regulation, but to seek exception from the HFC phase-down scheme (Articles 14-18). The exception from the phase-down scheme is mainly justified by the implementation of the Kigali Amendment to the Montreal Protocol. Norway has ratified the Kigali Amendment, and the phase-down scheme for HFCs is expected to enter into force in national legislation by 1 January 2019.

The users of f-gases are forewarned of coming restrictions and regulation, so despite the delay in implementing the revised F-gas regulation, some change in market behaviour is already observed.

Estimated effect on national emissions
In 2013, a national expert assessed the implications of the revised EU-Regulation on the national emissions in Norway in 2020 and 2030. The Norwegian Environment Agency provided an updated assessment on the implications in 2016 based on the work of the national expert. For 2020, the Norwegian Environment Agency estimated a reduction in emissions of 200-300 tonnes CO_2-equivalents and for 2030, an effect of 500-700 tonnes CO_2-equivalents. The averages of these ranges are reported in this National Communication.

4.3.8.12 **The environmental technology scheme – Innovation Norway**

The Environmental Technology Scheme was established in 2010. The overall target of the scheme is to encourage the Norwegian industry to bring the results from research projects on environmental technology to the market. The scheme aims at promoting sustainable business activities and helping to realize Norway's environmental goals.

In this context, the definition of environmental technology is all technology that directly or indirectly improves the environment, i.e. technology that limits pollution through purification processes, more environmentally friendly products and production processes, more efficient handling of resources and technological systems that reduce the impact on the environment.

The Environmental Technology Scheme offers grants and other support for development and investments in pilot and demonstration projects for new Norwegian environmental technology.

It is a nationwide scheme to which all Norwegian companies can apply. The companies apply for grants related to the costs for planning and development of the project, investment costs during the development and pilot phase, and costs relating to start-up and testing after the initial work to establish the pilot. The criteria for receiving grants are related both to the projects' economic and commercial effects, environmental effect and level of innovation.

In 2016, NOK 461 million was granted from the environmental technology scheme to 187 projects. Total investments in these projects (including the companies' own funds) are NOK 3,27 billion. The projects are based across a range of different technologies, including metallurgic industry, bio-refinery, renewable energy, water treatment, maritime sector and aquaculture.

Estimated effects on national emissions

The environmental technology scheme mainly supports projects in a research and development phase, and it is difficult to quantify the results. In the application the companies indicate the expected environmental impact of the pilot and the expected effect if the new solution spreads. However, there is no requirement for the effects to be converted into CO_2 equivalents and climate-specific reporting.

Table 4.14 *Summary policies and measures, industry*

Name of mitigation action[a]		Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2 eq) 1995	2000	2005	2010	2015	2020	2030
Consensus with the process industry, 2004 1	*	Industry	CO2, CH4, N2O, HFCs, PFCs, SF6	Reduce emissions	Voluntary agreement	Implemented	The Ministry of Climate and Environment entered into an arrangement with the processing industry. See text in NC for further details.	2004	Ministry of Climate and Environment	NA	NA	IE	IE	IE	IE	IE
Consensus with the process industry, 2009	*	Industry	CO2, CH4, N2O, HFCs, PFCs, SF6	Reduce emissions	Voluntary agreement	Implemented	The Ministry of Climate and Environment entered into an agreement with the processing industry that was not covered by the EU ETS. See text in NC for further details.	2009	Ministry of Climate and Environment	NA	NA	NA	NA	200	200	200
CO2 compensation scheme	*	Industry	CO2, N2O, PFC	Prevent carbon leakage	Economic	Implemented	CO2 compensation scheme to prevent carbon leakage resulting from increased electricity prices due to the EU ETS. See text in NC for further details.	2013	Ministry of Climate and Environment, Norwegian Environment Agency	NA	NA	NA	NA	NA	NA	NA
Use of bio carbon in the production of cement and	*	Industry	CO2	Reduce CO2 emissions	Voluntary	Implemented	The producers have voluntarily replaced some of the coal consumption with bio carbon.	1990s (cememt), 2000 (ferroalloys)	NA	NA	30	450	350	460	460	460
N2O reduction, production of nitric acid	*	Industry	N2O	Reduce N2O emissions	Voluntary/ Voluntary agreement/ EU ETS	Implemented	Mainly because the production lines have been equipped with a new technology – N2O decomposition by extension of	since 1991	NA	700	600	500	2100	2300	2800	2800
Agreement with aluminium industry	*	Industry	PFC	Reduce PFC emissions	Voluntary agreement	Implemented	The major aluminium producers signed an agreement with the Ministry of Climate and Environment to reduce emissions. See text in NC for	1997	Ministry of Climate and Environment	0-1500	600-3100	1900-5300	2000-4700	2400-5300	2600-5800	2900-6400
Agreement on SF6 reductions from use and production of GIS	*	Industry	SF6	Reduce SF6 emissions	Voluntary agreement	Implemented	Agreement between the Ministry of Climate and Environment and the business organisations representing most users of gas-insulated switchgear (GIS) and the single producer. See text in NC for further details.	2002	Ministry of Climate and Environment	NA	NA	50	46	61	59	58
SF6 reduction, production of magnesium 4		Industry	SF6	Reduce consumption of SF6	Voluntary	Implemented	Voluntarily reductions in the consumption of SF6 used as a blanket gas in the production of magnesium. See text in NC for further details.	1985	NA	1640	1308	1816	NA 1	NA	NA	NA
Tax and recycling schemes on HFCs	*	Industrial processes	HFCs	Reduce HFCs emissions	Economic	Implemented	Has resulted in better maintenance and improved routines during discharge of old equipment. See text in NC for further details.	2003, 2004	Directorate of Customs and Excise, Norwegian Environment Agency	NA	NA	300	600	700	700	500
Revised F-gas regulation	*	Industrial processes	HFCs	Reduce HFCs emissions	Regulatory	Planned	Planned implementation of the revised EU regulation No. 517/2014. See text in NC for		Norwegian Environment Agency	NA	NA	NA	NA	NA	250	600
The Environmental Technology Scheme		Cross-cutting	No direct effect	Contribute to sustainable business development in Norway and realize Norway's environmental goals.	Economic, research	Implemented	The Environmental Technology Scheme offers grants and other support for development and investments in pilot and demonstration projects for new Norwegian environmental technology.	2010	The Norwegian Ministry of Trade, Industry and Fisheries	NA	NA	NA	NE	NE	NE	NE

Note : The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).
Abbreviations : GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.
[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.
[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.
[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.
[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.
[f] Optional year or years deemed relevant by the Party.

Footnotes

1. The effect is included under N2O reduction, production of nitric acid.
2. The effects for cement were estimated by the producers and reported in Norway's fifth National Communication. Effects for 2015 and 2030 assumed equal to 2010 and 2020.
3. The effects for ferroalloys are based on the plants' annual reporting to the Norwegian Environmental Agency. For 2020 and 2030, the effect has been assumed equal to the effect for 2015.
4. The plant producing magnesium was closed down in 2006, and emisison reductions are not included in the estimated effects of policies and measures after this.

4.3.9 Agriculture

Emissions from agriculture are covered neither by the emissions trading system, nor subject to GHG taxation. As reasons for this, it has been stated that it is more difficult to estimate these emissions than other emissions, e.g. because they are a result of biological processes, and that the emissions stem from many small units, which are difficult to include in an emission trading system. In December 2016, the Norwegian parliament asked the government to introduce an equal CO_2 tax on all emissions not covered by the trading system, with a preliminary exception for agriculture and fisheries. The Solberg Government will appoint a committee to evaluate the possibility of introducing a gradually increased CO_2 tax for agriculture and to propose other climate mitigation measures.

However, Norway has implemented other measures affecting the emissions from agriculture. Existing measures in this sector are both statutory and financial, in addition to measures related to information. The Norwegian Ministry of Agriculture and Food presented a white paper on agricultural policies in December 2016; Change and development - A future-oriented agricultural production (Meld. St. 11 (2016–2017)). Climate change and agriculture was thoroughly discussed in the paper. The Norwegian Parliament's treatment of the white paper is an important foundation for further action. The Norwegian Parliament stated that the most important role for agriculture in the context of climate change is to reduce emissions per unit produced, increase the uptake of CO_2 and adapt the production to a changing climate. Identifying measures for reducing climate emissions in the agricultural sector is considered important, but complex. Emissions effects may vary in relation to natural changes such as precipitation patterns, temperature or soil properties. In addition, there exist regional and local measures. These include information on good agricultural practice and local land use planning. Some measures promoting for example, use of bio energy and reduction of emissions from greenhouses are included in the energy sector.

Measures aimed at reducing N_2O may have both positive and negative economic effects. Reduced amounts of fertilisers may result in reduced harvests and increased production costs. Improved soil cultivation practices may reduce the risk of erosion, loss of nutrients and the associated emissions. The sector is making efforts to improve the use of fertilising schemes based on increased use of soil analyses, harvest crop residues, and more efficient use of manure, since these are important tools for obtaining emission reductions without decreasing harvests. Precision agriculture is under development.

4.3.9.1 **Regional agri-environmental programmes**

The regional agri-environmental programmes are support schemes adapted to environmental challenges in different parts of the country. Each county (region) shall use schemes/measures taken from a national "menu", based on which measures that are best adapted to the reaching the goals of the regional environmental programme. Most financially supported measures are primarily directed towards other environmental goals than climated mitigation, like reducing water pollution from drainage and management of the cultural landscape, but several of the supported measures may lead to reduced GHG emissions and/or increased carbon sequestration. Such supported measures include drainage, no/delayed tillage (no-autumn tillage) and environmentally friendly dispersion of manure.

Estimated effect on national emissions
No-autumn tillage may reduce emissions of CO_2 and N_2O, but research is not conclusive nor unambiguous. Consequently, there is not sufficient knowledge to estimate the effect on emissions. Environmentally friendly dispersion of manure is likely to reduce loss of ammonia to air and may reduce the need for mineral fertilizers, both leading to a reduction of N_2O emissions. The exact effects, however, depend on several characteristics, like precipitation, topography and soil type, and are therefore hard to quantify.

4.3.9.2 Support scheme for Special Environmental Measures in Agriculture

Several measures with different environmental goals are given financial support from the support scheme for Special Environmental Measures in Agriculture. Many of these measures are primarily established to reduce water pollution, which can also have a positive effect on GHG emissions. Better storage of manure through building measures, is however one of the supported measures that can reduce emissions of CH_4 and N_2O.

Estimated effect on national emissions
The effect on emissions from better storage of manure depends on several characteristics and is therefore hard to measure. Support is given only to storage constructions that are better than what is demanded by regulations. However, the size of such measures has been very limited and the effect from the current scheme should therefore be considered small.

4.3.9.3 Drainage of agricultural soils

The main purpose of the scheme is to increase the quality of cultivated land by financial support to badly drained soil, in order to increase productivity and reduce danger of erosion and water pollution. As a side-effect, better drainage may also reduce GHG emissions.

Estimated effect on national emissions
There is a tendency of higher emissions of N_2O from soils with high humidity. Drainage may therefore reduce such emissions. However, the effect also depends on e.g. fertilizer, time of fertilization, humiditiy of the soil, structure of the soil and pH values. There are currently few studies available that can help quantifying the effect on emissions, and more knowledge is therefore needed.

4.3.9.4 Project Climate Smart Agriculture

A project called Climate Smart Agriculture is established. The aim of the project is threefold; Making a system for data collection and documentation of practical measures, develop a system for on-farm climate counselling, and information and sharing of knowledge. The project is funded by the Ministry of Agriculture and Food, and it will last for three years.

Estimated effect on national emissions
The project is related to information and sharing of knowledge, and develop a climate calculator. In addition, it is under development and the final outcome is still uncertain. It is therefore not possible to estimate the effect on national emissions.

4.3.9.5 Climate and environment programme

The aim of the Climate and environment programme is to contribute to climate and environmental goals within the agricultural policy through research and information measures. The programme is directed towards practical and agronomical knowledge on climate and environmental challenges, that can be quickly disseminated to the industry. Examples of projects that have been supported by this programme are Climate smart agriculture, Quality of roughage and Effects of tillage on drainage of nitrogen and phosphorus.

Estimated effect on national emissions
The project is related to development and dissemination of knowledge. It is therefore hard to estimate the direct effect on national emissions.

4.3.9.6 **Delivery of manure for production of biogas**

Treatment of manure in biogas plants can reduce CH_4 emissions from storage of manure. By using the biogas for energy purposes, use of fossil fuels for transport or heating are also reduced. To contribute to biogas treatment of an increased share of manure, the government established a pilot scheme from 2015 supporting delivery of manure to biogas plants. In 2016, the delivery of 61 600 tonnes of manure received support.

Estimated effect on national emissions
It is difficult to estimate the effect from delivery support scheme isolated from other incentives. The effect on emissions should e.g. be seen in relation grants for biogas projects and tax incentives for the use of biogas as compared to fossil fuels.

4.3.9.7 **Grant for biogas projects**

The government presented a national, cross-sectoral biogas strategy in autumn 2014. In the follow-up of the strategy, funding has been granted for pilot plants and research on biogas through Innovation Norway from 2015. The scheme is coordinated with the Ministry of Agriculture and Food, its commitment to biogas under the Value Added Program for Renewable Energy in Agriculture.

Estimated effect on national emissions
The grants are directed towards pilot plants. The effect on national emissions will depend on the success of the pilots and is hard to estimate. Innovation Norway will during 2018 evaluate the scheme, including the effect on national emissions.

BOX 13: Mitigation actions in a future-oriented agricultural production

The white paper on agricultural policies in December 2016; Change and development - A future-oriented agricultural production (Meld. St. 11 (2016–2017)), includes the following mitigation actions for the agricultural sector:

- In the light of Norway's 2030 commitment, work to reduce agricultural greenhouse gas emissions and gradually reform agricultural policy in a more climate-friendly direction
- Add greater importance to climate considerations in the annual agricultural neotiations
- After dialogue with farmers organisations, develop a plan of concrete measures an instruments for reducing climate emissions from agriculture, where the ambitions for emission reductions are quantified. The plan must be in proportion to our climate commitments
- Facilitate increased production of biogas based on livestock manure and waste reources in agriculture
- Prioritize knowledge-building and research related to opportunities for the agicultural sector to reduce its emissions, to the potential for carbon storage in soil and to how agriculture can adapt to a changing climate
- Establish a committee for calculating climate gas emissions from agriculture
- Establish an effective system of climate advisory at farm level to contribute to translating knowledge about climate change measures into action as quickly as posible
- When processing applications for agricultural investment support, energy, enironment and climate-friendly technology must be included as part of the casework
- Work to complete an industry agreement with the food industry to reduce food waste
- Climate measures should not cause increased subsidies to agriculture

4.3.9.8 New policies and measures

In June 2017, the Solberg Government presented a white paper on Climate policy; Norway's Climate Strategy for 2030 – a transformational approach within a European cooperation framework (Meld. St. 41 (2016–2017)). This white paper refers to the mitigation actions in the white paper on Agricultural policy. In addition to carrying out these actions, the government will appoint a working group that will evaluate the existing support schemes for climate measures at farm level.

The above-mentioned industry agreement with the food industry to reduce food waste, was completed and signed in June 2017. The goal is to half the food waste within 2030.

A committee has now been set up, to look at methods for how calculations of emissions from the agricultural sector best can be done, and how the methods can be improved. The committee is made up of representatives from several ministries, agricultural organizations and professional experts. The committee will provide expert advice on how existing calculations of emissions and reporting routines related to the emissions accounts may be improved.

In the agricultural sector approximately 200-400 ha of mires are cultivated annually. The Norwegian Parliament has asked the Government to implement a ban cultivation of mires due to the high amount of GHG emissions that is associated with this practice. The Solberg Government is currently considering a ban on cultivation of mires.

In the white paper on Climate policy, the government referred to analyses showing that it is possible to reduce cumulative emissions from agriculture in 2021–2030 by approximately 5 mill. tonnes CO_2 equivalents, that is on average half a million tonne annually, at a low economic cost. More than half of this potential is related to combined changes in food consumption (incl. reduced food waste) and production. The estimate also includes e.g. the considered ban on cultivation of mires.

The Solberg Government plans to invite the farmers organisations to negotiations where the overall goal is a political agreement on how much the agricultural sector shall reduce its emissions towards 2030. In the case where an agreement is not achieved with the farmers organisations on how to effectuate the sector's cost efficient share of emissions reductions, the government will take an initiative to put the necessary measures into effect.

***Table 4.15** Summary policies and measures, agriculture*

Name of mitigation action[a]	*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
									1995	2000	2005	2010	2015	2020	2030
Regional agri-environmental programme	Agriculture	CO2, N2O	Reduce emissions by no-autumn tillage and environmentally friendly spreading of manure	Regulatory and Economic	Implemented	Several support schemes. Differs between regions.	2003 (No-autumn tillage) and 2012 (environmentally friendly spreading of manure)	Ministry of Agriculture and Food	NA	NA	NE	NE	NE	NE	NE
Support Scheme Special Environmental Measures in Agriculture	Agriculture	CH4, N2O	Reduce emissions by better storage of manure	Economic	Implemented	Several support schemes, of which storage of manure is mostly related to climate mitigation	2004	Ministry of Agriculture and Food	NA	NA	NE	NE	NE	NE	NE
Drainage of agricultural soils	Agriculture	N2O	Reduced emissions of N2O, caused by better drained soils	Economic	Implemented	National support scheme	2013	Ministry of Agriculture and Food	NA	NA	NA	NA	NE	NE	NE
Project Climate Smart Agriculture	Agriculture	CH4, N2O, CO2	Data collection, councelling, sharing knowledge	Information	Implemented	The project will last for three years.	2017	Ministry of Agriculture and Food	NA	NA	NA	NA	NA	NE	NE
Climate and environment programme	Agriculture	CH4, N2O, CO2	Develop knowledge	Economic/information	Implemented	Develop knowledge which, among others, will contribute to reduced emissions on farm level	2011	Ministry of Agriculture and Food	NA	NA	NA	NA	NE	NE	NE
Delivery of manure for production of biogas	Agriculture	CH4	Reduce emissions from manure	Economic	Implemented	Support scheme for delivery of manure. The goal is to increase the utilization of livestock manure to biogas production.	2016	Ministry of Agriculture and Food	NA	NA	NA	NA	NA	NE	NE
Grant for biogas projects	Agriculture and transport	CH4, N2O, CO2	Reduce emissions	Economic	Implemented	Grants given to pilot projects to increase production and use of biogas	2015	Ministry of Climate and Environment	NA	NA	NA	NA	NE	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

4.3.10 Land Use, Land Use Change and Forestry

4.3.10.1 Introduction

Norway has an active forest policy, which aims to increase the forest carbon stocks. The forest also represents an important source of renewable energy, and contributes to production of wooden materials that can replace materials with a stronger carbon footprint. The forest as a renewable resource is strengthened through research, value creation, and long term sustainable management of the forest.

In 2015, the LULUCF sector contributed to net removals of 24,3 million tonnes of CO_2 equivalents. Since 1990, the carbon stock in living biomass in the LULUCF-sector has increased by around 30 per cent. The steady increase in living carbon stock is the result of an active forest management policy over the last 60–70 years. The combination of the policy to re-build the country after the Second World War II and the demand for timber led to a great effort to invest in forest tree planting in new areas, mainly on the west coast of Norway, and replanting after harvest on existing forest land. In the period 1955–1992 more than 60 million trees were planted annually peaking - more than 100 million annually in the 1960s. These trees are now at their most productive age and contribute to the increase in living biomass, and hence the forest carbon stock. 35 million trees were planted in 2017, which is a significant improvement since 2014. However, compared to the activity during the period 1950-1990 the planting activity is rather low, and is likely to influence the future increment growth and hence the net carbon sequestration. Furthermore, the annual drain levels are much lower than the annual increments, causing an accumulation of tree biomass. Recent studies indicate that the Norwegian forest capacity as a carbon sink has reached a peak and that annual increment is likely to decline over the next decades unless new measures are implemented. However, the carbon stocks are still increasing in Norwegian forests. Several forest management practices like afforestation, increased seedling density on regeneration sites, enhanced breeding of forest seedlings and fertilization of forest stands will influence the forest sink capacity in the future. Norway has in the latest years increased support for such measures significantly. Norway is also working to reduce emissions from drained soils.

4.3.10.2 Existing policy instruments for mitigation actions

A wide range of measures, including legislation, taxation, economic support schemes, research, extension services and administrative procedures, support the implementation of forest policy and mitigation actions. The current Forestry Act was adopted by the Norwegian Parliament in 2005 and came into force in 2006. Its main objectives are to promote sustainable management of forest resources with a view to promote local and national economic development, and to secure biological diversity, consideration for the landscape, outdoor recreation and the cultural values associated with the forest. The forestry Act also contributes to the conservation of biodiversity and the sustainable use of natural resources. However, the measures implemented will also influence CO_2 sequestration. The Forestry Act applies to all categories of ownership. A regulation under the Forestry Act requires forest owners to set aside between 4 and 40 per cent of the revenues from harvested timber into a Government administered fund, The Forest Trust Fund. This fund was established to secure long-term investment in sustainable forestry. The Forest Trust Fund is the property of the forest owners, but the use of the fund is regulated allowing only for specific purposes such as planting, road building, management planning, non-commercial thinning and other activities. When used, the money is treated as income for the forest owner. However, a part of it (85 per cent) is exempt from taxation. In addition to the tax relief granted through the Forest Trust Fund, economic support is provided for a similar range of activities supporting sustainable forestry and climate change mitigation. Special attention is directed to areas with relatively low utilisation of forest resources due to sparsely developed forestry infrastructure, including coastal areas in western, mid and northern parts of Norway.

Estimated effect on national emissions

It is difficult to quantify the mitigation effects of the existing measures in the forestry sector. It is uncertain what the activity level would have been without the measures, and the mitigation effects in slow growing boreal forests must be considered in a very long timescale. For that reason, only economic measures are listed in table 4.16, and illustrated in figure 4.6 and 4.7. As is a general trend, forest management practices declined from a high level in 1995 towards a bottom level around 2005. This was partly due to price fluctuations in the timber market and reduced economical funding for silvicultural activities. Increased funding and improvement of the forest trust fund have increased the forest management activities the last few years. The tax effect of the Forest trust fund is not included in the numbers in figure 4.7.

Several forest management practices, also mentioned in box 14 below, may influence the forests sink capacity and carbon stocks in the future. Owing to a slow rate of growth in boreal forests, fertilisation is the only forestry measure estimated to achieve a significant effect in the short term, where the limited fertilization area (10 000 ha yearly) is estimated to increase removals with approximately 0.27 mill. tonnes CO_2 per year after 10 years. Increased seedling density on regeneration areas may increase uptake by 0.7 mill. tonnes CO_2 per year in 2050, and 2 mill. tonnes per year in 2100. Enhanced breeding of forest seedlings, for instance by using more effective breeding methods, may increase uptake per year in 2050 by 0.2 mill. tonnes CO_2, and by 1.5 mill. tonnes CO_2 in 2100. Forest planting on new areas (afforestation of 5000 ha/year in 20 years (100 000 ha total) has been calculated to have a potential increased yealy uptake of 1.8 mill. tonnes in 2050 and near 2.2 mill. tonnes in 2100, within acceptable environmental limits. In the longer term (50 to 100 years), these measures can increase the removals substantially.

Funding of forest related mitigation efforts has increased substantially since the sixth National Communication in 2014, (see figure 4.7) and economic support schemes for new activities like improved seedling density, enhanced breeding of forest seedlings, and fertilization of forest have been implemented. Norway also conducts a pilot study on forest planting on new areas, to harvest experiences with climate effect, environmental criterias and implementation before upscaling and expanded implementation of the measure.

In 2015, Norway started a pilot study for restoration of organic soils. Fundings increased from 2016, and in the period 2016-2020 Norway is implementing a plan to restore wetlands as a climate measure. The work is directed at fulfilling the Solberg Government's targets on reduced GHG emissions from drained soils, adaptation to climate changes, and improvement in ecological condition. The reduction of greenhouse gas emissions will be distributed over several decades and is uncertain. The effect in the short term is therefore not estimated

4.3.10.3 **New policies and measures**

As mentioned in box 14 below, there is a political agreement in the The Storting (Norwegian Parliament). In the years after 2012, several of these measures have been examined and implemented. These are mentioned above. Yet other measures from this list are still under consideration.

BOX 14: Forest mitigation actions in the political agreement on climate of 2012

Through the political agreement on climate of 2012, the Norwegian Parliament calls for the following mitigation actions for the forestry sector:

- Increasing the productive forest area through reduced deforestation and forest degradation and by pursuing an active, sustainable policy for planting in new areas. As a part of this, a strategy for increased afforestation will be presented, while simultaneously developing environmental criteria for this effort. The municipalities should seek to reduce deforestation through land use planning.
- Maintaining or increasing the forest carbon stock through active, sustainable forest policies, e.g. by reinforcing efforts in forest plant breeding, increasing plant density and reintroducing the ban on harvesting young forest stands, as well as reinforcing forest conservation.
- Considering a possible system of voluntary climate measures and cooperation agreements with landowners for the establishment of climate forests.
- Improve incentives for the use of bio-energy derived from wood, with particular emphasis on forest residues.
- Contributing to increased forest carbon removals through targeted fertilisation of forests, while simultaneously developing environmental criteria for this effort. Funding for these measures is subject to decisions in the annual budget.

In a White Paper to the Norwegian Parliament (2014–2015) "New emission commitment for Norway for 2030 – towards joint fulfilment with the EU", Norway announced that it intends to fulfil the 2030 climate target jointly with the EU. If joint fulfilment of the 2030 climate target is agreed, the EU regulations on effort sharing and on land use, land-use change and forestry will become relevant for Norway. Norway's overall position for inclusion of forest and other land use in the climate and energy framework for 2030, is that this should not reduce the overall ambition level. Furthermore, the forest's role as a carbon sink should not prevent emission reduction measures in other sectors. Incentives for new measures for increased removals/reduced emissions from the land sector should also ensure that the incentives for low emission development in other sectors remain high, and can be strengthened.

In the White Paper, the Solberg Government states that it aims to give more weight to climate policy goals in the management of Norwegian forests. To secure a transition to a low-emission society, both in Norway and in other countries, CO_2 removals in forest and other land categories that were not a result of new action should be additional to and not replace emission reductions in other sectors. New action should be considered, including measures designed to maintain or increase the carbon stock in forest, and measures to allow the replacement of more emission-intensive materials with wood and fossil energy with renewable bioenergy. The Government also states that it intends to take steps to increase the timber harvest.

Figure 4.6 *Historical levels of tree planting in the Norwegian forestry. Afforestation in red and regular planting under forest management in blue. Norway spruce (picea abies) and Scots pine account for more than 95 per cent of the seedlings. Broadleaves and foreign tree species are only planted to a small extent.*

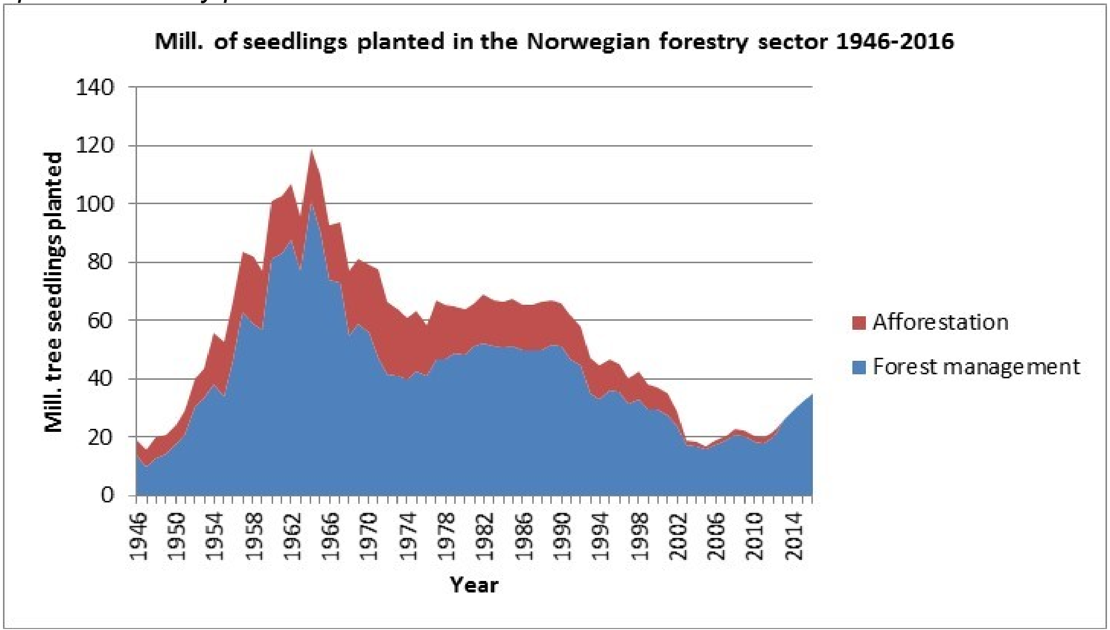

Figure 4.7 *Economical funding of measures in the forestry sector with mitigation impact*

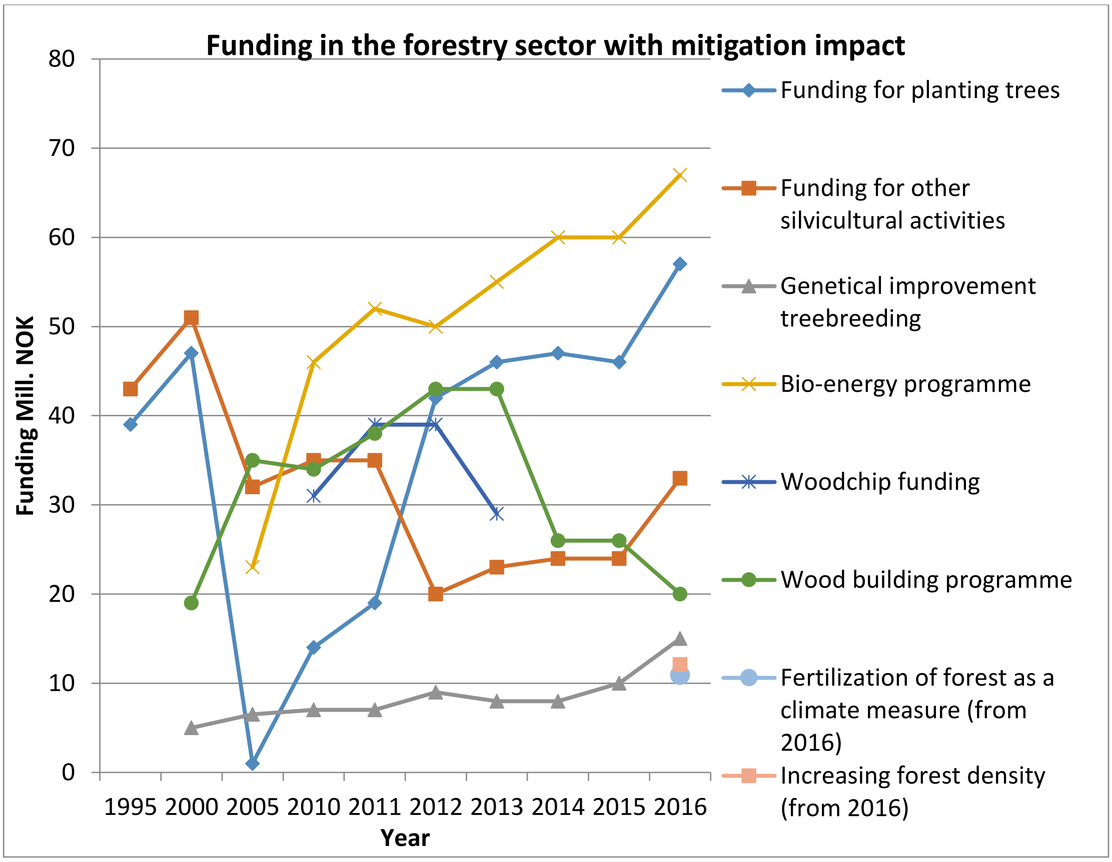

***Table 4.16** Summary polices and measures, LULUCF*

Name of mitigation action[a]	*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*						
									1995	2000	2005	2010	2015	2020	2030
Forestry, climate and energy funding programme The Forest trust fund	LULUCF	CO2	Increase sequestration and forest carbon stocks and displace fossile recources	Economic	Implemented	Enhance or increase carbon stocksby silviculture and reduce emissions in other sectors by displacing fossile resources with bio energy or wood materials	2009/1983	Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	>0
Genetical improvement, plant breeding	LULUCF	CO2	Enhanced carbon sink compared to baseline	Economic	Implemented	Genetically improvement means to single out robust plants which can improve the forest stand increment and quality. Enhanced action from 2016.	2016	Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Wood building programme	LULUCF	CO2	Use wood in buildings as a replacement for less climate friendly building materials, LULUCF (HWP)	Economic	Implemented	The Wood-based Innovation Scheme aims to increase the awareness and use of wood by stimulating innovation and market orientation in the wood industries.	2000	Ministry of Agriculture and Food	NA	NE	NE	NE	NE	NE	>0
Denser spacing between forest seedlings in regular forest plantations	LULUCF	CO2	Enhanced carbon sink compared to baseline	Economic	Implemented	Increase the number of plants to an optimum level from a climate perspective in order to enhance net carbon sequestration	2016	Ministry of Agriculture and Food	NA	NA	NA	NA	NA	NE	>0
Increased afforestation to enhance carbon stock and sequestration	LULUCF	CO2	Increase forest carbon stock and net CO2 sequestration	Economic	Under consideration	Planting trees on areas in early seccessional stages and/or areas without existing forests will expand forested areas and increase carbon sequestration. Pilot study to be completed in 2018.	2015	Ministry of Climate and Environment, Ministry of Agriculture and Food	NA	NA	NA	NA	NE	NE	>0
Restoration of organic soils	LULUCF	CO2, CH4, N2O	Reduce soil carbon emissions from peatlands, increase net sequestration	Economic	Implemented	Emissions from drained organic soils can be reduced by restoring trenches made for drainage of peatlands	2015	Ministry of Climate and Environment, Ministry of Agriculture and Food	NA	NA	NA	NA	NE	NE	>0
Fertilization of forests	LULUCF Agriculture	CO2, CH4, N2O	Enhanced carbon sink compared to baseline	Economic	Implemented	Fertilization can sustain or improve sequestration of carbon where scarcity of nitrogen on existing forest areas limits plant growth	2016	Ministry of Climate and Environment, Ministry of Agriculture and Food	NA	NA	NA	NA	NA	>0	270

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

4.3.11 Waste

4.3.11.1 **Introduction**

The main goal of the Norwegian waste policy is that waste is to cause the least possible harm to humans and the environment. Further, the growth in the quantity of waste generated is to be considerably lower than the rate of economic growth, and the resources found in waste are to be reutilised by means of waste recovery. Furthermore, the amount of hazardous waste is to be reduced and hazardous waste is to be dealt with in an appropriate way. The measures to reduce greenhouse gas emissions are to a large extent concurrent with measures to increase recycling and recovery. The most important measures are:

- Regulations under the Pollution Control Act, including prohibition against depositing biodegradable waste and requirements regarding extraction of landfill gas (see below);
- Extended producer responsibility for specific waste fractions.

4.3.11.2 **Requirement to collect landfill gas**

The largest emissions in the waste sector derive from landfill gas. In 2015, the methane emissions from landfills amounted to approximately 43 260 tonnes, corresponding to 2 per cent of the total greenhouse gas emissions in Norway. Landfill gas emissions have been reduced by about 34 per cent from 2000 to 2015 and by more than 47 per cent from 1990 to 2015. The reduction is mainly due to the decrease of organic waste in landfills as depositing biological waste has been prohibited.

The Landfill Directive was incorporated into national law by the Norwegian Landfill Regulations of 21 March 2002, and states that all landfills with biodegradable waste must have a system for extracting landfill gas. The gas emissions are monitored by measuring boxes placed on the landfill surface. Also, visual inspection of the landfill surface for obvious leaks should be conducted regularly.

Extraction of landfill gas increased from about 950 tonnes in 1990 to about 20 000 tonnes in 2010. In 2015, extracted methane from landfills amounted to almost 9500 tonnes. The reduction is primarily due to the prohibition of depositing organic waste. In Norway, in 2015, 8 per cent of the landfill gas production was utilized to generate electricity. 60 per cent is flared, and 32 per cent is used in heat production.

Estimated effect on national emissions

To estimate effect of the requirement to collect landfill gas it has been assumed that all collection of landfill gas occurred due to requirements. Even if the regulation was implemented in 2002, some landfills had been required to collect gas before. Therefore effect has been estimated from 1995. To estimate the effect for the years 2020, 2030, it has been assumed that the composition and the quantity of waste to be deposited to landfill will be constant during the same period. It has also been assumed that the share of collected methane among potential emissions will be constant during the same period.

The mitigation impact has been estimated to reductions of 0.22 million tonnes in 1995, 0.58 million tonnes in 2005, 0.48 million tonnes in 2010, 0.23 in 2015, almost 0.2 million tonnes in 2020 and 0.11 million tonnes in 2030. The downward trend is due to the prohibition regulation which has reduced amounts of organic waste deposited and thus potential emissions.

4.3.11.3 **Prohibition of depositing waste**

As a result of these regulations the annual amount of deposited biodegradable waste was reduced by 99.5 per cent from 1990 to 2015, although the amount of waste generated increased by 68 per cent. From 2002 landfilling of wet-organic waste was prohibited. This prohibition was replaced by the wider prohibition of depositing from 2009 that applies to all biodegradable waste. CH_4 production from landfills continues for several decades after the waste is deposited. Therefore emissions will continue for many years, but the prohibition of depositing waste has reduced CH_4 emissions over time, and will continue to, as the amount of biodegradable waste is reduced.

Estimated effect on national emissions
To estimate effect of the prohibition of deposition wet organic waste, it has been assumed a constant share of deposited amounts among wet organic waste from 2002 to 2030. A constant share of deposited amounts of waste among other biodegradable waste has been assumed from 2009 to 2030 so as to estimate the effect of the prohibition of all biodegradable waste.

So as to calculate total produced amounts of organic and other biodegradable waste, the population growth has been used.

Between 2002 and 2009, collected landfill gas amounted to around 25 per cent of national potential methane emissions from landfills. This value has been kept constant during the period 2002-2030 so as to estimate the mitigation impact of the regulation. This impact has been estimated to reductions of 0.05 million tonnes in 2005 and 2010, almost 0.2 in 2015, almost 0.4 million tonnes in 2020 and 0.68 million tonnes in 2030.

4.3.11.4 **Other measures in the waste sector**

Agreement with industry to minimise waste
The systems of extended producer responsibility are partly based on voluntary agreements between the Government and relevant industries, partly on requirements regarding waste regulation and to some degree on tax incentives. Agreements are made primarily to ensure that waste is collected and sent to approved treatment, and partly to fulfil national or EEA-wide targets for recycling. Agreements have been made for packaging, electronic waste, food waste, tires and PCB-infected insulation of windows.

Measures to increase waste recycling
The waste regulations regulates a number of waste fractions, and for some fractions set specific targets for recycling, for instance for end-of-life vehicles. In general targets set in waste directives are relevant for Norway owing to the EEA agreement, and such targets are normally set in the waste regulations.

There is also a tax on beverage packaging. The tax is reduced by the accepted recycling rate; each percentage of recycling reducing the tax one per cent. The recycling rate is set by the Environment Agency, and regulated by the waste regulation.

The pollution control act encourage municipalities to determine differentiated waste fees, as this could contribute to waste reduction and increased recycling. Many municipalities in Norway collect source separated household waste like paper and cardboard waste or biological waste free of charge or to highly reduced fees. This gives incentives to the inhabitants of a municipality to separately collect certain fractions of household waste that can be recycled.

Tax on final disposal of waste

Norway introduced a tax on the final disposal of waste (including both landfills and incineration) on 1 January 1999. The tax for incineration was lifted on 1 October 2010 and for landfills in 2015. The purpose of the tax was to place a charge on the environmental costs of emissions from landfills, and thereby provide an incentive to reduce emissions, increase recycling and reduce the quantities of waste. On 1 July 2009 a prohibition of landfilling of biodegradable waste was introduced. The prohibition entails that future waste to landfills will have low climate gas potential.

Estimated effect on national emissions

It is difficult to quantify the mitigation effects on greenhouse base emissions of these other measures in the waste sector. Their objectives are primarily to increase waste recycling, and this is not necessarily reflected in the GHG inventory that would be used to calculate GHG effects.

Table 4.17 *Summary policies and measures, Waste*

Name of mitigation action[a]		Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief description[e]	Start year of implementation1)	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2 eq)						
										1995	2000	2005	2010	2015	2020	2030
Requirement to collect landfill gas	*	waste	CH4	Collection of methane from landfills	Regulatory	Implemented	Landfill Directive incorporated into national law requires all landfills with biodegradable waste to have a system for extracting landfill gas	2002	Ministry of Climate and Environment	216	470	578	485	233	176	109
Prohibition of depositing biodegradable waste	*	Waste	CH4	Prohibition of wet organic waste and biodegradable waste	Regulatory	Implemented	Landfilling of wet-organic waste was prohibited in 2002 and was replaced by the wider prohibition of depositing from 2009 that applies to all biodegradable waste.	2002: wet organic waste 2009: biodegradable waste	Ministry of Climate and Environment	NA	NA	51	53	185	395	677
Agreement with industry to minimise waste		Waste, Energy	CO2, CH4, N2O	Increase waste recycling	voluntary agreement	Implemented	Agreements primarily to ensure that waste is collected and sent to approved treatment.	1995	Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Measures to increase waste recycling		Waste, Energy	CO2, CH4, N2O	Increase waste recycling	Regulatory	Implemented	Waste regulations for a number of waste fractions and a tax on beverage packaging.	2009	Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Tax on final disposal of waste		Waste, Energy	CO2, CH4, N2O	Reduce emissions, increase recycling and reduce the quantities of waste	Fiscal	Implemented	Tax on incineration up to 2010 and for landfills up to 2015.	1999	Ministry of Finance	NE	NE	NE	NE	NE	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom Footnotes

1) Actions may build on or replace previously established activities to incentivise recycling, reduced disposal and emissions from waste

4.4 Policies and measures no longer in place

Arrangement to reduce emissions in the processing industry, 2004 and 2009. See description in chapter 4.3.8.

Agreement with the aluminium industry. See description in chapter 4.3.8.

Agreement on SF6 reductions from use and production of GIS. See description in chapter 4.3.8

SF_6 reduction, production of magnesium. See description in chapter 4.3.8

Tax on final disposal of waste. See description in chapter 4.3.11

5 Trends in emissions, projections, the effect of policies and measures and the Kyoto Protocol mechanisms

5.1 Introduction

This chapter presents national projections of greenhouse gas emissions in Norway for the years 2020 and 2030.[20] In compliance with the UNFCCC reporting guidelines, these projections are based on policies and measures implemented as of the first quarter of 2017. The baseline is thus a "with measures scenario". Accordingly, the projections contain neither the effects of policies adopted after spring 2017, nor do they reflect planned measures, policies or political goals and ambitions.[21] The baseline scenario, including comparisons with the previous communication, is given in chapter 5.2.1. Uncertainty is discussed in 5.2.2. Projections of other gases having an indirect effect on greenhouse gases are presented in 5.2.3. The estimated impact of adopted policies and measures are provided in Section 5.3. Section 5.4 describes the use of Kyoto mechanisms. In section 5.5, supplementarity relating to the mechanisms under the Kyoto Protocol is discussed. Methodology is discussed in Annex III. Key macroeconomic assumptions are described in box 15 and box 16. These explain the changes in projections compared to those presented in the BR2. Since the NC6 was issued, the Norwegian inventory has been prepared in accordance with the revised UNFCCC Reporting Guidelines on Annual Inventories (decision 24/CP.19), including the changes in the GWPs. The update makes it difficult to compare the projections with those presented in NC6 and therefore comparison are with projections reported in BR2. Also, a new macroeconomic model to project emissions, SNOW, have been applied, see Annex III.

5.2 Projections

5.2.1 The baseline scenario

The starting point for the projections are emissions in 2015. Norway's greenhouse gas emissions this year were 53.9 million tonnes of CO_2 equivalents excluding net carbon

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[20] White paper on Long-term Perspectives on the Norwegian Economy 2017 (Meld. St. 29 (2016–2017)). https://www.regjeringen.no/en/dokumenter/meld.-st.-29-20162017/id2546674/

[21] There are several political goals and ambitions in Norwegian climate policy, for instance that all new cars in 2025 are zero emission.

sequestration in forest and other land areas (LULUCF), see Table 5.1.[22] Of the total, 26.6 million tonnes were emissions covered by the European ETS and 27.3 million tonnes non ETS sectors. Net carbon sequestration in the LULUCF sectors have been around 25 million tonnes of CO_2 annually in recent years, corresponding to about half of Norway's total greenhouse gas emissions in other sectors; see Table 5.1 and Figure 5.1. Most of the carbon sequestration occurs on forested land.

Per person, emissions were 10.3 tonnes in 2015, a decrease from 12.2 tonnes in 1990, see Figure 5.1A. According to the projections, emissions are estimated to be reduced to 51.8 million tonnes CO_2 equivalents in 2020 and further reduced to 48.3 million tonnes by 2030. The level in 2030, corresponds to 8.2 tonnes per person.

Emissions from oil and gas production, which is the sector having the highest emissions in Norway, were about 15 million tonnes of CO_2 equivalents in 2015. 1.1 million tonnes of these were non ETS emissions. Most of the emissions relate to energy use at the installations. Emissions from this sector have increased by in excess of 80 per cent since 1990, predominantly as the result of expanded activity. Production of oil and gas has increased by 82 per cent over the period 1990–2015 when measured in standard cubic metres.

Greenhouse gas emissions from the mainland economy[23] have been reduced by in excess of 4.5 million tonnes of CO_2 equivalents since 1990. Emissions from the mainland economy, mainly from transport, process emissions from manufacturing and agriculture were 38.8 million tonnes of CO_2 equivalents in 2015. Emissions from electricity generation and heating of residential- and commercial buildings in the mainland economy are low since electricity is mainly based on hydro power and use of heating oil is reduced.

In 2015, manufacturing and mining emissions were 11.9 million tonnes of CO_2 equivalents. This is a decline of close to 40 per cent since 1990. The reduction is largely caused by lower process related emissions of other greenhouse gases than CO_2. Manufacturing emissions are to a large extent attributable to the production of metals and chemical raw materials for export. 1.1 million tonnes of overall manufacturing emissions were non-EU ETS emissions.

Road traffic emissions grew by close to 30 per cent from 1990 to 2007; see Figure 5.1B. Emissions have remained fairly stable at around 10 million tonnes annually since 2007, despite continued strong population growth. Emissions from new passenger cars in Norway have declined by almost 50 per cent from 2006 to 2016 and has balanced the impulse from the overall growth in distance travelled (goods and passengers); see Figure 5.1C. This reduction reflects, inter alia, that car taxation has been restructured to give more weight to the environmental characteristics of cars, whilst rapid technological development has enabled a changeover to lower emission vehicles.

Emissions from agriculture has decreased by 5 per cent since 1990, and were in 2015 4.5 million tonnes CO_2 equvivalents. Net sequestration in forest and other land areas has more

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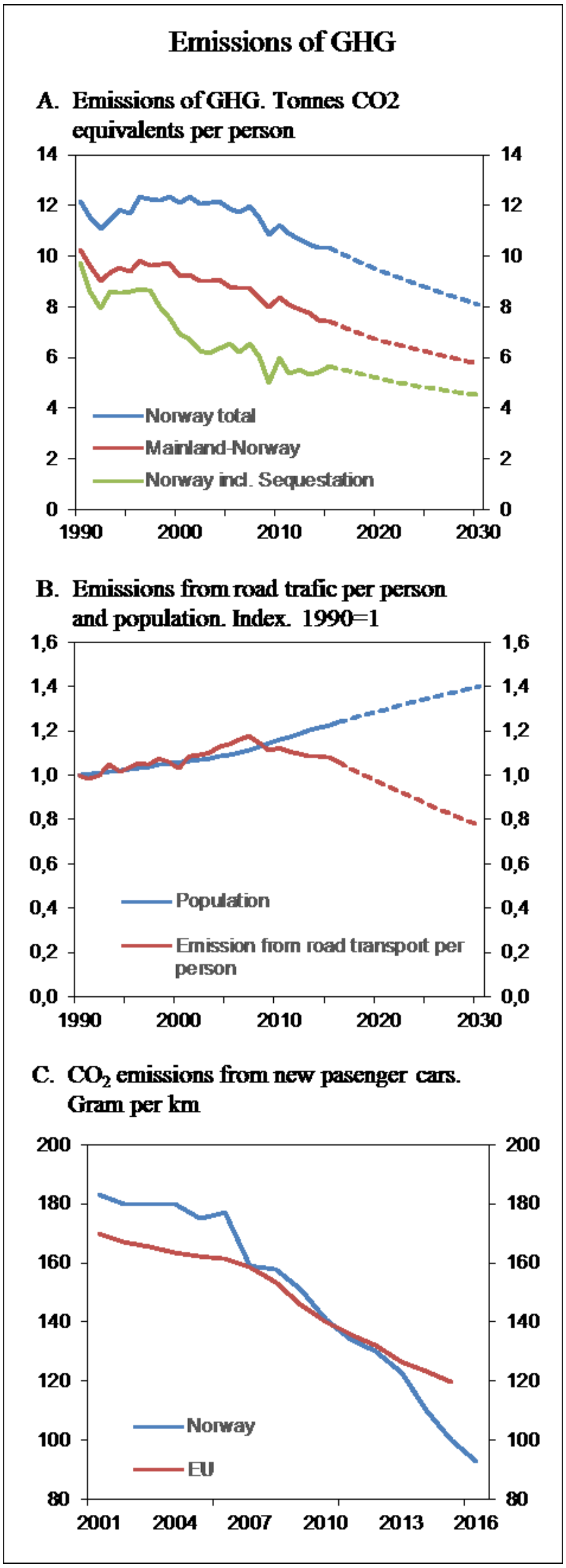
[22] After the projections were presented, numbers for 2016 have been presented. These show emissions in 2016 to be 53.3 million tonnes of CO_2 equivalents, 1 per cent lower than the year before.

[23] Total economy excluding petroleum activities.

than doubled from 1990 to 2015. High rates of planting after the World War II has contributed significantly to the current high sequestration.

Figure 5.1A, B and C *Emission characteristics*



Sources: Statistics Norway, Norwegian Environment Agency, European Environment Agency, Information Council for Road Traffic and Ministry of Finance.

BOX 15: Assumptions behind the calculation of emissions to air

The projections are based on the emissions account and the national accounts of Statistics Norway, which constitute the descriptive foundation of Statistics Norway's economic model SNOW, see 5.2.5 for a description of the model. The use of the model is in some respects supplemented by more detailed analyses.

In brief, the assumptions behind the projections may be summarised as follows:

- The current orientation of climate policy is maintained, including the scope and rates of the CO_2 tax.
- The price of future delivery of emission allowances under the EU ETS is assumed to increase to NOK 60 per tonne of CO_2 in 2020, in line with prices quoted in the futures market for such emission allowances. After 2020, it is assumed that the price of emission allowances in the EU ETS will increase by 4 per cent per year in real terms.
- The long-term price of crude oil is set to NOK 510 per barrel and for natural gas to NOK 1.9 per Sm3.
- The projections of emissions from oil and gas production have been prepared by the Norwegian Petroleum Directorate and are based on reporting from oil companies. The petroleum industry covers facilities on the Norwegian continental shelf and onshore facilities that are covered under the Petroleum Taxation Act. Operations at the onshore installations relating to onward transport of petroleum products are included, thus bringing the projections into line with the emissions account[1]. Changes in production composition have been taken into consideration, along with the increase in the expected lifespan of several fields. The majority of CO_2 emissions relate to energy production at the installations. Emissions from the construction and installation phase, maritime support services and helicopter transport are included under other industries.
- Statistics Norway's road traffic emissions model is used to calculate national road traffic emissions to air. It is assumed that the share of electric cars will increase to 50 per cent of new car sales in 2030. Sales of plug-in hybrid cars are estimated at about 20 per cent of new car sales. These assumptions imply that the share of new diesel and petrol cars (including non-plug-in hybrid cars) will decrease from about 70 per cent in 2016 to 30 per cent of new car sales in 2030. Traffic activity is assumed to reflect population developments. Emissions from new cars per kilometre driven on the basis of fossil energy carriers are assumed to decline by about 1 per cent per year. Biofuel blending is maintained at the level of 6.25 per cent in real terms.
- It is assumed that electricity consumption in energy intensive industries will remain more or less unchanged.
- The Norwegian Environment Agency prepares projections for agricultural emissions, on the basis of activity data from NIBIO. These assume the continuation of current agricultural subsidies and customs protections, but the discontinuation of export subsidies for cheese from 2020. Some efficiency improvement is assumed, thus reducing emissions per produced unit.
- The projections of emissions and removals in the sector for land use, land use change and forestry have not been updated since the projections in the National Budget for 2015. It was then estimated that the removals would decline from a level of about 25 million tonnes of CO_2 per year to just over 20 million tonnes of CO_2 in 2030. This development assumes, inter alia, a continuation of the historic trend in land use changes, and that the harvest increases from about 10 million m^3 in the first decade of the century to 11.7 million m^3 in 2015 and further to just over 12.6 million m^3 in 2030 reflecting also increased share of mature forest.

[1] Under this definition, the petroleum sector encompasses all petroleum installations offshore, the onshore installations at Kollsnes, Sture, Nyhamna (the Ormen Lange field), the Hammerfest LNG plant (the Snøhvit field), Mongstad (indirect emissions from crude oil terminal) and Kårstø (gas processing terminal).

Key features of the projection
The projections of emissions to air have been updated on the basis of the macroeconomic forecasts in the White paper on Long-term Perspectives on the Norwegian Economy. Emissions depend on the actions of a few hundred thousand businesses and about 5 million people. The projections seek to capture underlying developments and tendencies behind the sum total of such actions, based on, inter alia, economic, technological and population factors.

The projections is a "with measures scenario" and thus represent a continuation of the current climate policy orientation. This implies that the scope and rates of the CO_2 tax and other taxes are maintained at 2017-level and that the observed EU ETS prices for future delivery are applied, see Box 15. The support for new technologies, for example via Enova, is continued at current levels. Climate policy has been strengthened in recent years; see Box 16. The projections do not reflect goals nor the effects of future new policies and measures. Agreed targets without corresponding implemented policies or measures in the form of ia. regulations, directives, taxes or agreement are not included in the baseline scenario. One exception is the ban on use of fossil fuels for heating in households and office buildings in 2020, for which a regulation proposal has been issued for public comments.

Estimates as to how current policy will influence future emissions are subject to uncertainty, and such uncertainty is greater the longer into the future the projections extend. The uncertainty is not only related to the economic outlook and future population developments, but also to developments in, and access to, low- and zero-emission technology and the costs

BOX 16: Recent changes to policy measures

Projections of GHG emissions were previously presented in the National Budget for 2015 (also presented in BR2), and were based on the level of policy measures in the summer of 2014. Climate policy has been tightened considerably since then. Some key changes are outlined below.

The motor vehicle registration tax has been restructured in a more environmentally friendly direction in several budgets, especially following the consensus in the Revised National Budget for 2015. The restructuring results in higher tax for cars with high emissions relative to their engine power and weight, and reduced tax for cars with low emissions. The changes to motor vehicle registration tax provide a strong incentive to opt for low-emission cars, and have contributed to a steep reduction in average emissions from new cars; see Figure 5.1C.

The biofuel blending requirement has increased from about 4 per cent in 2014 to 6.25 per cent in real terms in 2017 (7 per cent when taking into account that advanced biofuel is accorded twice the weight). The isolated effect of this increase is about 200,000 tonnes of CO_2.

The focus on public transport, for example by way of expanded railway appropriations, incentive schemes and urban environmental agreements, as well as the focus on cycling and walking, increase incentives for using alternative means of transport. It is difficult to estimate the emissions effect of these measures, but they form part of the basis for assessing traffic policy developments.

of implementing such technology. Rapid development in new solutions will influence the effect of current policies and measures on future emissions.

BOX 16 continues: Recent changes to policy measures

The CO_2 tax has been gradually expanded, and also equalised across products, and is NOK 450 per tonne of CO_2 for many sources (mineral oil, natural gas, LPG, petrol and diesel) in 2017. The tax on HFC and PFC has also been increased to NOK 450 per tonne of CO_2 equivalents.

The CO_2 tax on mineral oil for domestic aviation has been increased and equalised, with both EU ETS and non-EU ETS aviation now paying a tax of NOK 430 per tonne of CO_2.

From 2017, a separate rate has been introduced for parts of emissions of natural gas to air in petroleum activities, thus implying that the pricing of the climate effect is the same as for the burning of natural gas on the continental shelf. In real terms, this is an increase from NOK 58 to NOK 444 per tonne of CO_2 equivalents.

The grant scheme for municipal climate measures was introduced in 2016, and about NOK 150 million have been appropriated for municipal and county climate measures in 2017.

Enova has received considerable funds and has been given a new mandate with more weight attached to reduction of non-EU ETS emissions. Supported initiatives include, inter alia, green shipping and charging/fuelling stations for zero-emission cars. In 2017, Enova will receive NOK 2.6 billion, more than NOK 0.6 billion of which are revenues from the grid tariff surcharge.

Also other schemes that contribute to the development of new technology have also been strengthened:

- The appropriation for the environmental technology scheme under Innovation Norway is more than NOK 500 million for 2017.
- The Research Council of Norway and Innovation Norway follow up on environmentally relevant research within most of their programmes.
- The Centres for Environment-friendly Energy Research (FME) have been strengthened.
- Technology Centre Mongstad (TCM) plays a key role in the Government's commitment to develop CO_2 capture and storage. Appropriations for the CLIMIT programme have been increased. It is the ambition of the Government to realise a full-scale CO_2 capture and storage demonstration facility by 2022, and it has encouraged feasibility studies for three different carbon capture projects in Norway.
- A new investment company charged with promoting reduced greenhouse gas emissions is under inception. The investment company will primarily invest in new technology in the transition from technological development to commercialisation, and shall prioritise low- and zero-emission solutions.

Greenhouse gas emissions are estimated to decline by about 0.75 per cent per year towards 2020 and 2030; see Table 5.1 and Table 5.2. The emissions path reflects, inter alia, the phase-out of oil-fired heating towards 2020, the closure of the gas fired power plant at Mongstad and a slight reduction in emissions from petroleum activities after 2020. The effect of an estimated reduction in transport emissions as the result of more zero-emission vehicles being entered into use only becomes truly significant after 2020. In 2030, emissions are estimated to be more than 5.5 million tonnes of CO_2 equivalents lower than in 2015. The predominant part of the reduction is expected to come in the non-EU ETS emissions sector, where emissions are estimated to be reduced by 4.25 million tonnes from 2015 to 2030.

Tabe 5.1 *Greenhouse gas emissions in Norway by sector. Million tonnes of CO_2 equivalents*

	1990	2015	2020	2030	1990-2015	1990-2020	1990-2013
Total Energy	30.2	39.6	38.1	35.1	31 %	26 %	16 %
- Public Electricity and Heat production	0.4	1.7	1.1	1.1	311 %	175 %	173 %
- Petroleum Refining	0.9	0.9	1.1	1.1	-3 %	22 %	17 %
- Oil and gas production	5.9	12.9	12.8	11.8	117 %	116 %	100 %
- Manufacturing Industry and Construction	4.0	3.8	3.8	3.6	-6 %	-6 %	-10 %
- Transport	10.3	13.2	12.7	11.4	29 %	23 %	11 %
- Other sectors (1A4 and 1A5)	5.1	3.5	2.9	2.8	-31 %	-43 %	-46 %
- Fugitives	3.5	3.5	3.6	3.3	1 %	3 %	-6 %
Industrial Processes	14.5	8.5	8.3	8.0	-42 %	-43 %	-45 %
Agriculture	4.8	4.5	4.4	4.4	-6 %	-10 %	-8 %
Waste	2.2	1.3	1.0	0.7	-42 %	-54 %	-67 %
Total emission (excl. LULUCF)	51.7	53.9	51.8	48.3	4 %	0 %	-7 %
Mainland economy (excl. LULUCF)	43.5	38.8	36.7	34.4	-11 %	-16 %	-21 %

LULUCF	-10.4	-24.3	-23.5	-21.3	133 %	125 %	104 %
Total emissions (incl. LULUCF)	41.3	29.6	28.3	27.0	-28 %	-31 %	-35 %
Mainland economy (incl. LULUCF)	33.0	14.5	13.2	13.1	-56 %	-60 %	-60 %

Sources: Statistics Norway, Norwegian Environment Agency, NIBIO and Ministry of Finance.

Table 5.2 *Greenhouse gas emissions in Norway by EU-ETS and non-ETS. Million tonnes of CO_2 equivalents*

	1990	2005	2015	2020	2030
GHG emissions in Norway	51.7	55.1	53.9	51.8	48.3
EU ETS emission		27.5	26.6	26.3	25.2
- Oil and gas extraction		12.9	14.0	13.9	12.8
- Manufacturing industries and mining		13.6	10.8	11.1	11.0
- Other sources[1]		1.0	1.8	1.9	2.0
Non-EU ETS emission		27.6	27.3	25.5	23.1
- Transport[2]		14.9	15.6	14.9	13.5
Of this: Road traffic		9.7	10.3	9.7	8.4
- Agriculture		4.6	4.5	4.3	4.4
- Other sources[3]		8.1	7.2	6.2	5.2

1. Includes energy supply and aviation.

2. Includes road traffic, shipping, fishing, non-EU ETS aviation, construction machinery and other mobile sources.

3. Includes non-EU ETS industry, oil and gas production, energy supply, heating and other sources.
Sources: Statistics Norway, Norwegian Environment Agency, NIBIO and Ministry of Finance.

The projections of LULUCF are not updated since 2014. According to the 2014 projections, net sequestration is expected to decline gradually as the result of the age structure of Norwegian forest. Net sequestration of greenhouse gases in LULUCF is nonetheless expected to correspond to more than 40 per cent of emissions from other sectors in 2030.

Emissions of other greenhouse gases than CO_2 are estimated to decline from more than 9 million tonnes of CO_2 equivalents in 2015 to 8 million tonnes of CO_2 equivalents in 2030; see Table 5.3 Removal of export subsidies for cheese may reduce agricultural methane (CH_4) emissions in the medium term. In the longer run, population growth is expected to increase agricultural emissions somewhat. Further reduction of methane emissions is related to, inter alia, declining landfill emissions. Nitrous oxide emissions (N_2O) are estimated to remain fairly constant in coming years, whilst HFC gas emissions are estimated to decline after 2020 as the result of the introduction of the EU F-gas Regulation in Norway.[24]

[24] Regulation (EU) No 517/2014.

Table 5.3 *Greenhouse gas emissions in Norway. Million tonnes of CO_2 equivalents*

	Million tonnes				Per cent change		
	1990	2015	2020	2030	1990-2015	1990-2020	1990-2013
Total emission (excl. LULUCF)	51.7	53.9	51.8	48.3	4 %	0 %	-7 %
CO_2	35.7	44.7	43.1	40.4	25 %	21 %	13 %
Other greenhouse gases	16.0	9.2	8.6	7.9	-42 %	-46 %	-51 %
CH4	5.8	5.2	4.9	4.5	-10 %	-15 %	-22 %
N2O	4.2	2.6	2.5	2.5	-38 %	-40 %	-41 %
HFC	0.0	1.2	1.0	0.6			
PFC	3.9	0.1	0.2	0.2	-96 %	-96 %	-96 %
SF6	2.1	0.1	0.1	0.1	-97 %	-97 %	-97 %

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

The observed reduction in emissions intensity in the mainland economy is expected to continue and emissions per unit of GDP estimated to decline by just over one third towards 2030. The pricing of greenhouse gas emissions contributes to this reduction.

Details of the projections

Projections of emissions to air have been updated since NC6 and BR2. Because the emissions inventory was revised between NC6 and BR2 we compare the projection with those presented in BR2 in order to isolate the effect of new information and new assumptions.

Projected emissions in this report are 3 million tonnes of CO_2 equivalents lower in 2020 and in excess of 4 million tonnes lower in 2030 compared to the previous projection (BR2). Both CO_2 emissions and f-gas emissions, primarily HFC, contribute to this reduction. A small increase in estimated agricultural nitrous oxide emissions have an opposite effect.

The projections for some of the key sectors are discussed in more detail below.

Emissions from oil and gas production are estimated to remain at around 15 million tonnes of CO_2 equivalents in 2020, and thereafter to decline to just under 14 million tonnes in 2030. Production of oil and gas is expected to decrease. The fall in production is assumed to be stronger than the decrease in greenhouse gas emissions from that sector until 2030. This has to do with a decline in production on several fields, whilst energy needs, and thus emissions, generally do not change much on individual fields although production is in decline. Furthermore, the projections are based on that just over 30 per cent of Norwegian oil and gas production over the period 2015–2030 will take place on fields with an onshore power supply. This implies that today's level is prolonged. The estimate for emissions from oil and gas production in 2020 are somewhat reduced from those in the previous projection. The emissions estimate for 2030 has not been changed.

The projections assumes that power-intensive industries in both 2020 and 2030 consume electrical power at about the same level as in 2016. Due to productivity growth, emissions are estimated to stay at about current levels even though production is expected to increase somewhat over time. Thus, emissions per produced unit will continue to decline. The strong support to develop friendly climate technology may deliver reduced greenhouse gas emissions and energy efficiency improvements for manufacturing industry in coming years. It is, however, very challenging to estimate the effects on greenhouse gas emissions of such budget scheems, and these have therefore not been quantified. It is, for example, uncertain when, how strongly and in what sector expanded research and technological development efforts will deliver results in the form of reduced emissions. Innovations in other countries may also serve to reduce Norwegian emissions. Manufacturing emissions are estimated to remain fairly stable in the years ahead, and at about the same level as in the previous emissions projection.

All in all, EU ETS emissions are estimated to decrease by 1.5 million tonnes towards 2030.

The estimate for non-EU ETS emissions has been reduced by 3 million tonnes of CO_2 equivalents in 2030, compared to the previous projection primarily due to updated assumptions on transport emissions. Road transport emissions are now estimated to decline from 10.3 million tonnes in 2015 to 9.7 million tonnes in 2020, and down to 8.4 million tonnes in 2030, compared a stable development in emissions at today's level in the previous projection. The primary cause of the reduction is that the observed take up of electric vehicles (EV) and other low emssions cars in recent that is assumed to continue in the coming years. The number of kilometres driven per person have been stable over the last 5–10 years. It is assumed, as in the previous projection, that this trend will continue. The share of biofuel in petrol and diesel has been increased from the previous projection. In the projections, the 2017-level of the sales obligation is continued both in 2020 and 2030. The sales obligation is planned to increase to 20 per cent in 2020. This increase will, when taken in isolation, reduce emissions by about 1 million tonnes in 2020. The effect is somewhat less in 2030 due to more zero- and low-emission vehicles.

Technological development for zero- and low-emission cars has been more rapid than assumed in the previous projection. In addition, the special incentives for electric cars have been extended and the motor vehicle registration tax has been further restructured. This use of strong economic policy measures to facilitate environmentally friendly choices in the purchase of new cars has served to steeply reduce emissions per kilometre driven for passenger cars. It is in the projections assumed that the share of zero-emission cars will increase from the current level of about 15 per cent of new car sales to 50 per cent in 2030. With a continuation of the current tax incentives, a higher share of electric cars will reduce government revenues. An increase in the share of electric cars to 50 per cent may result in an annual NOK 5 billion loss of revenues due to a shortfall in motor vehicle registration tax alone, estimated on the basis of an average tax of NOK 95,000 per new passenger car. In addition, there are, inter alia, the loss of revenues from value added tax and other excise duties, as well as road usage tax on fuel.

Future developments are uncertain. These depend, in particular, on how rapidly new cars with adequate range are developed and on whether the costs associated with these cars develop such as to make them more common amongst households with only one car. Since cars have a long lifespan, it will take time for permanent changes in zero-emission car registration figures to be fully reflected in transport emissions. If the registration share develops such as to change the level in 2030 by for example 20 percentage points, to 30 per cent or 70 per cent, respectively, transport emissions that year will change by close to 0.5 million tonnes. However, new car sales may end up outside that range. Bloomberg has, for example, noted that battery technology may become competitive with fossil technology before 2025. The above figures relate to passenger cars only. In other segments of road transportation zero emission alternatives are scarce.

Domestic shipping and fisheries emissions have declined significantly in recent years; see chapter 5.2.3. The projections assume that this decline is permanent and that further technological development and the enhancement of policy measures over the last few years will cause emissions to keep declining on after 2020.

Emissions from the consumption of fossil oils in the heating of households and businesses have declined by almost 60 per cent since 1990. If this development continues, emissions will be around ¾ million tonnes of CO_2 equivalents in 2030. The ban on the use of heating oil from 2020 means that residential building already in 2020 will have phased out emissions from such use, although there will still be emissions from the use of gas. The ban will also accelerate the decline in the use of oil for heating in service industries. However, for power security reasons the projection assume emissions at just below 0.5 million tonnes of CO_2 equivalents in 2030. All in all, emissions from heating of buildings have been revised downwards by 0.75 million tonnes in both 2020 and 2030, compared to previous projections.

Energy supply emissions, 1.7 million tonnes in 2015, stem from the burning of fossil carbon in waste and the use of fossil energy carriers in district heating and other energy supply, such as gas power or the coal-fired heating power plant in Svalbard. Energy supply emissions are in the projections estimated to be reduced by about 0.5 million tonnes of CO_2 from the current level in 2020 and 2030. The reduction is caused by the announced closure of the power plant at Mongstad. Emissions have thereby also been reduced correspondingly from the previous projection.

As before, landfill emissions are estimated to continue to decline as the result of the prohibition against the depositing of wet organic waste.

5.2.2 Uncertainty

The projections illustrates how Norwegian greenhouse gas emission can evolve when todays climate policy is being continued. The picture is uncertain, among others because the development of new climate friendly technology will influence on what a continuation of current policy means for future emissions. Such uncertainty is greater the longer into the future the projections extend. Moreover, the uncertainty is not only related to developments in, and access to, low- and zero-emission technology and the costs of implementing such technology but also to the economic outlook and future population developments.

Between 1990 and 2017, the population growth in Norway has been about 25 per cent. A considerable part of this increase comes from immigration, mainly from EU-countries. Calculations done by Statistics Norway show that CO_2-emissions could have been around 6 per cent lower in 2030 if the population growth had been more in line with the EU-average of about 2 per cent since 2005.[25] In the same analysis, Statistics Norway estimates that a supply shock that causes oil and gas prices to fall by 24 per cent could cause Norwegian CO_2-emissions to increase by 8 per cent in 2030. Lower prices on fossil fuels causes emissions in the mainland economy to increase more than the fall in emissions from lower production of oil and gas. An international set back that causes Norwegian export prices, including on oil and gas, to decline by 25 per cent is estimated to reduce CO_2-emissions by 14 per cent in 2030.

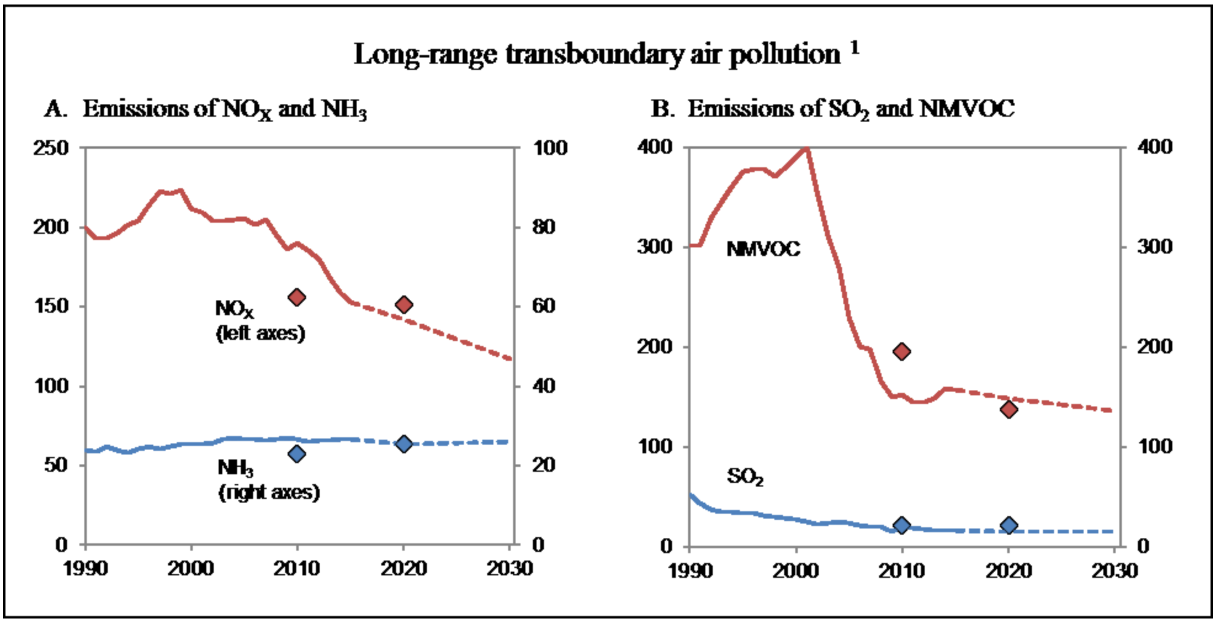
5.2.3 Other emissions

Emissions of long-range air pollutants, nitrogen oxides (NO_X), sulphur dioxide (SO_2), ammonia (NH_3), fine particulate matter ($PM_{2,5}$) and non-methane volatile organic compounds (NMVOC) are regulated under the Gothenburg Protocol. These pollutants are spread across borders via the atmosphere and give rise to, inter alia, acidification, particle concentrations that are detrimental to health, as well as the formation of tropospheric ozone.

In 2015, Norway met its commitment under the Gothenburg Protocol with regard to the gases NO_X, SO_2 and NMVOC, see Figure 5.2. In 2012, new emission commitments were negotiated under the said Protocol. These commitments will apply from 2020 and have been determined by reference to the emission level in 2005. In December 2016, new guidelines for the calculation of emissions from the Convention on Long-range Transboundary Air Pollution were implemented in the emissions account in Norway. The basis for the calculations has been expanded and includes, inter alia, new sources of agricultural emissions, which mean that nitrogen oxide (NO_X), NMVOC and ammonia (NH_3) emissions have been revised upwards.

[25] Greaker, M. og O. Rosnes (2015): Robuste norske klimamålsetninger. Samfunnsøkonomen nr. 1-2015, pp. 67–77

Figure 5.2 *Emissions of long-range transboundary air pollutants falling within the scope of the Gothenburg Protocol. 1,000 tonnes.*



[1] *The squares show the emission commitments under the Gothenburg Protocol.*

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

Since 1990, nitrogen oxide (NO_X) emissions have declined by 23 per cent, as a result of the exhaust gas requirements having been tightened in several rounds. Domestic shipping emissions have declined considerably since 2007 as the result of, inter alia, measures funded with support from the Business Sector's NOx Fund and the gradual phase-out of older engines with high emissions. From 2012, fisheries emissions have also declined. The reduction in domestic shipping and fisheries emissions is probably related to a changeover to less emission-intensive fuel and the adoption of new technology. It may also be the result of fuel being bunkered abroad. Emissions fluctuate somewhat from year to year. Exhaust gas requirements have served to reduce emissions from diesel-driven motorised equipment. Emissions from petroleum activities have increased by more than 80 per cent since 1990 and accounted for just over 30 per cent of overall NO_X emissions in 2015.

NO_X emissions are projected to decline to 117,000 tonnes in 2030. The estimated decline has to do with lower road traffic emissions as the result of stricter exhaust gas requirements, especially for heavy goods vehicles, and a steep increase in the number of zero- and low-emission vehicles. The use of biofuels may result in higher NO_X emissions. In addition, emissions from oil and gas activities are expected to decline somewhat after 2020. The projections do not take account of a potential new NO_X agreement from 2018. The anticipated effect of the current agreement is incorporated.

***Table 5.4** Emissions of long-range transboundary air pollutants. 1,000 tonnes*

	1990	2000	2005	2015	2020	2030
NO_X	199.9	211.6	205.5	153.2	142.1	117.5
SO_2	52.3	27.2	24.1	16.4	15.7	15.4
NMVOC	301.7	390.9	229.8	157.0	148.7	136.6
NH_3	23.7	25.3	26.7	26.7	25.5	26.1

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

Norway has under the Gothenburg Protocol committed to reducing NO_X emissions by 23 per cent by 2020, relative to the emission level in 2005. In the current account this means an emissions cap for 2020 in excess of 156,000 tonnes. Consequently, NO_X emissions are estimated to be well below the commitment in 2020.

In 2015, non-methane volatile organic compounds (NMVOC) emissions were a full 60 per cent lower than in 2001, which was the year emissions peaked. The reduced NMVOC emissions are primarily the result of lower emissions from the loading and storage of crude oil off shore. In the projections, NMVOC emissions decline to 136,600 tonnes in 2030. Compared to the previous projections, emissions have been adjusted upwards by 22,000 tonnes in 2020. The upwards adjustment is linked to the revision of historical data, as well as to petroleum sector emissions having turned out to be higher than previously assumed. The commitment under the Gothenburg Protocol calls for emissions in 2020 to be less than 138,000 tonnes. Consequently, estimated emissions are higher than the commitment in 2020, but further reductions bring emissions below the commitment before 2030.

Sulphur dioxide (SO_2) emissions have declined by almost 70 per cent since 1990. Since 2007, emissions have been lower than the commitment in the first Gothenburg period, which was for a maximum of 22,000 tonnes. In 2015, emissions were 16,400 tonnes. The projections estimate a continued modest decline in SO_2 emissions. Emissions are well below the Gothenburg commitment for 2020 of 21,700 tonnes.

The emissions account for ammonia (NH_3) has previously indicated that Norway was meeting its commitment in the first Gothenburg period of 23,000 tonnes. In 2013, emission figures back to 1990 were revised upwards by 10–20 per cent as the result of a new calculation method for emissions from livestock manure. In 2015, emissions were 26,700 tonnes. Emissions are estimated to remain stable at around 26,000 tonnes towards 2030, whilst the Gothenburg commitment for 2020, which is based on emissions in 2005, is 26,400 tonnes. Norway is thereby well poised to meet the commitment for 2020. There is considerable uncertainty as to how the discontinuation of export subsidies for cheese will affect emissions over the next few years.

Upon the revision of the Gothenburg Protocol in 2012, Norway committed to reducing fine particulate matter ($PM_{2,5}$) emissions by 30 per cent in 2020, compared to the level in 2005. In the current emissions account, this corresponds to an annual emissions cap of about 27,000 tonnes from 2020. No projections have been prepared for these emissions as part of the macroeconomic analysis. Projections of $PM_{2,5}$ emissions will be updated in time for Norway's annual reporting under the Gothenburg Protocol. In 2015, $PM_{2,5}$ emissions came to 28,100 tonnes.

5.2.4 Fuel sold to ships and aircraft engaged in international transport

Table 5.5 summarises the historic and projected emissions of fuel sold to ships and aircraft engaged in international transport. These emissions are reported separately and are not included in previous totals. CO_2 emissions from use of international bunker in aviation are projected to increase up to 2030 by 1.8 per cent per annum. That is half of the average annual growth during the period 1990-2015. Emissions from fuel sold to ships are projected to decrease by 1.2 per cent per annum (half of the annual decrease 1990-2015) during the projection period.

Compared with the previous national communication, the emissions have been adjusted downward mainly because emissions in 2015 were lower than previously predicted.

Table 5.5 *CO_2 emissions from international bunker. Million tonnes*

	1990	2015	2020	2030
International Bunkers	2.1	2.3	2.5	2.7
Aviation	0.6	1.5	1.7	2.0
Marine	1.5	0.8	0.8	0.7

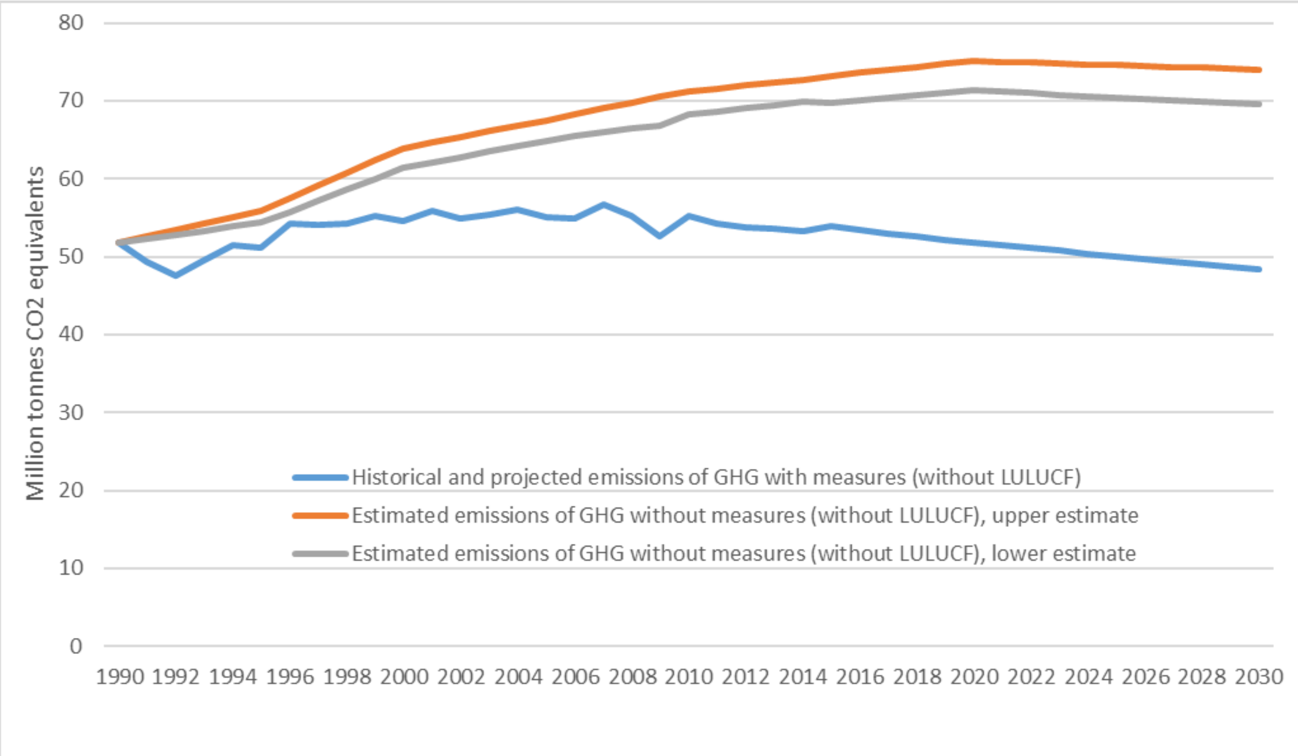
Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

5.3 Assessment of aggregate effects of policies and measures

There are considerable methodological difficulties in calculating the effect of policies and measures ex post, including establishing a hypothetical baseline and obtaining relevant data. Nevertheless, effects are estimated for a number of policies and measures. According to the estimates, the projected GHG emissions in 2010 would have been 13-16 million tonnes of CO_2 equivalents higher than observed, if these policies and measures had not been implemented. GHG emissions would be 19.5-23.3 million tonnes higher in 2020 and 21.3-25.7 million tonnes higher in 2030 (see Figure 5.3 and Table 5.6).

To arrive at a total the estimated effects of each significant policy and measure are aggregated. The estimated and expected effects of the individual policies which are addressed in chapter 4 are based on studies by the Norwegian Environment Agency, the Norwegian Petroleum Directorate, Statistics Norway and the Ministries. Some measures are however not covered by the analysis. For example, the effect of policies and measures aimed at changes in the means of transport has not been assessed. Structural policy changes, which might have an indirect impact on emissions, are likewise not estimated.

Figure 5.3 *Actual and projected emission with and without measures*



Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

As the electricity supply in Norway is almost entirely based on renewable energy, enhancing energy efficiency and encouraging the use of new renewable energy sources do not necessarily have an impact on emissions in Norway.

Table 5.6 *Effects of policies and measures that have been implemented. Total in million tonnes of CO_2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Cross sectoral	-	0.8	0.8	1.5-1.8	2.2-2.5	2.9-3.2	2.9-3.2
Petroleum activity	0.6	3.01	3.24	5.3	6.2	7.2	7.1
Energy	-	-	-	-	0.066	0.4	0.2-0.3
Transport	-	-	0.01	0.5	0.8-1.0	1.4-1.7	2.4-2.9
Industry	2.3-3.8	2.5-5.0	5.0-8.4	5.2-7.8	6.1-9.0	7.0-10.3	7.5-11.0
Agriculture	-	-	-	-	-	-	-
LULUCF	-	-	-	-	-	-	0.3
Waste	0.2	0.5	0.6	0.5	0.4	0.6	0.8
Total	3.1-4.6	6.9-9.3	9.7-13.1	13.0-16.0	15.8-19.2	19.5-23.3	21.3-25.7

The totals in table 5.6 may differ slightly from the totals below due to rounding off.

Table 5.7 *Effects of policies and measures that have been implemented. CO_2 in million tonnes*

	1995	2000	2005	2010	2015	2020	2030
Cross sectoral	-	0.8	0.8	1.5-1.8	2.2-2.5	2.9-3.2	2.9-3.2
Petroleum activity	0.6	3.0	3.0	>5.0	6.0	7.0	7.0
Energy	-	-	-	-	0.1	0.4	0.2-0.3
Transport	-	-	0.01	0.5	0.8-1.0	1.4-1.7	2.4-2.9
Industry	-	0.03	0.45	0.4	0.7	0.7	0.7
Agriculture	-	-	-	-	-	-	-
LULUCF	-	-	-	-	-	-	0.3
Total	0.6	3.8	4.3	7.4-7.7	9.8-10.3	12.4-13.0	13.5-14.4

Table 5.8 *Effects of policies and measures that have been implemented. CH4 in million tonnes CO2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Petroleum activity	-	0.01	0.24	0.3	0.2	0.2	0.1
Waste	0.2	0.5	0.63	0.5	0.4	0.6	0.8
Total	0.2	0.5	0.9	0.8	0.6	0.7	0.9

Table 5.9 *Effects of policies and measures that have been implemented. N2O in million tonnes CO2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Industry	0.7	0.6	0.5	2.1	2.3	2.8	2.8
Total	0.7	0.6	0.5	2.1	2.3	2.8	2.8

Table 5.10 *Effects of policies and measures that have been implemented. HFCs in million tonnes CO2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Industry	-	-	0.3	0.6	0.7	1.0	1.1
Total	-	-	0.3	0.6	0.7	1.0	1.1

Table 5.11 *Effects of policies and measures that have been implemented. PFCs in million tonnes CO2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Industry	0-1.5	0.6-3.1	1.9-5.3	2.0-4.7	2.4-5.3	2.6-5.8	2.9-6.4
Total	0-1.5	0.6-3.1	1.9-5.3	2.0-4.7	2.4-5.3	2.6-5.8	2.9-6.4

Table 5.12 *Effects of policies and measures that have been implemented. SF6 in million tonnes CO2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Industry	1.6	1.3	1.9	0.0	0.1	0.1	0.1
Total	1.6	1.3	1.9	0.0	0.1	0.1	0.1

5.4 Accounting for the Kyoto mechanisms

This chapter provides an overview, while the Biennial Report in the Annex will give some more detail.

5.4.1 First commitment period (2008-2012)

Norway was found eligible to participate in the three Kyoto mechanisms on 22 April 2008. The Norwegian Environment Agency has been assigned the tasks as Designated National Authority for the Clean Development mechanism (CDM), as well as Designated Focal Point for Joint Implementation (JI). However, Norway has not allowed JI projects on its territory. The Norwegian Environment Agency also operates the Norwegian national registry.

Norway overachieved its commitment under the Kyoto Protocol's first commitment period (2008-2012) by about 13 per cent. This chapter provides an overview, while the Biennial Report. Average annual emissions in 2008-2012 excluding the LULUCF sector were about 53.4 million tonnes and the assigned amount 50.1 millions.

The accounting rules under Article 3.3 covering afforestation, reforestation and deforestation did not give a basis for a contribution of RMUs towards the commitment. Acquisition of Kyoto units through participation in the European Emissions Trading System was sufficient to ensure compliance.

A governmental procurement programme for Kyoto units was established under the Ministry of Finance in 2007. About 30 million tonnes of Kyoto units, mostly CERs, were contracted pursuant to the first commitment period. The procurement strategy for the period 2008-2012 emphasised the acquisition of units from UN-approved projects at market prices. Furthermore, a diversification of the portfolio to mitigate different risk-components was implemented. This involved inter alia the acquisition of some units from LDCs. Following the change of government in autumn 2013, the administration of the procurement programme was moved to the Ministry of Climate and Environment. The state purchase program acquired enough units (mainly CERs) to realize the domestic target of overachieving the commitment by of 10 per cent, and these have been cancelled.

Furthermore issuance and cancellation related to RMUs under Article 3.4 added another 3 percentage points to the overachievement. Detailed documentation related to Norway's compliance is provided in various reports on the UNFCCC website[26].

5.4.2 Second commitment period (2013-2020)

Norway ratified the Doha amendment 12 June 2014. Norway's commitment under the Kyoto Protocol for the second commitment period (2013-2020) is that average annual emissions of greenhouse gases shall be limited to 84 per cent of emissions in 1990. Policies and measures needed to comply with this commitment represent a continuation from the first commitment period, balancing domestic measures with utilization of the Kyoto mechanisms. Norway submitted its Initial Report for the second commitment period in 2016 in conjuction with its

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[26] http://unfccc.int/kyoto_protocol/reporting/true-up_period_reports_under_the_kyoto_protocol/items/9049.php

National Inventory Report. The report has been reviewed, and thus Norway would be ready to issue its assigned amount.

Norway will issue 348.9 million AAUs for the period 2013-2020, or on average 43.6 million AAUs annually. The actual emissions for 2013-2016 and projections for the remaining years in the period through 2020 are higher than the assigned amount. On average the need for acquisition can be 9-10 Mt/year, or about 75Mt.

LULUCF accounting is expected to result in a small net emission despite significant overall net sequestration. Norway expects to be eligible to issue RMUs from forest management under Article 3.4 corresponding to 3.5 per cent of total greenhouse gas emissions in 1990, or about 14 Mt for the entire period. The real increase in carbon stocks is expected to be much higher as shown in table 5.1 . Other selected activities under Art. 3.4 (cropland and grazing land management respectively) are expected to yield limited contributions. The net changes in greenhouse gas emissions by sources and removals by sinks resulting from land-use change under Article 3.3 (afforestation, reforestation and deforestation), measured as verifiable changes in carbon stocks in the commitment period, are accounted for in their entirety. Currently the contribution from deforestation is expected to outweigh all the sequestration that can be accounted for under Art. 3.3 and 3.4, so that the total contribution from LULUCF will be accounted as a small emission.

Participation in the EU ETS is expected to result in a net acquisition of Kyoto units. For comparison, the average annual acquisition in the first commitment period was 3.7 million units, which for 8 years would equal almost 30 Mt. As for the first commitment period, the net transfer of units from the EU to Norway will depend on how many AAUs Norway will set aside to back the emissions allowances (EUAs) in the EU ETS, and the number of allowances surrendered by Norwegian installations. The arrangement between Norway and the EU on how the participation in the EU ETS will relate to KP units in the second commitment period is still to be finalised.

The programme for the procurement of CERs from the CDM aims at acquiring 60 Mt for the period 2013-2020.

The market for CERs has for a number of years been characterised by low demand which has led to excess supply and low prices, both in the primary and secondary market. An implication of this is that a number of registered projects are not issuing credits, and the number of new projects submitted for registration is low. Owing to the situation in the carbon market, Norway has sought to acquire units only from projects facing a risk of discontinuing their operations, or from new, yet unregistered projects.

Norway has also, in line with restrictions in the EU ETS, refrained from purchasing units from so-called industrial HFC projects. Furthermore, Norway has had a policy to refrain from purchasing units related to coal-based energy production without carbon capture and storage. A small part of the portfolio has been procured from the Adaptation Fund under the UN. Norway has contracted some 29 Mt through the Nordic Environment Facility Cooperation (NEFCO). The remaining volume is contracted directly from the Ministry of Climate and Environment.

Ultimo 2017 the total contract volume is close to the targeted 60Mt, while the risk adjusted volume is 15-20 per cent lower and delivered amount about 16 Mt. For further documentation of the procurement programme, see: www.carbonneutralnorway.no. In addition, the use of CERs and ERUs by the ETS installations in 2013 and 2014 has resulted in 6 million Kyoto units.

5.5 Supplementarity relating to mechanisms under Articles 6, 12 and 17, of the Kyoto Protocol

Section 5.3 indicates that the emissions level in 2010 would have been around 13-16 million tonnes of CO_2 equivalents higher than actual emissions in the absence of domestic policies and measures taken to mitigate climate change, or about 25-30 per cent of the 1990 emission level, and in 2020 19.5-23.3 Mt higher (41-45 per cent). The estimates are uncertain, but could still be conservative as not all policies and measures are quantified. The estimates illustrates that the use of Kyoto mechanisms has been supplemental to domestic action.

By way of comparison, the gap between emissions and the commitment under Article 3.1 was 3.3 million tonnes/year for KP 1, and could be 9-10 Mt/year for KP 2. Such a gap also illustrates that it is possible to assume a more ambitious target with access to mechanisms than what could have been possible without.

6 Vulnerability assessment, climate change impacts and adaptation measures

6.1 Introduction

The Norwegian economy, environment and society are vulnerable to climate change. The Government has conducted several actions, in compliance with the requirements of UNFCCC, in order to prepare for climate change. In 2010, an Official Norwegian Report[27] NOU 2010:10 *Adapting to a changing climate* was published. In this report, a committee appointed by the Government assessed Norway's vulnerability to the effects of climate change and the need to adapt. The NOU incorporates many of the aspects described in the Intergovernmental Panel on Climate Change (IPCC) Technical Guidelines for Assessing Climate Change Impacts and Adaptations and the United Nations Environment Programme (UNEP) Handbook on Methods for Climate Change Impacts Assessment and Adaptation Strategies. Following publication of the Official Norwegian Report, a white paper on climate change adaptation, Meld.St. 33 (2012-2013) *Climate change adaptation in Norway* was prepared and adopted by the Norwegian Parliament. The White Paper outlines actions to be taken at various governmental levels and within sectors in order to adapt to a changing climate.

Since the release of Norway's Sixth National Communication in 2014, Norway has passed several milestones in its work related to climate change adaptation, and important progress has been made on local to national administrative levels and across different sectors. Projections of climate change for Norway have been updated, an Official Norwegian Report (NOU) concerning urban storm water management has been published, and the development of guidelines on how to integrate climate change adaptation into municipal planning activities is under way. Capacity building has been strengthened through networks, cooperation and

[27] Official Norwegian Reports (NOU). The government or a ministry may appoint committee and work groups to report on different aspects of society. A report may either be published as a Norwegian Official Report, or as a regular report.

other activities related to climate change adaptation. Climate change adaptation is also integrated into strategies and action plans within and across relevant sectors, such as in the recently adopted White Paper *Risk in a Safe and Secure Society* (Meld.St. 10 (2016-2017)), where climate change is considered one of the major threats to the Norwegian society.

In 2017, the Norwegian Parliament adopted a Climate Change Act which includes reporting requirements related to adaptation to climate change.

This chapter provides an overview of observed and projected climate change in Norway, the expected impacts of these changes and related risks and vulnerabilities. Furthermore, the framework for climate change adaptation work is described, including the legal framework, policies and strategies. Adaptation actions are presented in the final part of the chapter. Norway's climate change related support to developing countries is described in chapter 7.

6.2 Climate Change on the Norwegian mainland

Norway is a sub-Arctic country with a long and convoluted coastline combined with a long mountain chain facing a relatively warm ocean surface to the west. This results in large geographical contrasts in the present climatic conditions as well as in the projections of future climate change. These contrasts are found both from coast to inland and mountainous regions, from north to south and not least from the Norwegian mainland to the Arctic islands (Spitsbergen, Bear Island and Jan Mayen). Climate change at the high Arctic islands is described in section 6.5.1 *Climate change in the Norwegian Arctic*.

In Norway, comprehensive studies of regional climate development in a scenario of global warming were initiated in 1997 through the RegClim project, and from 2007 to 2011, continued in the NorClim project. In later years, several research projects have contributed to continuing these activities, and from it was established in 2013, the Norwegian Centre for Climate Services (NCCS) has taken on a responsibility for regular assessments of available regional climate projections.

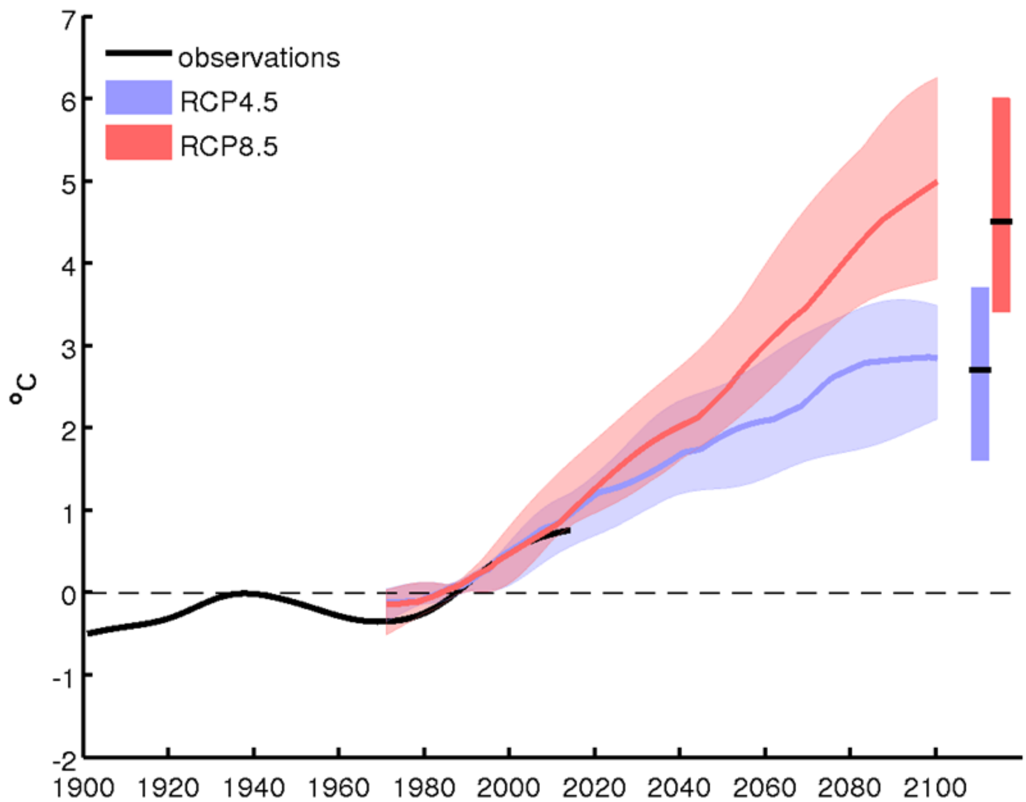
In 2015, the NCCS published an updated report describing projections of climate change for Norway from the present climate (1971-2000) and up to two scenario periods (2031-2061 and 2071-2100)[28]. The projections are based on statistical and dynamic downscaling of global climate model results from IPCCs fifth Assessment report (2013). Due to national guidelines relevant to climate change adaptation stating that assessment of climate change impact is to be based on a precautionary approach the results related to the emission scenario RCP8.5 are presented below. Graphics however, show projections for two different emission scenarios, namely RCP4.5 and RCP8.5. However, if future global greenhouse gas emissions are reduced significantly (e.g. following RCP4.5 or RCP2.6) projections show that the expected changes in climate parameters will be significantly less.

Temperature
The projections indicate warming in all parts of Norway and during all seasons. The annual mean temperature for Norway (Figure 6.1) is estimated to increase by 4.5 (3.3-6.4) °C towards

[28]NCCS report no. 2/2015. A condensed English version of NCCS report no. 2/2015 was published in 2017 as NCCS report no. 1/2017

the end of this century. For the Norwegian mainland, the greatest change in annual mean temperature is estimated for the northern parts of Norway, where the warming is approximately 6 °C by the end of the century. For Western Norway the estimated warming is considerably lower with a median value close to the global average estimate of 3,7 °C. A general trend is that the projected warming is greater for winter (DJF) than for summer (JJA) season. This trend is more pronounced inland than along the coast; more pronounced in the north than in the south, and more pronounced for RCP8.5 than RCP4.5.

Figure 6.1 *Annual temperature for Norway as deviation (in °C) from the mean for the reference period 1971-2000. Black curve shows observations (1900-2014), red and blue curve show median value for the ensemble of ten RCM simulations for emission scenarios RCP4.5 and RCP8.5. All curves are smoothed by low-pass filtering. Shading indicates spread between low and high climate simulation (10th and 90th-percentile). The box plots on the right show values for 2071-2100 for both scenarios.*



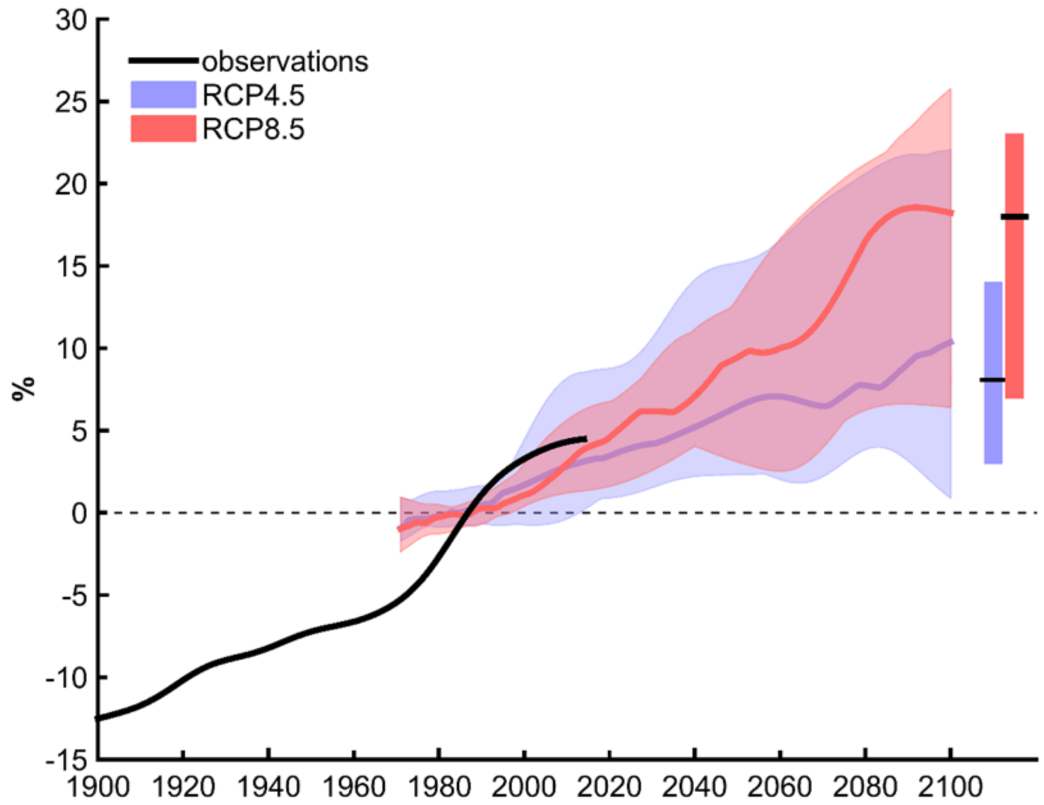
Growing season
The growing season, defined as the number of days with an average temperature above 5° C, is expected to become considerably longer over the course of this century. Calculations show a one to two-month increase in large parts of the inland areas, and a two to three months increase in in coastal areas and in a zone between the coast and the inland. The total area (not only area used for agricultural purposes) with a growing season longer than six months, is projected to increase from about 37,000 km^2 in the period (1971-2000) to 165.000 km^2 by the end of the century (2071-2100).

Precipitation
Amounts of annual precipitation averaged over the Norwegian mainland is projected to increase by 18 per cent towards the end of this century (Figure 6.2). The projections indicate increases for all seasons.

Heavy rainfall is defined as the 99.5th percentile for 24-hour precipitation, i.e. the amount of rainfall that is expected to be exceeded approximately twice a year on annual basis. The projections indicate an increase of days with heavy rainfall for all season and all regions. For the Norwegian mainland an 89 per cent increase is projected by the end of this century, with the largest increase in the winter season. However, due to the large range in the projections it cannot be ruled out that the number of days with heavy rainfall will more than double by the end of the century. In addition, it is expected that the actual amount of rainfall on such days will increase with between approximately 10 and 20 per cent. This also applies to all seasons and for all regions.

In general, such increases, for both amount and frequency, are even higher when analysing high-intensity rainfall during a few hours (3-hours).

Figure 6.2 *Annual precipitation over Norway as deviation (per cent) from the period 1971-2000. Black curve represents observations (1900-2014), red and blue curved lines show median values for the ensemble of ten RCM simulations for emission scenarios RCP8.5 and RCP4.5. All curves are smoothed. Shading indicates the spread between low and high climate simulation (10th and 90th-percentile). The box plot on the right shows projections up to 2071-2100 for both scenarios.*



Wind speed
The projections from climate models indicate small changes in average, as well for high, wind speeds throughout Norway towards the end of this century. However, some model results indicate that adverse wind conditions may become more frequent.

Hydrology, floods and droughts
The annual runoff from the Norwegian mainland is estimated to increase, but less than annual precipitation since evapotranspiration also will increase. The largest relative changes are expected in the winter (large increase due to increased precipitation that falls as rain) and in the summer (large decrease caused by earlier snowmelt in mountainous regions and higher evapotranspiration losses).

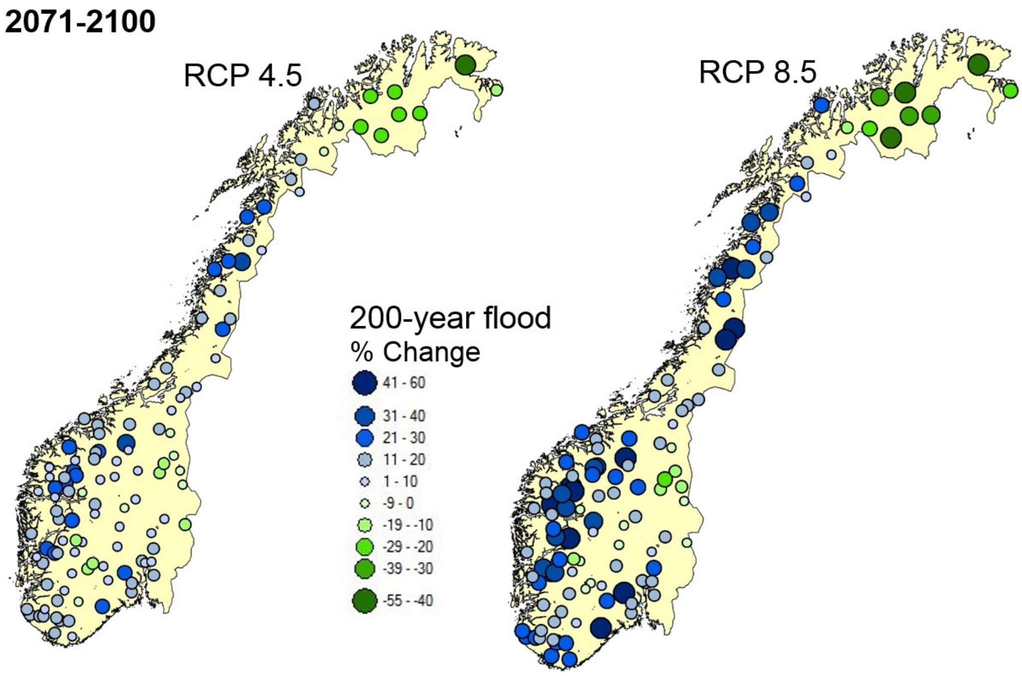
In general, a trend towards a later snow accumulation and earlier snowmelt has already been observed. These observed changes are expected to continue in the future. For the high emission scenario, the snow season can become one to more than six months shorter.

Future changes in flood magnitudes have been analysed for 115 rivers in Norway (Lawrence, 2016). The results show that the magnitude of change strongly depends on the emission scenario, but the direction of change is the same. We can expect rain flood magnitudes to increase and snowmelt flood magnitudes to decrease. In many areas, this is also associated with a change in seasonality. More frequent and intense rainfall events may in the future give special challenges in small steep rivers and urban areas all over the country.

Higher temperatures causing earlier snowmelt and higher evaporation losses during the summer season may lead to reduced river flow, more severe soil moisture deficits and lower groundwater levels even in regions where summer precipitation is expected to increase. This will result in more severe summer droughts.

Expected climate change under the high emission scenario will have a large impact on the area and volume of glaciers in Norway towards the end of the century. For larger glaciers, a reduction of up to 2/3 of the area and volume they have today is expected, such that remaining glaciers will be significantly smaller and will only be found at higher altitudes. The smaller glaciers will disappear (completely melt).

Figure 6.3 *Percentage change in the 200-year flood for medium (RCP4.5) and high (RCP8.5) emissions. Green indicates a reduction and blue an increase in flood magnitude.*



Landslides and avalanches

Landslides are separated into earth slides (including flood slides), rockslides and quick clay slides. Avalanches are – depending on the water content in the snow – separated into dry and wet snow avalanches and slush slides. Landslides and avalanches mostly occur in steep terrain (except quick clay slides) but the weather is one of the main triggering factors, and hence, climate change will affect their frequency. In particular, we can expect more wet snow avalanches and earth, flood and slush slides.

Ocean temperature and acidification

Downscaled projections covering oceans along the Norwegian coast from different CMIP5 models have been performed during the last years. These show that the sea surface temperature in the Barents Sea will increase by around 1 °C in wintertime 50 years from now, and somewhat more in the North Eastern parts which is reflected in the reduced sea ice cover in this region (Islantsonen, 2017; Klima i Norge 2100, 2015; Sandø et al., 2014[29]). In general, this warming is somewhat less during summers. The warming of the surface layer increases southwards along the coast during winter, and the greatest wintertime warming is seen in Skagerrak and Oslofjorden, where it reaches 3-4 °C. Also here, the warming is somewhat less during summer, and in Skagerrak and Oslofjorden, the model results indicate a summertime decrease in temperature of about 1 °C. It should be emphasized that natural variability on decadal timescale is relatively large compared to the average increase during this period, and that the choice of the relative short reference periods (2010-19 and 2060-69) might affect the results.

The ocean acidification is mainly a direct result of anthropogenic CO_2 absorption by the sea. There is considerable uncertainty associated with future CO_2 emissions, but ocean acidification is expected to accelerate over the course of this century. It is estimated in Skogen et al. (2014)[30] that the pH value will decrease by between 0,1 and 0,25 in the Nordic Sea, and between 0,25 and 0,35 in Arctic oceans, by the year 2065.

Sea-level rise and storm surges

The relative sea-level off the Norwegian coast is calculated in Simpson et al. 2015 to have increased on average by 1.9 mm per year in the period 1960-2010. During the more recent period 1993-2014, the average increase was about 3.8 mm per year. Thermal expansion of the ocean and melting of the world's glaciers and ice caps are the main reasons for this. Projections of regional sea-level change show that, for all emission scenarios, the majority of Norway will experience a sea-level rise over this century (Figure 6.4). For a high emission scenario, projections show that relative sea-level rise increases with between 10 and 60 cm towards 2100, and that the rate of sea-level rise may exceed 1 cm per year in the end of the century. The local differences in projected sea-level change largely reflect differences in land uplift. This effect on sea-level change is of particular importance for Norway where the Earth is rebounding following the last glacial.

Future sea-level rise will cause an increase in the height of extreme sea-level episodes (e.g. storm surges). Owing to this, coastal areas already exposed to storm surges will experience a large increase in the frequency of inundation (Simpson et al., 2015). Climate change can also

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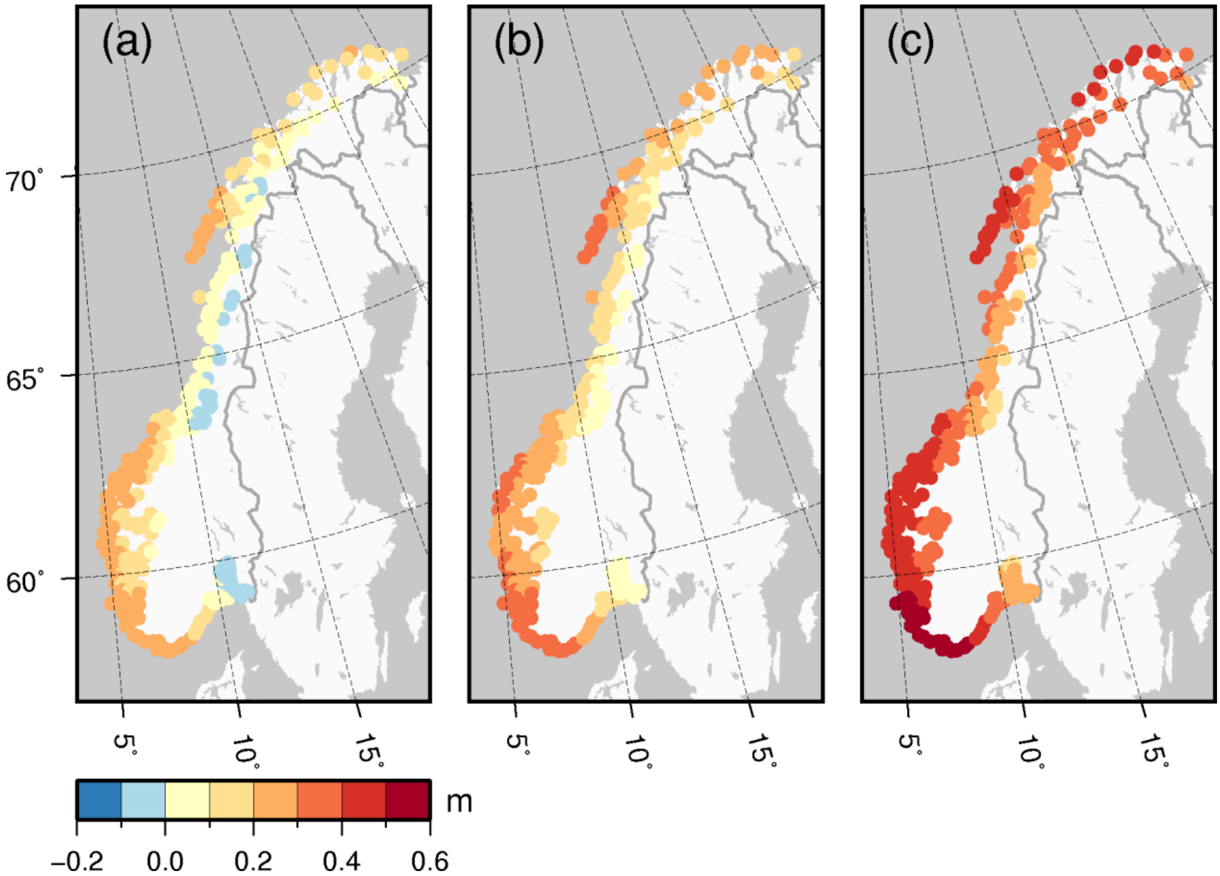
[29] Iskantsonen, report from Norwegian Polar Institute 2017; Klima i Norge 2100, report from Norwegian Climate Service Center, 2015; Sandø, A. B., A. Melsom and W. P. Budgell (2014), Downscaling IPCC control run and future scenario with focus on the Barents Sea, Ocean Dynamics, doi:10.1007/s10236-014-0731-8

[30] Skogen, M.D., A. Olsen, K. Y. Børsheim, A.B. Sandø, and I. Skjelvan. 2014. Modelling ocean acidification in the Nordic and Barents Seas in present and future climate. Journal of Marine Systems 131:10-20.

cause changes to the nature of storm surges themselves, for example, due to changes in storminess and/or waves.

Projections of storm surge changes are in general of low confidence. But projections available suggest a weak increase in future storm surge heights along the Norwegian coast.

Figure 6.4 *Projections (model average) of changes in relative sea level in Norway from 1986-2005 to 2081-2100 for a). RCP2.6, b). RCP4.5 and c) RCP8.5.*



Source: Simpson et al. (2015).

6.3 Vulnerability to climate change and expected impacts on society and nature

6.3.1 Introduction

According to the committee that conducted the vulnerability assessment in the Official Norwegian Report 2010:10 *Adapting to a changing climate*, Norway is in a good position to adapt to climate change. Future vulnerability, however, will depend on the extent to which climate change considerations are incorporated into planning and decision-making processes in all areas and all levels of society. The committee considered that the degree of vulnerability varies between different areas of society. Climate affects all areas of society, but in different ways, to different extents and at different timescales. In the committee's assessment of the various areas of society, vulnerability has been considered on the basis of how exposed the area is and its adaptive capacity.

Exposure to climate change was assessed on the basis of climate projections, other research results and contributions from people involved in the sectors. Adaptive capacity was evaluated in the light of the sector's organisational structure, resources, knowledge base and priorities. The interaction between these factors was also an important part of the assessment. The review showed that vulnerability is not just dependent on the exposure to climate change; it is also very closely linked to the adaptive capacities in various areas.

The committee concluded that the natural environment, infrastructure and buildings, in particular water and sewage, are especially vulnerable to climate change in Norway. The impact of the climate varies between regions and types of terrain. The nature of the exposure varies between the coast and the interior, between Northern Norway and Southern Norway, and between steep, mountainous areas and low-lying, flat areas.

The committee considered the north, particularly from Finnmark County and northwards, and alpine areas to be especially vulnerable to climate change. Part of the Sámi population in the north derives its livelihood from natural resources, and Sámi culture is therefore vulnerable to the impact of climate change on nature.

Climate change may intensify existing problems and create new ones. On the other hand, opportunities for business development and advantages for local communities may also emerge.

Climate change is expected to have a major impact on ecosystems and increase the overall strain on the environment. The environment is affected in various ways by human activities through land and resource utilization, transport and pollution. These activities and climate change affect ecosystems separately and in combination, and in some cases they are mutually reinforcing. The vulnerability of an ecosystem is a result of the integral impact of the numerous stress factors.

Ecosystems adapt continuously to climate variability. This takes place among others through changes in the distribution of species and through natural selection over generations. One challenge of a changing climate is the fact that changes may manifest themselves faster than ecosystems and species are able to adapt. Adaptation through natural selection is particularly challenging for species with small populations and low genetic variation. In addition, fragmentation and changes in land use may create barriers that prevent species from migrating to new areas.

Certain local communities that are not currently at risk for landslides, avalanches and floods, may face these risks in the future, but in general, climate change may enhance existing challenges. To some extent, these recurring themes take on different guises in different sectors, but they challenge adaptive capacity across sector boundaries.

The municipalities are Norway's local administrative level, and have the overall responsibility for development planning and provision of services within their geographical catchment areas. Many municipal responsibilities will be affected by climate change, and plans and decisions adopted by municipalities today will have consequences for many decades.

6.3.2 Nature and ecosystems

6.3.2.1 Terrestrial ecosystems

Effects of climate change on terrestrial ecosystems in Norway have already been observed. Earlier arrival of migrating birds, earlier sexual maturation in some animals, higher production and reproduction in both plants and animals, and earlier budding and pollen production are some of the changes observed. There are also some signs of plant species having expanded northwards or to higher altitudes. Satellite-based mapping indicate that the growing season has increased since the 1980's by up to 2-4 weeks in parts of Norway. Melting of palsa mires (type of mires that contain permafrost) has been observed in recent years.

Alpine and tundra ecosystems are regarded as particularly vulnerable to climate change. Climate change causes the tree line and vegetation zones to creep upwards, which in turn affects species in the mountains. For alpine species, there is a risk that there will no longer be any suitable natural habitats to migrate to and that some species will become extinct. This applies for example to the arctic fox, wild reindeer and alpine plants. Competition from new species will also pose a threat, such as the red fox which migrates to alpine areas and competes with the arctic fox. The tree line moving ever higher reduces the number of continuous alpine areas, something that will particularly affect those alpine species that are dependent on large, continuous alpine areas - such as wild reindeer. This will happen at the same time as pressure increases in alpine areas owing to land use and other human activity. Red listed species that are threatened in Norway because they are at their northerly distribution limits, may, however, become less threatened.

The growing season is expected to become longer and warmer. For *forest ecosystems* this will result in faster growth and primary production, a rise in the proportion of trees that prefer a warmer climate and perhaps changes in the species composition of forests with broadleaf species replacing pine and spruce in the south. Rising temperatures may also result in the northward and upward spread of forest. In the short term, climate change may result in increased damage by factors such as storms, pest outbreaks, drought, and forest fires. Such factors can pose serious threats to forest health, vitality and productivity. Some *cultural landscape systems,* such as species-rich hay meadows and grazed grasslands, are vulnerable to increased production. Many cultural landscapes are already threatened by re-growth due to abandonment, and increased growth will accelerate this process.

In Norway, *wetlands*, especially bogs, have also been exposed to major human encroachment, such as drainage for agricultural purposes, forestry, harvesting of firewood and peat moss, as well as other developments. Climate change represents a new factor that is threatening wetlands, in addition to other threats. This applies in particular to Southern and Eastern Norway where one expects higher temperature and less precipitation in summer and to certain types of wetlands, such as palsa mires which may melt in a warmer climate. Increased precipitation in other parts of the country may lead to an increase in wetland areas.

Conditions for invasive *alien* species also change with climate change. At present, many invasive alien species are not able to survive cold winter conditions in large parts of Norway. With the milder winters expected in the future, more of the harmful species will be able to survive and spread.

6.3.2.2 **Fresh water ecosystems**

The effects of climate change on the freshwater ecosystem are many and complex, and they will have impact on production, biomass, life cycles and the species composition. Together with an increase in extreme precipitation events and flooding, this will result in more runoff, transport of particulate matter and leaching of nutrients and other pollutants. Higher erosion rates along river banks and runoff of particulate matter and nutrients from farmland may become a greater problem, and such tendencies have already been registered in smaller rivers in Eastern Norway. Particulate matter and pollutants are transported downstream to coastal waters, adding to the overall environmental pressure on marine ecosystems.

The ice-free season will be longer, the water temperature will increase, and the thermal vertical stratification in the lakes will increase. In parts of Norway, prolonged periods of summer drought and low stream flow are expected. For vulnerable fish species such as salmon, trout and Arctic char and grayling, temperatures exceeding 20º-25 º C could be critical. Regulated rivers with low residual flows may be particularly exposed.

6.3.2.3 **Marine ecosystems**

In *marine waters*, climate change will result in higher temperatures, and a higher CO_2 content in sea water will lead to ocean acidification. This in turn may cause serious impacts on marine ecosystems. A large proportion of CO_2 of anthropogenic origin is absorbed by the oceans, where it reacts with water to form carbonic acid. Ocean acidification will result in changes in the seas' ability to precipitate calcium carbonate, on which calciferous organisms depend. This problem increases at great depths with high pressure and low temperatures. It implies that Norwegian waters and especially the Polar Regions are particularly exposed and will be impacted before more temperate regions. Calciferous organisms include coralline algae, phytoplankton, zooplankton, crustaceans, molluscs and corals. There are many cold-water coral reefs in Norwegian waters, including the world's largest known cold-water coral reef complex. Coral reefs are among the most species-rich ecosystems, and are a vital habitat for many types of fish. Ocean acidification has negative impacts on these ecosystems, and by the end of this century, up to 70 per cent of the calciferous organisms related to coral reefs in Norwegian waters are expected to show signs of erosion. Phytoplankton, such as calciferous flagellates, form the basis of marine ecosystems, and the zooplankton that graze on them are essential food for many fish species. As plankton species with calcareous skeletons may not survive in more acidic seawater, the acidification can have major impacts on many trophic levels.

Higher temperatures result in northwards migration of a number of species. Owing to its great depths, the Norwegian Sea is a key area for the production of copepods (zooplankton). They represent an important food source for fish larvae and fry for the large boreal fish stocks, such as herring and mackerel. In the North Sea, quantities of the common copepod *Calanus finmarchicus* have dropped considerably as the sea temperature has risen; at the same time, the quantities of a plankton species that prefers higher temperatures have increased. However, this species is less nutritious. A decline in *C. finmarchicus* and an increase in plankton species that spawn later in the season may result in a mismatch between spring-spawning fish and their prey, and also between seabirds and marine mammals and the herring. Detailed consequences to the ecosystems and particular species are however yet to be well known.

Along with a northwards migration of copepods, it is expected that the southern boundary for boreal fish species will move northwards. Species such as cod, haddock, herring and mackerel may have their migration patterns disturbed. However, it is expected that, in the 21st century, several temperate and subtropical fish species, such as sardine, anchovy, European bass and tuna, may become common in the North Sea. In the Arctic, fish species such as Arctic char and polar cod may disappear from parts of the Barents Sea, since they primarily feed on the arctic zooplankton whose natural habitat is along the ice edge.

Overall, it is very uncertain how the changes will affect species composition, fish stocks and total production in marine ecosystems.

Seabirds along the coast are subject to a range of different pressures, many of which are caused by intended or unintended human activity – oil pollution, competition with fisheries, climate change (increasing sea temperatures), marine litter, persistent organic pollutants, introduced predators, habitat degradation and disturbance by people. Many seabird populations have shown a dramatic decline in recent years. Moreover, a number of seabirds are specialised feeders, which makes them particularly sensitive to climate change and changes in the availability of prey species such as sandeels, herring and capelin.

6.3.3 Human life and health

6.3.3.1 **Civil protection and emergency planning**

AThe exact scope, severity and pace of future climate change impacts are difficult to predict, still it is clear that climate change will affect societal safety. Specific examples include:

- Increasing frequency and severity of extreme weather events such as storms, floods and droughts will threaten human lives and health, material assets and vital societal functions.
- Both changed extreme weather events and a gradual change in the average climate will increase the vulnerability of critical infrastructure.
- Global effects of climate change can have an indirect impact on societal safety in Norway. For example, intensifying droughts or floods can result in food insecurity, economic

collapse and human suffering, which in turn may lead to cross-border migration and the spread of harmful organisms.[31]

Climate change will thus challenge society's ordinary emergency management capacity.

From 2006 to 2009, The Norwegian Directorate for Civil protection (DSB) prepared a National Risk and Vulnerability Report (NSBR) as a basis for follow-up of cross-sectoral social security work. In 2012, DSB further developed methodology that enabled analyses of different types of events across sectors and areas of responsibility. From 2012 to 2014, the report was called National Risk Picture (NRB), and included a selection of likely worst case scenarios that could affect Norwegian society and that the authorities should be prepared to demand extraordinary government efforts. From 2017, the National Risk Picture has changed its name to "Crisis Scenarios" - analyses of serious events that may hit Norway.

The "Crisis Scenarios" has concluded that extreme weather and landslides are among the hazards most likely to affect Norway, with potentially severe consequences for our citizens.

Large forest fires can lead to great economic loss and damage to forestry, and may represent danger for life and health, housing and critical infrastructure. Norwegian Centre for Climate Services concludes that in particular the Southern and Eastern parts of Norway will have an increase in forest fire risk in the coming century.[32] In Eastern Norway, changes in climate could lead to doubling of the number of days with forest fire risk by 2050.[33]

6.3.4 Business and other industry

6.3.4.1 Introduction

Climate change in Norway will have a direct impact on industries that base their activities on natural resources, such as agriculture and forestry, fishing and aquaculture. Other businesses and industries may be indirectly affected by vulnerabilities in other sectors, such as interrupted power supply. Utilising the opportunities that may emerge will also require adaptive measures to enable these opportunities to be realised.

6.3.4.2 Agriculture and forestry

In areas where lower summer precipitation does not produce a soil moisture deficit, the combination of a longer growing season and higher CO_2 content in the air will allow the forest to grow more quickly. In addition the productive forests will expand both to higher altitudes and northwards throughout the country. There will be significant regional differences, with forests in Southern and Eastern Norway potentially facing drought stress and during a transition period, it appears that the growing season in the interior of Finnmark and Troms may become somewhat shorter.

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[31] Ibid.

[32] Hanssen-Bauer et al. (2015) Klima i Norge 2100 – kunnskapsgrunnlag for klimatilpasning oppdatert i 2015 NCCS-rapport 2/2015

[33] Tveito, O.E. 2014. Klimaendringer og betydning for skogbruket, MET Report 25/2014

The largest threat to the continued health and vitality of Norwegian forests will be increasing attacks by native pests, as well as non-native organisms that may be able to establish viable populations in Norway as a result of climate change.

Without ground frost for much of the year and with less snow cover, operating conditions will become more difficult using existing technology.

The main pattern in climate projections for Norwegian agriculture is higher temperatures and precipitation. Increases in rainfall may cause problems to field operations, like thinning and harvesting. Increase in evapotranspiration as a result of higher summer temperatures may, however, also cause drought in certain periods. In addition to such changes in abiotic factors, new pests and diseases may arise that reduce productivity in plant production as well as animal husbandry.

Climate change may also result in more damage caused by freeze–thaw cycles, changes in wind patterns, heightened fire risk due to drought and increased erosion as a result of more precipitation, with a risk of nutrients being washed out of the soil, causing environmental stresses. Climate change also has impact on the conditions for reindeer husbandry, see section 6.5.3.

6.3.4.3 **Fisheries and aquaculture**

The Norwegian fisheries and aquaculture generate significant export revenues, and Norway is one of the world's leading exporters of fish and seafood products. There is uncertainty linked to various aspects of climate change and the potential consequences for the marine environment. The fishing fleet has very high adaptive capacity since the ocean-going fishing fleet has an extensive range. The traditional coastal fleet on the other hand may be more exposed to climate change owing to its more limited range or potential change of target species.

Climate change along the Norwegian coastline will reflect the changes that are expected to occur in the open sea. Coastal areas and the continental shelf are important spawning grounds for many fish stocks on which climate change may have an impact. Several of the coastal cod stocks have declined significantly over the past decades. A number of factors are probably involved in this, one of which may be climate change. A plan for rebuilding coastal cod stocks has already been adopted. It has been suggested that a combination of higher water temperature, eutrophication and sediment deposition explains the loss of sugar kelp forests (important as a nursery area for coastal cod and other species) from many areas along the Skagerrak coast and the south-western coast of Norway. Climate change will have a number of impacts on wild stocks of anadromous salmonids at different stages of their life cycle. A higher water temperature may result in changes in the numbers and distribution of important preyspecies for anadromous salmonids in coastal waters and the open sea, and of disease organisms and parasites such as sea lice. On the other hand, higher precipitation will increase water flow in rivers and the freshwater content in the coastal zone. This may improve conditions for juvenile salmonids in rivers and reduce the impacts of salmon lice. It is important to maintain the genetic diversity in the wild salmon populations, among other ways by reducing the genetic interaction between farmed salmon and wild salmon, as this makes the species and the various populations more robust for changes in the living environment brought about by climate change. Higher precipitation will also result in more runoff from land, which may lead to sediment deposition and pollution and subsequently to more frequent algal blooms, sometimes of toxic algae.

Higher sea temperatures may cause a shift in the distribution of marine organisms, with populations making a general migration northwards. The overall productivity of the boreal species of fish is expected to increase in the northernmost fishing areas, while the productivity of the Arctic species is expected to decline in the same areas.

Overall, climate change over the remainder of the 21st century may increase fish resources in Norwegian waters. There are however two factors that may counteract these predictions. One of them is associated with natural climate variability, which may dominate over anthropogenic climate change and result in a somewhat colder marine climate. The other major uncertainty factor is ocean acidification, a process taking place simultaneously with, and to some extent independently of, climate change. Acidification creates a more hostile environment for calcifying organisms.

Temperature is of vital importance to the aquaculture industry, as it affects factors such as growth rates, algal blooming and disease. In the long term, an increase in sea temperature therefore has the potential to result in significant structural changes in terms of the species farmed, the best production areas and siting structure, and occurrence of diseases. Emerging technology opens up for more off-shore aquaculture.

The nature of the risk from marine infectious agents (pathogens) will change. The extent to which this will lead to larger problems, as opposed to different problems, remains unclear.

6.3.4.4 **Petroleum production**

Oil and gas production on the Norwegian continental shelf is significantly affected by the weather and climate. The technology used in Norway for both production and support functions is therefore designed to withstand significant weather-related impact.

Higher sea temperatures may reduce the capacity of gas pipelines and reduce the efficiency of LNG plants (facilities that produce liquefied natural gas). Higher sea temperatures may also alter the fauna and flora in the vicinity of the facilities, which may in turn result in fouling. If the temperature of the sea water used as cooling water increases, existing cooling water intakes may become too small in the future.

At some facilities, increased sea levels may change the evacuation criteria ahead of storms, and at others they may entail the introduction of procedures for evacuation in the event of high wave forecasts. Increased sea levels may also cause damage to facilities.

For onshore facilities, sea level rises and storm surges may make it necessary to construct facilities on high ground or to limit use of facilities.

6.3.4.5 **Insurance**

Climate change will affect the use of insurance policies and the market for insurance services.

More frequent weather-related and natural damage will both change the risk pattern and stimulate demand for insurance. Climate change will result in a greater need for various insurance policies, among other things related to health, primary industries, buildings and equipment.

6.4 Adaptation measures

6.4.1 Domestic adaptation policies and strategies

Climate change adaptation is a complex and interdisciplinary issue which demands a cross sectoral approach. In 2007, an inter-ministerial working group was appointed to promote coordination and dialogue in the national climate adaptation work. The working group was led by the Ministry of Climate and Environment and in 2008 the Government presented a five-year platform to enhance society's resilience to climate change, to reduce vulnerability and strengthen Norway's ability to adapt. The inter-ministerial working group was supported by a programme-secretariat that was established in the Directorate for Civil Protection (DSB). A committee consisting of experts from government agencies, research institutes and civil society published an Official Norwegian Report (NOU) on Norway's vulnerability and adaptive needs in 2010[34]. The objective of the report was to facilitate sustainable development through increased knowledge of the significance of climate change for Norway and to provide advice regarding how the authorities and other parties best can proceed to prevent negative impacts from these changes on people, society and the environment. In cases where climate change also represents a potential for increased economic growth, this should be made clear, and advice should be given on how society best can utilise this potential. The report addresses both challenges and opportunities caused by a changing climate, and provides guidance on priorities and specific measures to reduce vulnerabilities.

6.4.1.1 **The national climate change adaptation strategy**

Following the NOU, the Norwegian Parliament adopted the first white paper on climate change adaptation in 2013 (Meld.St 33 (2012-2013) – Climate change adaptation in Norway), outlining national policies and guidance for adaptation in Norway. The paper provides an overview of the implications of climate change for Norway and sets out a framework to facilitate the development of adaptation strategies and identification of effective adaptation measures across sectors and administrative levels. The white paper upholds that everyone – individuals, business and industry and the authorities – is responsible for assessing and addressing the impacts of climate change on their areas of competence. In line with the principle of responsibility, all ministries have responsibility to safeguard consideration for climate change within their sector.

Several actions are presented in the white paper;

- ensure that the knowledge base for climate change adaptation is strengthened through closer monitoring of climate change, continued expansion of climate change research and the development of a national centre for climate services.
- plans for pregular updates of knowledge about the impacts of climate change and vulnerability, and of assessments of adaptation needs in Norway. Updates will be

[34] NOU 2010:10. Adapting to a changing climate: Norway's vulnerability and the need to adapt to the impacts of climate change URL:http://www.regjeringen.no/en/dep/md/documents-and-publications/Official-Norwegian-Reports/2010/nou-2010-10-2.html?id=668985

considered when substantial new knowledge is available, particularly related to the assessment reports of the Intergovernmental Panel on Climate Change (IPCC).

- as a precautionary approach, assessments of the impacts of climate change to be based on figures from the high end of the range of national climate projections. However, when decisions are made in individual cases, climate change considerations and underlying assumptions about the degree of climate change must be weighed against other considerations of the public interest, the lifetime of the development in question and its importance to society.

Moreover, the white paper emphasises the role of the municipalities related to climate change, and describes that;

- appoint a committee to evaluate the current legislation and as appropriate make proposals for amendments to provide a better framework for the municipalities, which will have to deal with increasing volumes of stormwater as a result of climate change, will be appointed.

- draw up central government planning guidelines describing how the municipalities and counties should integrate climate change adaptation into their land-use and general planning processes. The new guidelines on adaptation will be incorporated into the existing guidelines for climate change mitigation and energy planning.

6.4.1.2 **Climate change adaptation in other policy documents**

In accordance with the principle of responsibility, the issue of climate change adaptation is addressed in several sectoral policy documents published recently. Among these are:

- The White paper Nature for life – Norway's national biodiversity action plan (Meld.St. 14 (2015-2016)).

- The White paper Risk in a Safe and Secure Society – on public security (Meld.St. 10 (2016-2017), executive summary in English)

- The White paper Friluftsliv – natur som kilde til helse og livskvalitet (Meld.St 18 (2015-2016) *Outdoor recreation – nature as a source of improved health and life quality*, in Norwegian only)

- The White paper Hvordan leve med farene, om flom og skred (Meld.St 15 (2011-2012) *How to live with the hazards – floods and landslides*, in Norwegian only)

- The White paper Verdier i vekst – konkurransedyktig skog- og trenæring (Meld.St 6 (2016-2017 *Values in growth – a competitive forestry and timber industry*, in Norwegian only)

- The White paper Endring og utvikling – en fremtidsrettet jordbruksproduksjon (Meld. St 11 (2016-2017) *Change and development – a future-oriented agricultural production*, in Norwegian only)

- The White paper Reindrift. Lang tradisjon, unike muligheter (Meld. St 32 (2016-2017) *Reindeer husbandry. Old tradition – unique opportunities*, in Norwegian only).

- The White paper National transport plan 2018-2029 (Meld. St 33 2016-2017, English summary)

Several agencies have prepared strategies and action plans addressing climate change adaptation. See further descriptions of concrete actions under 6.4.4 *Implementations and actions*.

6.4.1.3 **Legislation relevant to climate change adaptation**

Climate change adaptation concerns basic social structures, and a number of laws are therefore relevant, including rules on land use planning, contingency legislation, waterway legislation, legislation regulating various types of infrastructure, natural property legislation etc.

Planning is a core tool in the work to meet the challenges related to consequences of climate change. The Planning and Building act provides the framework for planning in Norway. This framework includes tools and requirements for local, regional and national planning. One such tool is the Central Government Planning Guidelines, which define certain areas of interest to be implemented in local and regional planning. Another tool is the national expectations regarding regional and municipal planning, issued every 4th year by the ministry. The Planning and building act is based on the principle of sustainable development.

The Environmental Impact Assessment framework and various guidelines and policies is revised as of 2017 and ensures that vulnerability due to climate change is included in environmental impact assessments

Pursuant to the Act of 25 June 2010 No. 45 relating to the Municipal Preparedness Duty, Civil Protection Measures and the Norwegian Civil Defence (Civil Protection Act), municipalities have a duty to identify the adverse events that could occur in their municipality, assess the likelihood of these events occurring, and assess how they could affect their municipality. The results of this work must also be assessed and compared in a comprehensive risk and vulnerability analysis. Municipalities must draw up contingency plans based on this analysis, have a municipal crisis team, and carry out exercises and other skills enhancing measures to ensure they are able to handle adverse events.

In June 2017, the Norwegian Parliament adopted a Climate Change Act (Lov om klimamål) which establishes by law Norway’s emission reduction target for 2030 and 2050. The act will have an overarching function in addition to existing environmental legislation. According to the act the government shall submit to the Parliament updated information on how Norway prepares for and adapts to climate change.

Within the different sectors, several laws are relevant – though to varying extents – to the climate change adaptation work. Relevant legislation include, inter alia:

- The Harbour and Fairway Act
- The Pilotage Act
- The Pollution Act
- Svalbard Environmental Act
- The Public Health Act

- Water resources Act
- The Natural damage insurance act
- The Natural damage compensation act
- The Land Act
- The Forestry Act
- Nature Diversity Act
- Marine Resources Act
- Aquaculture Act
- Act relating to the Control of Communicable diseases
- Act relating to food production and food services
- Act relating to municipal health and care services
- Act on health and social preparedness

6.4.2 Monitoring, reporting and evaluation

The Norwegian Climate and Environment Ministry is responsible for the overall reporting of the climate change policy in Norway, including reporting on adaptation progress. The national Climate Act commits the government to providing annual reports to the parliament on the status regarding adaptation. A national system for monitoring, reporting and evaluation (MRE) for climate change adaptation has not yet been implemented, but is under way.

The member states of the United Nations adopted in 2015 the Sendai Framework for Disaster Risk Reduction 2015- 2030. According to the Sendai framework, climate change adaptation is a central part of UN Member States' commitments to reduce risk and vulnerability. Norway is among the countries that have joined the framework and committed to implement. The UN General Assembly adopted in February 2017 a resolution (A/71/L.54) for the indicators and terminology relating to disaster risk reduction based on the work and a report by an open-ended intergovernmental expert working group. These indicators (38) are based on the seven targets of the Sendai framework for disaster risk reduction. The national reporting on these indicators will start in 2018.

6.4.3 Roles and responsibilities

A key principle in Norway's adaptation policy is that all sectors – private and public – are responsible for assessing and addressing the impacts of climate change on their areas of competence.

6.4.3.1 National level

All government agencies and local and regional authorities carry a responsibility for climate change adaptation within their field. The Norwegian Environment Agency supports the Ministry of Climate and Environment in the work on climate change adaptation, and is the coordinating agency. The Environment Agency assists the Ministry in the follow-up of the White Paper on climate change adaptation (Meld.St 33 (2012-2013)) and in policymaking. Furthermore, it contributes to ensure that the Government's climate change adaptation work is being implemented in the public administration as well as in society in general, and supports the Ministry in its international climate change adaptation work.

In its role as coordinating agency for climate change adaptation, the Environment Agency works to ensure that actors on local, regional and national level are taking account of and adapting to climate change. As part of the coordination tasks, the Environment Agency also gives guidelines and guidance to the county governors in their climate change adaptation work.

As part of the role as coordinator, the Environment Agency works to strengthen climate adaptation efforts in Norway, among others things by increasing the knowledge base for climate adaptation. The Agency has a particular responsibility for disseminating and sharing knowledge and experience, contribute to competence and capacity building, and facilitate cooperation between different public administration levels, sectors and actors in the field.

Climate change has implications for natural hazards, and several actors have responsibilities in this regard. The Directorate for Civil Protection (DSB) supports the Ministry of Justice and Public security in coordinating civil protection and emergency planning efforts in Norway, in order to prevent and limit consequences of natural hazards. The interdisciplinary approach of civil protection ensures that climate change is managed as part of a comprehensive risk approach, emphasizing the interdependencies between different sectors, different types of infrastructures, and different levels of planning.

The Ministry of Petroleum and Energy has the responsibility for floods, landslides and avalanches at the national level, with the Norwegian Water Resources and Energy Directorate (NVE) as an executive authority. As a support to the municipalities, NVE performs mapping programmes, warnings (flood, soil landslides and avalanches), gives advice in the spatial planning processes and offers technical and financial support in the planning and construction of structural protection measures.

A number of other sectoral agencies also carry a sector responsibility for climate change adaptation, see further descriptions of actions under 6.4.4 *Implementations and actions*.

6.4.3.2 **Regional level**

The county governor is important in following up the government's policy on regional and local level. It plays an important role in supporting and guiding the municipalities in their work on adaptation, particularly related to risk and vulnerability analysis and land use planning. They also coordinate and cooperate the civil protection efforts, both prevention and preparedness, on the regional level. The county governors have to ensure that climate change has been taken into consideration and followed up, both in planning and risk and vulnerability assessments.

The county municipalities also play an important role regarding guidance and coordination in relation to municipal and regional plans.

6.4.3.3 **Local level**

Climate change will affect a number of municipal tasks and areas of responsibility. Therefore, the municipalities are required to use relevant knowledge about current and future climate change as a basis in their planning activities and exercise of authority, for example in their application of legislation relating to civil protection and nature management, where they have vital responsibilities. The local authorities must also take climate change into account when applying the rules on the construction of housing, roads and other infrastructure. Climate change will also affect a number of other municipal services, such as provision of drinking water and waste water and waste management. Climate change considerations are particularly important in long-term planning for the development of municipal services and associated infrastructure.

6.4.4 Implementations and actions

Since Norway's 6th National Communication, important progress have been made in the climate change adaptation work, within and across a range of sectors.

Climate change create a need for a service that provides information on the current and future climate and play a part in translating climate science into practical adaptation work. The Norwegian Centre for Climate Services (NCCS) was officially established in 2013. The development of a national centre for climate services involves the Norwegian Meteorological Institute, the Norwegian Water Resources and Energy Directorate and the Bjerknes Centre for Climate Research including Uni Research. The Meteorological Institute has overall responsibility for the centre.

One important reason for establishing a centre for climate services was to provide a basis for climate change adaptation to be implemented in the municipalities and by sectoral authorities. In 2015, the centre issued a synthesis report "Climate in Norway 2100 – a knowledge base for climate adaptation", based on the 5th Assessment Report of the IPCC.[35] The information for individual counties has later been published as so-called "county climate profiles". The climate and hydrological projections for Norway are available at the NCCS's web site and can also be downloaded for use in further research on the effects of climate change[36]. The centre also participates in a number of research projects involving various user groups to increase the dialogue with decision makers to develop targeted products for use in climate change adaptation.

Furthermore, in the wake of the white paper on climate change adaptation, the Government appointed a committee to evaluate the current legislation and as appropriate make proposals for amendments to provide a better framework for the municipalities responsible for managing storm water, to deal with the increasing challenges associated with urban floods as a result of climate change. The committee launched their report with proposals for amendments in December 2015 (NOU 2015 -16) *Overvann i byer og tettsteder – som problem og ressurs* (Storm water runoff in towns and cities - As problem and a resource, in Norwegian only). The official report on urban storm water is further described in the section *Urban storm water management.*

In the white paper on climate change adaptation, the need to better integrate adaptation to climate change into the municipal responsibilities in order to enable the municipalities to ensure

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[35] For further information about the report, see chapter 6.2 *Climate change on the Norwegian mainland*

[36] For more information, see chapter 6.2 *Climate change on the Norwegian mainland*

resilient and sustainable communities also in the future, is emphasised. New guidelines describing how the municipalities and counties can incorporate climate change adaptation work into their planning activities is currently being developed.

In addition, a circular published by The Ministry of Climate and the Environment in 2016 provides guidelines for the use of objections in climate and environment related issues (T-2/16 *Nasjonale og vesentlige regionale interesser på miljøområdet – klargjøring av miljøforvaltningens innsigelsespraksis*, in Norwegian only). The circular includes requirements regarding climate change adaptation.

Research
The Ministry of Climate and Environment has identified Norway's research needs related to environment and climate, also addressing specific research needs related to climate change adaptation. The Ministry's priorities are presented in the document *Priority research needs of the Ministry of Climate and Environment* (2016-2021). Furthermore, improving understanding of climate change and good practices for adaptation is also highlighted in the current government's Long-term plan for research and higher education (2015-2024).

The Norwegian Research Council supports several research projects related to climate change and adaptation. KLIMAFORSK, a 10-year programme for climate research (2014-2023) is aimed at providing new, future-oriented knowledge of national and international significance, including enhanced knowledge about how society can and should adapt to climate change.

Another major activity addressing climate change adaptation supported by the by the Research Council of Norway, is *Klima 2050*. *Klima 2050* is a Centre for Research-based Innovation (SFI).The SFI status enables long-term research in close collaboration with trade and industry, as well as other research partners aiming to strengthen Norway's innovation ability and competitiveness within climate adaptation. The center is addressing societal risks associated with climate change and enhanced precipitation, storm water runoff and water induced landslides within the built environment. The program started in 2015 and will last until 2022.

During the period 2012-2015 the Norwegian Water Resources and Energy Directorate, the Norwegian Public Roads Administration and the Norwegian National Rail Administration joined forces in the research and development project NIFS: "Natural hazards, infrastructure, flood and landslides" (www.naturfare.no). Several other agencies and other actors participated in the project.

For further information about research related to climate change, see chapter 8 *Research and systematic observation*.

BOX 17: R & D programme Natural Hazards – infrastructure, floods and slides (NIFS)

The overall goal of the programme was to contribute to a safer society with more robust infrastructure, safer homes, safer transport and reliable avalanche/landslide and flood warnings. Important objectives were to generate new knowledge and develop good, effective and forward-looking solutions for handling different natural hazards through collaboration across agencies and areas of responsibility. The programme was divided into 7 technical sub-projects, and climate change adaptation and coordination with flanking projects was important for all the sub-projects. The project had a total budget of 42 million Norwegian kroner, and approximately 120 specialist reports were produced.

Information, capacity building and education

Several pilot projects concerning climate change adaptation and related issues have been conducted. In 2014, a guide on how to integrate climate change adaptation efforts in social and spatial planning related to disaster risk management for municipalities was prepared by the Troms County Governor, the Directorate for Civil Protection, the Norwegian Water Resources and Energy Directorate, the Norwegian meteorological institute, the Troms county authority and the municipalities Lyngen, Balsfjord, Målselv and Tromsø. As a follow up, three County Governors and The Environment Agency are currently developing a guide on how to address climate change adaptation related to the nature and environment sector in municipal planning activities.

Furthermore, The County Governor of Vestfold has developed an introductory course on climate change adaptation for municipalities. The course has later been implemented in several other counties.

In 2008, the web based information portal *klimatilpasning.no* was established. The portal intends to support the Norwegian society in preparing for the consequences of climate change. Local level practitioners being the main target group, the website provides tools, case studies and information on climate change adaptation. It also comprises information and tools relevant for the building sector and agriculture. The Norwegian Environment Agency develops and maintains the website, on behalf of the sectoral authorities.

The information campaign *Sjekk huset* (website sjekkhuset.no), commissioned by The Norwegian Environment Agency and The Norwegian Building Authority and conducted in 2016, offered information to private house owners on recommended measures to prevent damage on houses and cottages due to changing climate conditions. Climate adaptation measures suitable for gardens were also included.

Starting in 2017, The Western Norway University of Applied Sciences (HVL) offers an interdisciplinary master programme on climate change management, where climate adaptation in general, and particularly related to land use planning, is a core topic. For further information about education, see chapter 9 *Education, training and public awareness*.

Financial support to county councils and municipalities

A grant scheme to support regional and local authorities in their climate change adaptation work was established in 2015 by the Ministry of Climate and Environment and is administered by the Norwegian Environment Agency. Support is given to projects designed to strengthen the knowledge base on which municipalities build their climate change adaptation measures. Between 2015 and 2017, a total of approximately 15 million Norwegian kroner were distributed among about 50 different projects.

Networks and cooperation
The Cities of the Future (2008-2014) was a collaborative effort between the Government and the 13 largest cities in Norway to reduce greenhouse gas emissions and adapt to a changing climate. The network *Cities of the Future* was an important driving force for the climate change adaptation work in Norway. 11 of the participating cities are continuing the collaboration through *The front runner network*, established in 2015. This network focuses on developing new knowledge on climate change adaptation on local level and sharing competence among the participating cities through joint projects (see example below).

BOX 18: Cost-benefit analysis "Consequences of increased precipitation, sea level rise, storm surge wave and current conditions"

One of the major future climate challenges in Norway is flooding from extreme rainfall and storm surges. A pilot study analyzing two cities, Stavanger and Tromsø, indicates that the cities can achieve economic net profit by taking preventive measures against the consequences of climate change.

The cost benefit analysis estimates damage with and without preventive measures on existing buildings and infrastructure, and disruption of social functions due to flooding from the sea or due to extreme precipitation. The analysis does not cover damage to life and health, loss of natural diversity or cultural values. Even if the study applies a relatively simple methodology, it still gives an initial indication on the economic costs of climate change, and the potential value of adaptation measures. Among other things, there is a risk chart that identifies areas where it will be relevant, from an economic point of view, to implement climate adaptation measures in each of the two cities.

The study was conducted by the consultancy company COWI Denmark, commisioned by the two cities Stavanger and Tromsø.

An improved cross-sectoral cooperation has been established related to natural hazards, including climate change. In 2016 the network “Naturfareforum” – Natural Hazards Forum was established. The aim is to improve cooperation between national, regional and local actors in managing natural hazards, including the impact of climate change. The Natural Hazards Forum will identify gaps and the potential for improvement related to the society’s management of risk related to natural hazards, and initiate projects or working groups on cross-sectoral issues. The network is organised with a secretariat consisting of The Norwegian Directorate for Civil protection, The Norwegian Water Resources and Energy Directorate and The Norwegian Public Roads Administration, and a steering committee where a number of directorates and other national level actors, as well as The Norwegian Association of Local and Regional

Authorities (KS) and the Environment Agency, are represented. The Natural Hazards Forum acts as the national platform for the global Sendai Framework for Disaster Risk Reduction.

In addition to the public authorities, organisations in both the private and voluntary sector make important contributions to the climate change adaptation work. The Norwegian Association of Local and Regional Authorities support municipalities and county authorities in their work and carry out various capacity building and support activities related to climate change adaptation, including networks.

6.4.4.1 **Risk reduction and natural hazard management**

6.4.4.1.1 Introduction

Norway is a stable democratic society with low conflict levels, and one of the safest countries in the world to live in. However, we are experiencing serious events that may have disastrous consequences for individuals and major consequences for society. Dangers and threats with severe consequences may originate from a variety of causal factors both nationally and internationally. Some of the most important trends are related to climate change, political, economic, technological and demographic factors. The risk picture society faces is wide and complex and changes over time.

Climate change adaptation is often considered through a sectoral lens. To gain an overall picture of responsibilities for dealing with climate change, it is important to use a different starting point: the types of phenomena and events on which climate change is expected to have an influence. In Norway’s case, the main problems are expected to be water-related – in particular flooding, landslides and avalanches, stormwater, sea level rise and storm surges.

6.4.4.1.2 Civil protection and emergency planning

In Meld.St. 10 (2016-2017) *Risk in a Safe and Secure Society*, climate change is considered one of the major threats. Challenges related to natural hazards will probably increase in years to come, and good preventive work and active adaptation to a changing climate is crucial in order to handle these challenges. The white paper states that the Government will:

- support municipalities' work with societal safety and security in societal- and area-planning, maintaining its high quality to reduce the consequences of serious natural events, among other things through completing a national digital height and terrain model.
- improve society's ability to cope with flooding, landslide and avalanche risk.
- enhance municipalities' ability to include social security and climate change in its long term planning, by providing guidance and scientific-based knowledge.
- extend the natural insurance scheme to include property/land costs.
- actively contribute to the EU's and UN's work on societal safety and security, and follow up the UN adopted Sendai Framework for Disaster Risk Reduction 2015-2030

The Norwegian strategy for disaster risk reduction focuses on four priorities for reducing vulnerability and strengthening resilience. These priorities may also represent different stages in planning for disaster risk management (DRM):

- **Knowledge**: Assess risk and vulnerability at national, regional and local level. All relevant sectors and stakeholders should take responsibility for assessing their vulnerability, including both existing and future hazards (changes due to climate change, urbanisation, demographical/social changes, technological/economic development, etc.). Local knowledge of past and present experiences should be combined with available sciences and social science research as well as information available in databases etc. – they are supplementary elements of the knowledge base needed.

- **Prevention**: Avoid new risk and vulnerability by ensuring that development does not take place in hazard-prone areas, or by promoting protection measures in cases where such development cannot be avoided. Land-use planning; development of robust infrastructure, ecosystem based DRR; innovative urban design (e.g. creation of 'blue-green' structures); building restrictions etc. are key instruments to ensure development of resilient local communities.

- **Prevention**: Reduce existing risk and vulnerability through preventive measures in already developed areas, including technical (protective) installations; building enforcement; improvement of infrastructure; sustainable management of agriculture and ecosystems in order to enhance resilience; etc.

- **Preparedness and response**: Manage remaining risks by strengthening disaster preparedness and response at all levels, including monitoring and (early) warning systems; preparedness plans; information to the public; reconstruction programs ('build back better'), etc.

The report *Vital Functions in Society* (DSB 2017) identifies 14 vital societal functions. The designated vital societal functions are: Governance and Crisis Management, Defence, Law and Order, Health and Care, Emergency Services, ICT security, Nature and the Environment, Security of Supply (Food and fuel), Water and Sanitation, Financial Services, Power Supply, Electronic Communication, Transport and Satellite-based Services. Climate change will affect most of these vital societal functions. The Norwegian government has established a system of status assessments for these functions. Over a four-year period, the ministries will report to Parliament on status for the vital functions for which they are responsible. The status reports will largely be based on a risk and vulnerability assessment.

The National Mapping Authority (NMA) is currently working on developing a digital height and terrain model. The model will be largely based on new laser scanning data from survey aircraft. The program started in 2016 and is scheduled to finish in 2022. This model will help in many aspects of improving understanding of climate change impacts, for example in applications related to flooding, landslides, avalanches, and inundation from storm surges and sea-level rise. The NMA has now started work on inundation mapping using this new digital terrain model (where laser data is currently available in the coastal zone).

6.4.4.1.3 Urban storm water management

Several different authorities administer the legislation and determine the framework for municipal stormwater management in urban areas. Examples of the most important legislations are the Planning and Building Act, and the Pollution Control Act.

With growing cities and increasing precipitation, Norway has experienced an increase in frequency and cost of flooding events in urban areas due to uncontrolled storm water runoff. Today the annual total cost of storm water damage ranges from 1,6 to 3,6 billon Norwegian kroner. Recognizing the need for better storm water management, the Norwegian government established a committee in 2014 to assess the legal framework for urban storm water management. The committee published an official report in December 2015 (NOU 2015: 16) with recommendations on how to strengthen the capacity to implement urban storm water management plans. The recommendations consist of informative, legal and economic policy instruments that integrates with existing Norwegian legislation and governance. The committee proposed that property owners should be responsible for handling runoff from their respective premises, whereas local, regional and national authorities should be responsible for appropriate management frameworks and overall guidance. The committee suggests that early planning provisions for storm water management should be mandatory for both area planning and building authorities. Management plans should be catchment area wide and subject to stakeholder collaboration and joint action.

The committee emphasizes that the need for local measures should be subject to risk- and vulnerability assessments, cost- benefit analysis and continuous evaluation. Green infrastructure providing local infiltration, local retention and safe transport to a watercourse, can replace costly pipeworks, reduce storm water damage costs and offer environmental benefits. Hence, there is a potential to find solutions that will, in due time, be paid back by reduced storm water damage costs.

The relevant Ministries have welcomed the report and are looking into ways of implementing some of the recommended policy instruments.

6.4.4.1.4 Floods, landslides and avalanches

Climate change will increase the frequency of natural hazards and this entails a need for continuous climate change adaptation in order to prevent unwanted incidents that may endanger human life and affect key infrastructure and societal functions. The Norwegian Water Resources and Energy Directorate (NVE) has developed its second strategy for climate change adaptation (NVE's strategy for climate change adaptation 2015-2019 – summary in English)[37] that covers NVE's areas of responsibility. This includes how to use instruments such as flood and landslide hazard mapping, land use planning and protection measures as tools in climate change adaptation.

The general awareness regarding climate challenges has increased. The climate change effect on floods (Lawrence, 2016) is now included in flood hazard maps. Relevant knowledge has been incorporated in guidelines. For example, how to take climate change into consideration in design flood estimates, is included in the Dam Safety Guidelines. Particularly sensitive dams have been identified, and protection against flood and landslide hazards is included in the guideline "Flaum og skredfare i arealplanar" (Floods and landslides in land use plans, NVE, 2014). In a newly developed cost/benefit tool to assess and prioritize between protective flood and landslide measures, climate change effects are included.

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[37] https://www.nve.no/Media/3051/rapport2015_80.pdf

The observed and projected climate development in particular calls for measures to protect against floods, erosion and landslides in small, steep, mass-transporting rivers with a large potential for damage. A particular guideline for floods in small rivers has been issued (NVE, 2015) as well as guidelines and reports on landslide and avalanche mapping and protection (Øydvin, 2011; Fischer, 2014; Schanche, 2014; Schanche and Haugen, 2014).

NVE, as the national hydrological institution, will continue to monitor the effect of climate change on hydrology. A high level of R&D activity on the effect of climate change on hydrology and natural disasters is ongoing and will be maintained. There is a general need to reduce the uncertainty of climate and hydrological projections and to develop methods to quantify the uncertainty, communicate these results, and make decisions under increased uncertainty.

6.4.4.1.5 Sea level rise

The Norwegian Mapping Authority (NMA) is responsible for the operation and maintenance of Norway's sea level observing system. The system provides data on tides, sea level extremes (storm surges), reference levels for use in planning, and observed changes in sea level. This information, as well as sea-level projections, and guidance on how to use these numbers in planning are available on the website www.kartverket.no/sehavniva. Users can also access this information through an interface that allows them to integrate the data into their own applications.

In December 2017 the NMAlaunched a new web tool, which allowes users to map and visualize storm surges and future sea-level rise at a very detailed level. Users will also have the option of mapping infrastructure at risk and downloading data. The tool will be designed to give communities, planners and policy makers the information they need to understand and respond to the risks of sea-level rise and coastal flooding.

In addition to this, the NMA has two pilot projects aimed at improving datasets in the coastal zone that are important for vulnerability assessments and climate change adaptation planning. The first of these will focus on the connection between the height system used on land and vertical reference levels used at sea. The second project aims to map nearshore areas of the seafloor using water penetrating green laser from survey aircraft. .

6.4.4.2 **Environment, nature and ecosystems**

The white paper on climate change adaptation in Norway (Meld. St. 33 (2012 – 2013) – described above, constitutes the national strategy for adaptation measures, including for the natural environment. The white paper on biodiversity (Nature for life. Meld. St. 14 (2015-2016)) constitutes Norway's national biodiversity action plan. In both white papers the Government acknowledges that climate change will alter Norway's natural environment and entail a growing risk of losing characteristic species and habitats. Hence, climate change adaptation must be designed to support the capacity of species and ecosystems in order to adapt to rising temperatures, and to avoid any increase in the vulnerability of the environment. The white papers point to the importance of the principles that decisions affecting the environment should be based on scientific knowledge of the impacts of environmental pressures and on assessments of the cumulative environmental effects on ecosystems. These principles are stated in the Norwegian Nature Diversity Act (Act no. 100 of 19 June 2009) and must be followed when making any decisions affecting nature. The white papers also focuses on that the natural environment`s function as a buffer against many negative impacts of climate change. For example, wetlands may serve as effective buffers against flooding and forests may reduce the risk of erosion and avalanches.

A primary objective involves protecting the structure and function of the ecosystems. A major tool for this is ecosystem based management systems (developed on the basis of the Malawi Principles, laid down in the Convention on Biological Diversity). Integrated marine management plans are in place for all Norwegian marine areas (i.e. The Barents Sea and Lofoten, the Norwegian Sea and The North Sea and Skagerrak) and the management plans for the Barents Sea and Lofoten and for the Norwegian Sea has been updated in 2010 and 2017. The management plans are based on the ecosystem approach. They facilitate coexistence and coordination between different commercial activities such as offshore oil and gas extraction, maritime transport, fisheries, and other emerging activities such as off-shore renewable energy production. Management plans provide a framework for both existing and future commercial activities, while sustaining the structure, function and productivity of the ecosystems.

The Norwegian Environment Agency is developing a new strategy for the sectoral work on climate adaptation. The strategy aims to reduce the negative effects of climate change on nature and the environment. A changing climate will influence the use of, the distribution of, the levels and the effects of harmful substances. It also affects nature and ecosystems, and may influence outdoor recreation, an activity which is very important to many people in Norway. The Agency will therefore ensure that it has sufficient knowledge of how a changing climate influences its areas of responsibilities. The agency is responsible for an extensive number of monitoring programs, and possible effects of climate changes have been integrated in relevant programs. The Agency will also work to ensure that the effect of climate change have been assessed when developing new/revised regulations and that it is included in relevant risk-assessments before permissions to pollute are issued.

Norwegian Environment Agency coordinates the work of establishing a cohesive, ecosystem-based water management in Norway. The agency has undertaken a preliminary study with the aim to develop guidance of how to implement relevant adaptation actions in water management.

A workshop on climate adaptation in nature management was arranged in September 2016 (cf. workshop report: M-report 674/2016[38]) in which various types of adaptations or measures were discussed, among others planning work, administrative decisions, physical measures, amendments to statutes and regulations, information and advice, sectoral cooperation, monitoring and research and development (R&D). Following the strategy there will still be a need to develop action plans based on results from a.o. the workshop.

Securing a representative network of land areas through national parks, nature reserves etc is important for plants and animals that need to migrate as a consequence of climate change. In the existing work on expansion and adjustment of protected areas in Norway, such considerations are being included. Mountainous and Arctic areas are regarded as particularly

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[38] Miljødirektoratet 2016. Klimatilpasning i naturforvaltningen. Rapport fra workshop 7.-8. september 2016. (*Climate adaptation in nature management. Workshop report 7.-8. September 2016.*) M-Report 674.

vulnerable to climate change. In Norway approximately 33 per cent of the mountain areas is protected[39].

With regard to the cultural landscapes threatened by climate change due to increased growth and regrowth, a number of national and regional environmental programs and measures, which are aimed at securing cultural landscapes are in place.

Wetlands are particularly important with regard to climate change. Ecosystems along rivers are known as an important forms of insurance against flooding and erosion, and securing and restoring wetlands are regarded as win-win measures, which reduce climate vulnerability, store carbon and secure the habitat of many species. A number of wetlands are protected, and a national plan for restoration of wetlands for the period 2016-2020 has been developed by the Norwegian Environmental Agency and the Norwegian Agriculture Agency. The plan aims to meet the governmental goals connected to both climate change mitigation, biodiversity and climate adaptation.

A major contribution to the ecosystem based management of freshwater, is the comprehensive and cross-sectoral planning under the Water Regulations, which implement the EU Water Framework Directive in Norway. The regulations state that water must be managed as a whole, from mountain to fjord. Surface water, groundwater and coastal waters must be viewed in context. River basin management plans have been developed for all river basin districts, and include monitoring programs and measures to reach the environmental goals. A common European guide[40] has been prepared that provides guidelines for the management of catchment areas in a changing climate.

Many invasive alien species will have improved conditions for survival and reproduction owing to climate change in Norway. The Nature Diversity Act has a separate chapter on the importation and introduction into the environment of invasive alien species. In addition several regulations are in place which together provide Norway with a comprehensive and coordinated regulatory framework for better control of the invasive alien species. A cross-sectoral strategy has also been developed by 10 of the Ministries, which includes measures to be carried out by the different sectors, and measures that they must cooperate on accomplishing.

Through various international agreements, Norway has committed to a number of goals and strategies related to management of the natural environment. At the 13th Conference of the Parties to the Convention on Biological Diversity in 2016 a decision on biodiversity and climate change was adopted by the conference of the parties, focusing among others on nature based solutions to climate change. Nature based solutions for climate change adaptation have been getting increasing attention over the last years in Norway. In autumn 2017, an assessment of possible and existing nature based solutions to climate challenges such as flooding,

[39] Miljødirektoratet 2015 Miljøstatus.no: *(Norwegian Environmental Status*)

[40] European Commission (2009) River basin management in a changing climate. Common implementation strategy for the water framework directive (2000/60/EC). Technical Report 2009–040. Guidance document No. 24

avalanches, runoff water and sea-level rise in Norway, was published[41]. The report included an evaluation of their effectiveness and brief analyses of cost-benefits, and concluded among others that nature-based solutions generally are cheaper particularly in the implementing phase and may have positive co-benefits. However, they are often not as effective as technical solutions with regard to meeting specific climate challenges. Hence, both nature-based and traditional solutions are needed.

The OSPAR Convention (Oslo/Paris Convention for the Protection of the Marine Environment of the north-east Atlantic) regulates the marine environment in the north-east Atlantic, especially with regard to pollution of the sea and protected marine areas. Marine fish resources are also managed at an international level, by e.g. quota negotiations with other countries and by regional fisheries organisations. The International Council for the Exploration of the Sea (ICES) plays an important role here.

Guidance about climate change adaptation and nature management towards local and regional level has been developed during the last years and is collated in the two web-portals: www.miljokommune.no and www.klimatilpasning.no. County Governors and The environment Agency are currently developing a guide on how to address climate change adaptation related to nature and environment sector in municipal planning activities.

6.4.4.3 **Human life and health**

6.4.4.3.1 Human health

The Norwegian Public Health Act is intended to induce societal changes that promote public health. Regional and local authorities shall have an overview of their respective states of public health and the factors that may have an effect on them. Regional and local authorities shall undertake the actions necessary to meet their respective public health challenges. Such action may be undertaken in anticipation of emergencies having public health implications.

Scope of the Norwegian Public Health Act includes the mitigation of likely threats to public health from climatic conditions, potential floods and the seasonal incidence of high pollen concentration in the air etc. Pre-emptive action is required to meet health threats from the deficiencies in the maintenance of water works. These actions are to be undertaken in accordance with the Norwegian Planning and Building Act, etc.

The Norwegian Public Health Act has also assigned to various government institutions certain responsibilities concerning health in general, the level of competence in social medicine in local authorities, emergency preparedness, internal quality assurance and supervision.

The annual white paper of the Norwegian Ministry of Health and Care Services defines the range and scope of the public health activities at national, regional and local levels. Norwegian Directorate of Health provides detailed guidelines on those activities as well as the public

[41] Magnussen, K, Wifstad K Seeberg AR, Stålhammer K, Bakken SE, Banach A, Hagen D, Rusch G, Aarrestad PA, Løset F og Sandsbråten K. 2017. *Naturbaserte løsninger for klimatilpasning*. Menon-Publikasjoner 61/2017.

health issues related to the environment. In 2017, a survey was undertaken in order to determine the competence of local authorities to manage major accidents and crises.

6.4.4.3.2 Outdoor recreation

The Norwegian authorities have stated a goal that everyone shall have the opportunity on a daily basis to take part in outdoor recreation. A white paper on outdoor recreation, *Friluftsliv – natur som kilde til helse og livskvalitet* (Outdoor recreation – *nature as a source of improved health and life quality*, in Norwegian only), was adopted by the Storting in 2016. The white paper mentions consequences that climate change is expected to have on the conditions for outdoor recreation and the need to take climate change adaptation into account in the management of outdoor recreation areas and trails.

6.4.4.4 **Infrastructure and buildings**

6.4.4.4.1 Transport

The National Transport Plan is submitted to the Storting in the form of a white paper from the Ministry of Transport and Communication every four years. It sets forth the Government's transport goals and strategies in a long-term perspective. The current National Transport Plan (2018 – 2029) provides principles for integrating climate change and climate change impacts in planning and prioritization processes. In addition, and in accordance with the requirements of the Ministry of Transportation and Communication, the transport agencies developed strategies for civil security in transport, where adaptation to climate change is an integral part[42].

The transport sector is working on adaptation to climate change by intensifying its work on management of natural hazards, and has among others participated in the R&D programme "Naturals hazards – Infrastructure, floods and landslides" (NIFS)[43], as well as in the follow-up of the programme, "Nature Hazards Forum" (Naturfareforum). [44]

The transport agencies Avinor, The Norwegian Public Roads Administration and The Norwegian Railway Directorate services are also partners in Klima 2050, a centre for research based innovation related to climate adaptation.[45]

Bane NOR is continuing to develop the system for warning during extreme weather events and flooding, expanding the cooperation with NVE using the national warning system for floods, landslides and avalanches. The Norwegian Public Roads Administration is currently working on a similar system.

Maritime transport

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[42] Strategi for samfunnssikkerhet i samferdselssektoren (Norwegian Ministry of Transport and Communication 2015, Strategy for civil security in the communications sector, in Norwegian only) https://www.regjeringen.no/contentassets/88bc393f2779462a9bc39768735e98fd/statsamfsik2015.pdf

[43] Naturals hazards – Infrastructure, floods and landslides" (NIFS) is further described in section 6.4.4. *Implementations and actions*

[44] Nature Hazards Forum is further described in section 1.4.4 *Implementations and Actions*

[45] Klima 2050 is further described in section 1.4.4 *Implementations and Actions*

In maritime transport, the Norwegian Coastal Administration (NCA) will carry out risk and vulnerability assessments in order to adjust infrastructure projects to climate change. The NCA has implemented a *Climate and Environmental Strategy* (2016-2018). In addition to its related Action plan, the strategy outlines how the NCA must contribute to meet both national goals and international environmental and climate obligations.

Road

The Norwegian Public Roads Administration adopted a Strategy and is developing an Action plan for civil security (and climate change adaptation). The points of the Action plan comprise the learning and experience from ten years of work on adaptation to climate change, and include i.a. regular updates of guidelines for design and maintenance, intensified work on management and warning systems for natural hazards, better methods and procedures for vulnerability mapping and implementation of adaptation measures on roads and road structures.

Railway

Bane NOR decided on a new Action plan for Civil protection, including adaptation plans for climate change in fall 2016. Bane NOR is continuously revising handbooks, guidelines and standards for both maintenance and construction of new infrastructure to account for the effects of climate change, based on the recommendations given by national guidelines.

Aviation
In 2008-2011, safety areas at the sides and ends of runways at several of Avinor's airports were expanded. Climate change projections were decisive for decisions related to the dimensioning of the projects ensuring critical infrastructure should be able to withstand future storms and increased precipitation. In 2014, Avinor carried out a risk assessment of all its airports, including connected navigation systems and surface access to the airports. This identified several challenges regarding climate change such as drainage issues, wind issues and flooding issues. The next step is to implement measures regarding climate change in the early stages of project plans such as increased drainage capacity (this is already done in relation to an expansion project at Oslo Airport where it was decided to add 50 per cent drainage capacity compared with the drainage systems from the 1990s, when the airport was constructed), choice of building materials, resolving drainage issues et cetera.

Avinor also works with climate adaptation through ICAO and the Airport Council International (ACI).

Aviation is a very risk averse industry, and safety is of paramount importance. The airspace and runways are under continuous surveillance, so if weather and/or surface measurements indicate it, air traffic can be diverted and the airports can be closed for shorter or longer periods of time.

6.4.4.4.2 Power supply

The energy sector must adapt to climate change in order to ensure supply reliability. Several policy instruments are in place. These instruments also take into consideration risks related to anticipated future climate change. The Norwegian Water Resources and Energy Directorate (NVE) follow this up through licensing and inspections. Requirements are also set by NVE to electricity utilities in terms of proper contingency planning, available spare parts, transport and communication systems, training etc., to enable an efficient restoration of electricity supply. Furthermore, NVE conducts research and development in the light of anticipated challenges of the energy sector and climate change by participating in national and international programs and projects.

6.4.4.4.3 Buildings

Impacts of climate change are of vital importance to requirements of the home and construction sector, and a huge effort has been made in order to increase the knowledgebase. SINTEF Building and Infrastructure has conducted a risk and vulnerability assessment and has proposed measures for reducing climate vulnerability and strengthening the adaptive capacity of this sector.

Owing to the increased exposure to humidity and risk of rot in a changing climate, the Norwegian Institute of Wood Technology and Norwegian Forest and Landscape Institute is conducting research aimed at developing new methods of protecting wood against humidity- and rot damage.

In addition, the Government published in 2012 a white paper "Good buildings for a better society. The white paper also highlights the need to address climate change impact in the building and construction sector.

Pursuant to the Planning and Building Act it is mandatory for planning authorities to ensure that risk and vulnerability analyses are carried out.

Climate change adaptation is integrated into the planning and building act and technical building regulations (TEK 17). Technical regulations requires that buildings shall withstand the stresses they are exposed to, and to some extent may be exposed to in the future. Examples are requirements relating to the siting of buildings, moisture protection, indoor climate, structural safety and the selection of suitable products and materials.

6.4.4.5 **Business and industry**

BOX 18: Report "The Norwegian State's Direct Ownership of Companies Climate Related Risks"

Climate change poses a serious economic and financial threat to both the public and private sectors due to physical, market, operational, regulatory, reputational, resource and subsidy risks. There is a clear business case for companies to take action to mitigate and adapt to the risks of climate change in order to minimize the financial consequences for shareholders and customers. In order to gain insight into how the state as owner is exposed to risks of climate change through partial or full ownership of companies, The Norwegian Ministry of Trade, Industry and Fisheries (NFD), in cooperation with five other ministries, commissioned a study which was conducted by Trucost. 37 companies, fully or partly state owned were analyzed, and assessments on how the companies meet the government's expectations in regard to climate and environment were also included. The findings of the study are presented in the report The Norwegian State's Direct Ownership of Companies – Climate Related Risks, published in 2017.

Expert commission – climate risk

Both climate change and measures to counter it affect conditions for and risks associated with economic activity. This recognition has led to increased demand for decision-relevant information on the exposure of financial institutions and other businesses to climate-related risk.

On 6 October 2017, the Solberg Government appointed an expert commission to assess climate-related risk factors and their significance for the Norwegian economy. The commission, has been asked to deliver its recommendation to the Ministry of Finance by 14 December 2018.

6.4.4.5.1 Agriculture and forestry

Adaptation in the agricultural sector is crucial in order to prevent and limit the damages from extreme weather events as well as gradual changes in climate. Adaptation is also important for utilisation of the potential productivity benefits of climate change. Agriculture and forestry sectors also manage extensive areas, and proper management of these areas can prevent damage to other sectors and interests.

There is a continuous need to provide knowledge and approaches for the agricultural sector. In latter years, responses to climate change have been emphasized in programmes for knowledge development and support/extension services.

Since 2013, a climate- and environment programme has been in place to improve and disseminate know-how concerning environmental and climate problems and solutions in agriculture. It also comprises climate adaptation. The programme grants financial support to projects improving knowledge, studies and information. In 2017 NOK 18 million was allocated to the programme. Recently, the Solberg Government has granted money to establish a new project: “Climate Smart Agriculture”, which involves climate advisory service at farm level.

Various instruments and support schemes are in place to improve practices in agriculture and address abiotic and biotic stresses that confronts agriculture and livestock. We can distinguish between supportive systems working at a joint level, and grants and regulations operating at farm level.

Veterinary services within the livestock sector, and sanitary measures and services in the cropping sector, are crucial services to limit biotic stresses. Further, continuous use, development and conservation of animal and plant varieties is crucial to provide adequate varieties for future production.

In 2012 it was decided that grants can be allocated to support reserves of crop seed as a food security measure.

Genetic diversity and plant breeding are important in handling climate change. Economic support is given to increase the conservation and use of the genetic resources in plants, animals and forestry. In Norway, commercial agriculture is performed even far north. The short growing season with low temperatures, great variation in daylight and challenging winters give few comparable nations with similar growth conditions. Grants are given for plant breeding and seed production to ensure production of plant varieties suitable to Nordic climate.

To limit future reductions in harvest quantity and quality, the existing warning service for pest infestations could be enhanced. This service estimates and communicates the risk of attacks by plant diseases, insects and weeds for important crops in agriculture and horticulture. This is a useful tool for planning measures for crop protection.

At a practical level, there is a combination of regulation and support schemes to provide for adaptation and preparedness to climate change. Fundamentally, there are instruments to maintain the use of agricultural lands and pasture resources, which safeguards them for future use.

Climate changes will affect the production and demand of agricultural commodities on a global scale. This may affect Norway’s ability to import food, which means that an important measure to adapt to climate change is to ensure Norway’s self sufficiency. Food security has long been one of four overall goals for the Norwegian agricultural policy. This was continued with the white paper on agriculture (Meld.St. No 11 (2016-2017)) from the Ministry of Agriculture and Food. The white paper also states a goal of increased production on Norwegian resources.

Food security and increased production on Norwegian resources depends on protection of soil resources. Norway has very little farmland compared to other countries. Only 3 per cent of the land is cultivated soil, one third of which can be used for the production of food grains.

Between 2007 and 2015, about 6900 acres/year of cultivated land has been decided used for other purposes than agriculture. In 2015, the Norwegian parliament adopted the Government's strategy for protection of soil resources, stating that no more than 4000 acres of land/year should be used for other purposes than agriculture. The strategy promotes several measures to reach this goal within 2020.

Surplus rainfall and flooding impose challenges to harvests and field operations in agriculture. There is a support scheme to support investments in drainage systems for agricultural lands. Various support schemes are also in place to limit losses of soil and nutrients from agricultural land through the use of tillage practices, cover crops and other measures that limit exposure of soils over the winter period.

The Solberg Government proposes that the existing instruments for cultivation of forest stocks should be adapted to changes in climate, and the adaptation of existing legislation for forest health should be assessed with regard to climate change. In 2016, a multidisciplinary research program approaching advanced-generation breeding in Norway spruce was concluded, and the knowledge is now being implemented in future breeding programs. Further, NOK 10 mill. is being granted from public funds of a total budget of NOK 26,9 mill. to modernize and improve the facilities of The Norwegian Forest Seed Center.

The Ministry of Agriculture and Food has started to revise the regulations concerning the use of foreign species for forestry purposes.

Adaptation is being assessed in the revised regulations for planning and construction of agricultural and forestry roads and "Standards for agricultural and forestry roads" (both 2015), and a guidance – “Forestry roads and risk of landslides” - has been produced (2011). The guidance deals with the risk of landslides when building forestry roads in steep terrain and how to reduce such risks by correct construction of road and drainage systems. A circular about the regulations is under preparation by the Ministry for Agriculture and Food.

Climate change will have an impact on biological production systems and makes forestry and agriculture vulnerable to both gradual changes in climate and extreme weather events. Research and development projects, monitoring programs, international cooperation and dissemination will show how production in agriculture and forestry in Norway will be affected by climate change and how different production methods in different regions of the country can adapt.

Due to changes in the climate, production output in the Norwegian reindeer husbandry may be reduced. As a short term solution, to mitigate the effects of a changing climate, the number of reindeer herders utilizing trucks to transport reindeer between seasonal pastures has increased along with the number of herders practicing supplementary feeding.

6.4.4.5.2 Fisheries and aquaculture

A comprehensive effort aims to produce more knowledge about the role of the oceans in the climate system and consequences of climate change for marine ecosystems and resources.

The Ministry for Fisheries and Coastal Affairs has elaborated a climate strategy (2013). The goal of the strategy is to maximise the ability of the coastal and fisheries administration to meet the challenges of climate change and to promote reduction of emissions of greenhouse gases from the sector.

Norway has a well developed fisheries- and aquaculture management system. Environmental conditions in the marine environment has always varied and climate change is one of several causes for variability. It is the nature of the management system to be adaptive and deal with such changes no matter what causes them. Substantial changes in the organization of the management system or its major decision making processes are thus not foreseen.

6.4.4.5.3 Insurance and public compensation schemes

The insurance companies play an important role in reducing the economic risk borne by companies and private households. Two insurance/compensation schemes cover damage related to natural hazards: private fire insurance and the public Natural Disaster Compensation Scheme.

In accordance with the Natural Damage Insurance Act, every object insured against fire risks is also insured against natural damage on the same terms. This compulsory natural damage insurance strengthens society's resilience against natural hazards by providing economic means for the rebuilding of damaged buildings and some types of infrastructure.

The public Natural Disaster Compensation Scheme provides compensation for the rebuilding of damaged objects and infrastructure that can not be insured against fire risks, and works together with insurance to provide resilience against natural hazards. It only applies to privately owned property. Compensation is only paid when the applicant is rebuilding the damaged object. When compensation for rebuilding is granted the applicant can also apply for a grant to “build better”, limited to 20% of the grant for rebuilding and a maximum of NOK 30.000. This grant is a subsidy subject to individual assessment in each case.

Both the compulsory natural damage insurance scheme and the public compensation scheme contain common obligations for mitigation against natural hazards that may also mitigate against the consequences of climate change. Examples of statutory mitigation measures are adherence to public requirements, plans and risk mapping when building, maintenance, renewal and taking necessary protection measures against natural hazards. The consequences for the applicant of non mitigation are reduction of the compensation, up to 100 per cent.

BOX 19: Disaster Loss Reduction project: Using local insurance loss data to strengthen municipalities' efforts to prevent climate-related natural hazards

The project was initiated by Finance Norway in 2013, and is based on a recommendation in NOU 2010: 10 "Adapting to a changing climate" about using insurance claims for prevention purposes. The project was a cooperation between Finance Norway, a selection of insurance companies, Western Norway Research Institute, NTNU (Department of Geography) and ten pilot municipalities. The project was funded by Finance Norway and the Ministry of Local Government and Modernization. The overall objective of the project has been to clarify the potential and prerequisites for strengthening the prevention of climate-related natural damage by testing out the usefulness of access to insurance companies' damage compensation data (disaster loss insurance data). The main focus of the project has been urban storm water problems, but natural damage related issues such as landslides, storms, floods and storm surges has also been included in the project. The main conclusion of the project is that it is useful for the municipalities to gain access to the insurance industry's damage compensation data.

6.4.4.5.4 Cultural heritage

Owners and managers of cultural monuments and cultural environments are facing greater challenges in the future in terms of preserving the cultural heritage in a changing climate. Well maintained buildings and other cultural heritage objects and environments will become increasingly more important in the future.

Collecting and preserving artefacts melting out of the ice due to warmer climate is an important task. It gives us new knowledge of the use of the mountains and daily life in earlier times. Oppland County Municipality, among others, has conducted extensive investigations and a climate park has been established at Juvfonda.

The Cultural Heritage Directorate, initiated and conducted together with NIKU (Norwegian Institute for Cultural Heritage) in 2015 a pilot project with Aurland municipality in order to develop good administration of cultural heritage and cultural environments in a changing climate. Goals for the project was to gain experience and knowledge, develop management of all administration levels and to minimize loss of cultural heritage values due to climate change. The directorate is now involved as a co-lead partner in the interreg project Adapt Northern Heritage, partly financed by the Northern Pherephery and the Artic Programme. The methods developed in the Aurland project will be further developed.

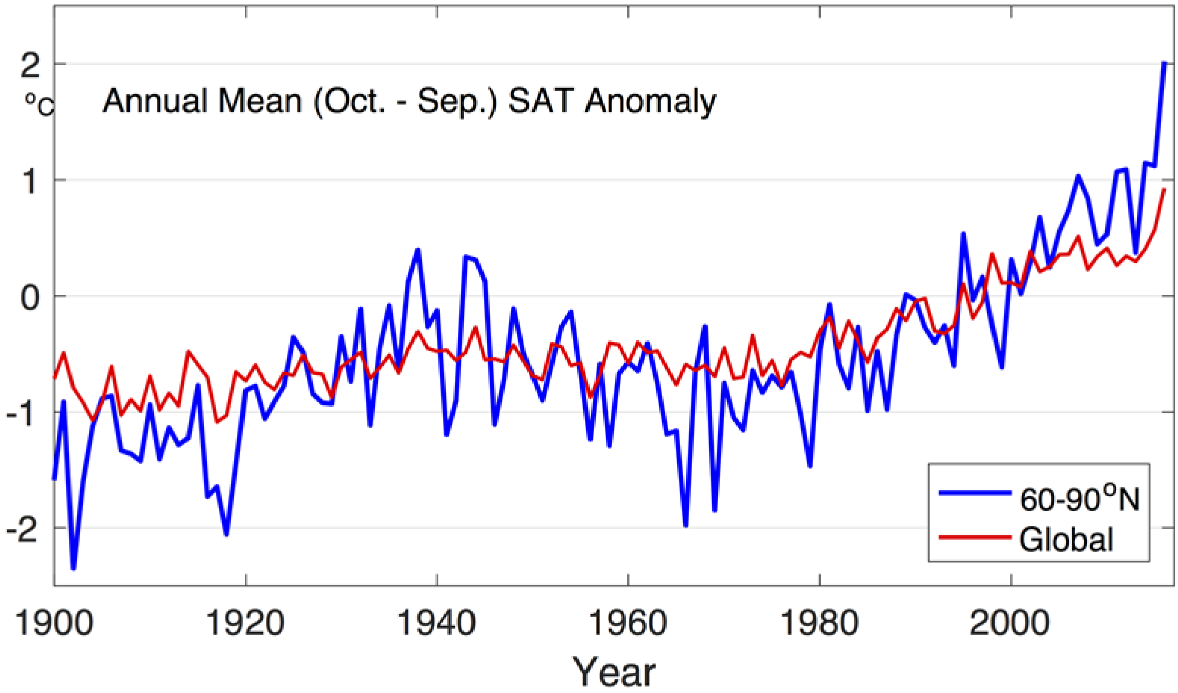
6.5 The Arctic

This chapter presents specific challenges to the Arctic region, which have not been covered in the previous chapters. The Norwegian Arctic is here defined as the Arctic waters under Norways jurisdiction in the Barents- and Norwegian Sea, as well as The Svalbard archipelago and the island of Jan Mayen. Areas with sub-arctic climate in northern part of mainland Norway is described together with the rest of mainland Norway.

6.5.1 Climate change in the Norwegian Arctic

According to SWIPA (2017)[46], the Arctic for the past 50 years has been warming more than twice as rapidly as the world as a whole. Sea temperatures are also increasing, both near the surface and in deeper water. Sea ice extent has varied widely in recent years, but continues a long-term downward trend. A record low minimum sea ice extent occurred in 2012, and a record low maximum sea ice extent occurred in 2016. Sea ice thickness in the central Arctic Ocean has declined by 65 per cent over the period 1975-2012. Most sea ice in the Arctic is now "first year" ice that grows in the autumn and winter, but melts during the spring and summer. The Arctic Ocean could be largely free of sea ice in summer as early as the late 2030s, only two decades from now.[47]

Figure 6.5 *Trends in average global (red line) and Arctic (blue line) temperature relative to the 1981-2010 mean, 1900-2016.*



Source: NOAA Arctic Report Card, 2016. The data are from the CRUTEM4 dataset, which is available at www.cru.uea.ac.uk/cru/data/temperature/.

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[46] AMAP, 2017. Snow, Water, Ice and Permafrost. Summary for Policy-makers. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 20 pp

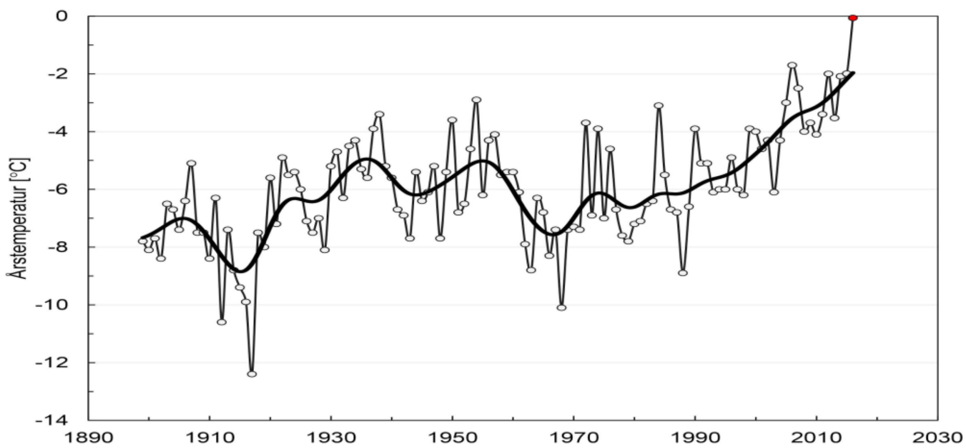
[47] Ibid.

SWIPA (2017) also states that the snow cover has continued to decrease in the Arctic, with its annual duration decreasing by 2 - 4 days per decade. The permafrost warming continues, and the layer of the ground that thaws in summer has deepened in most permafrost areas. The loss of land-based ice has accelerated in recent decades, and since at least 1972 the loss of land-based ice in the Arctic accounts for more than a third of global sea-level rise. In addition to the Arctic's role in global sea-level rise, the Arctic warming appears to be affecting weather patterns also in lower latitudes.

Svalbard is presently amongst the areas in the globe with fastest warming, and during 1979-2015 the annual temperature has increased by 1,3 °C/decade and the winter (DJF) temperature by 2,3 °C/decade (Gjelten et al., 2016).

The Svalbard archipelago is situated in one of the most important areas for energy transport to the Arctic, and thus variations in atmospheric and oceanic circulation patterns leads to large natural temperature variability (Figure 6.6). Cold periods occurred in the early 20th century and in the 1960s, while mild periods were observed in the 1930s and 1950s. From around 1970, the temperature has increased significantly.

Figure 6.6 *Annual mean temperatures for Svalbard Airport (Longyearbyen) during 1898-2016. The bold black curve illustrates smoothed variations on a decadal scale*



At Svalbard, the measured annual precipitation is rather low, e.g. around 200 mm/year at Svalbard Airport/Longyearbyen and 385 mm/year at Ny-Ålesund. Despite the low annual precipitation, heavy rainfall events may occur. Thus at Svalbard Airport more than 40 mm rainfall during one day was recorded in August 1981 and November 2016; and in Ny-Ålesund 98 mm in one day in January 2012; i.e. at both sites ¼ of the average annual precipitation may fall during just one day. Such events may trigger landslides and avalanches as well as local flooding. Since 1912, the annual precipitation at Svalbard Airport has increased by about 2 per cent per decade. Snow measurements at Svalbard Airport during 1976-1997 show an average of 253 days/ year with snow cover, while during 2006-2016 the average was 216 days/year. During the latest 40 years there has been a weak decline in frequency of high wind speeds at Svalbard Airport.

According to SWIPA (2017), recent climate model simulations indicate that average autumn and winter temperatures in the Arctic will increase to 4 - 5 °C above the late 20th century values before mid-21st century, under either a medium or high greenhouse gas concentration scenario. This is twice the increase predicted for the northern hemisphere as a whole. The projections indicate increase in cold-season precipitation of 30-50 per cent over the Arctic Ocean toward the end of this century, with an increasing portion of that precipitation falling as rain rather than snow. The duration of snow cover is projected to decrease by 10-20 per cent from current levels over most of the Arctic by mid-century under a high emission scenario, and the area of near-surface permafrost will decrease by around 35 per cent under the same scenario. Many of the smallest glaciers across the Arctic would disappear entirely by mid-century (SWIPA 2017).

According to SWIPA, Svalbard is among the Arctic areas with the strongest projected warming. Local projections for the Svalbard region also indicate substantial warming also in this part of the Arctic (Isaksen et al., 2017). For the Longyearbyen area, results from regional climate models indicate an increase in annual mean temperature of 3,5 to 9,0 °C up to the end of the century depending on emission scenario. The winter warming may be 13 °C under the worst emission scenario. However, several of the global models are hampered by an overestimation of the sea ice extent in the Svalbard region, and thus modelling too low “present day” temperatures in this region. This may lead to too high estimates of future warming. Consequently it is important to select models with representative measures of sea ice and local temperatures in the present day climate.

Figure 6.7 *Projected temperature change for the year, winter (DJF) and summer (JJA) from 1989-2000 to 2089-2100 based on the RCP8.5 scenario. Average sea ice border (80 per cent ice concentration) for the period 1989-2000 is shown as a light blue line for the two seasonal maps. For the scenario period, the ice border is north of Svalbard.*

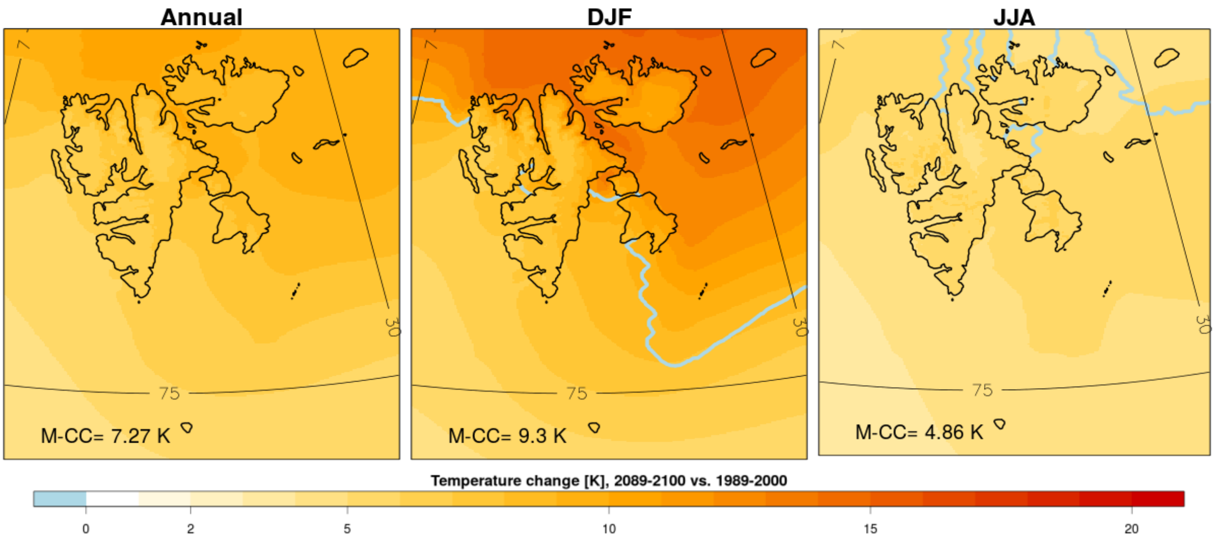


Figure 6.7 illustrates results from simulations with a regional climate model which provides realistic present day temperatures for the Longyearbyen area. The results are based on rather short present and future time periods, but illustrate the stronger warming during winter than summer, and that the warming is stronger in northeastern parts (Nordaustlandet and the Barents Sea) than at the southwestern coast of Spitsbergen. The strongest warming is found in areas where sea-ice is replaced by open water.

Monitoring of permafrost in Svalbard started in 1998, and the results show that the temperature on average has increased 0.8 °C per decade in the upper part of the permafrost. The active layer has become 25-30 cm thicker since 1998. The permafrost warming has accelerated in the latest decade. During the 21st century sites close to sea level are modelled to undergo some permafrost degradation and thus to develop layers of year-round unfrozen ground above the remaining permafrost.

Results from regional climate models (Arctic CORDEX) project an increase in both annual and seasonal precipitation. For the medium emission scenario the annual precipitation in the Longyearbyen area is projected to increase by ca. 30 per cent towards the end of the century (Isaksen et al., 2017). The projections also indicate a substantial increase in frequency and intensity of days with heavy rainfall. For the winter half-year it is estimated that number of days with precipitation as rain will triple compared with present-day climate. In interior parts most of the winter-time precipitation will be as snow, and may lead to an increase in maximum snow depth in these areas. Recent simulations indicate increased frequency of cyclones moving into the Barents Sea towards the end of the century. An increase in average wind speed is projected for areas east of Svalbard, while the wind speed tends to decline in the Longyearbyen area, particularly during winter. [48]

6.5.2 Vulnerability to climate change and expected impacts on biodiversity and natural ecosystems

The decline in sea ice thickness and extent, along with changes in the timing of ice melt, are affecting marine ecosystems and biodiversity; changing the ranges of Arctic species; increasing the occurrence of oceanic algal blooms; leading to changes in diet among marine mammals; and altering predator-prey relationships; habitat use, and migration patterns (SWIPA 2017). Terrestrial ecosystems are being affected by rising temperatures, changes in precipitation and snow cower and thawing permafrost, altering species distribution and habitats. The occurrence of rain-on-snow and winter thaw/refreezing events affects grazing animals by creating an ice barrier over lichens and mosses.

The comprehensive Arctic Biodiversity Assessment (ABA) from CAFF (CAFF 2013) concludes that "climate change is by far the most serious threat to Arctic biodiversity and exacerbates all other threats". CAFF also published the report "State of the Arctic Marine Biodiversity" in 2017, which builds on the ABA, and compiles available knowledge and monitoring data on a specific set of marine ecosystem components. The report gives an overview of detectable changes in biodiversity in different Arctic regions, including northern parts of the Norwegian Sea and the Barents Sea. Impacts of climate change on biodiversity in the Norwegian Arctic areas have been assessed in three recent national reports (Arneberg, P. et al. 2017; Quilfeldt & Øseth

[48] The Norwegian Centre for Climate Services (NCCS) will in the coming two years prepare and analyze climate and hydrological projections for the Norwegian Arctic. The results will be published in a report similar to the report Climate in Norway 2100.

2016; Forsgren et al 2015)[49] and climate change impacts on wildlife in the Svalbard Archipelago have been reviewed by Descamps et al. (2017).[50]

According to ABA, the distribution of flora and fauna is shifting northwards as the Arctic continues to warm. While low Arctic species are expected to move into the high Arctic, some high Arctic species and ecosystems are expected to disappear or remain only as isolated fragments in high mountain areas. In the ocean, loss of sea ice is already affecting the timing and patterns of primary production, altering food webs and reducing the availability of sea ice to walrus and ice seals for resting, molting, breeding and rearing young. The total loss of some key habitats such as multi-year pack ice is expected. In the process of rapid change and transitions, new combinations of species are altering Arctic ecosystems.

The pace of the temperature rise in the Arctic is very high, causing difficulties for the Arctic species to adapt. The consequences of climate change on Arctic marine biodiversity are difficult to forecast. This is partly due to the fact that current biodiversity monitoring is not sufficient to describe status and trends for many arctic species[51] but also because the ecological changes that are detected vary between the Arctic regions. A number of Arctic species are shifting their ranges northwards to seek more favourable conditions as the Arctic warms. Many species and habitats that are characteristic of the Arctic today, however, will be unable to move further north to find new areas of habitat with a suitable climate. Species and ecosystems associated with the sea ice are particularly vulnerable to climate change, and risk having their ranges severely restricted or disappearing due to loss of sea ice. This includes polar bears, hooded seals, harp seals, ringed seals, narwhals, little auks, ivory gulls, polar cod and a number of species, like algae and small animals living inside the sea ice. The Svalbard area and the Northern Barents Sea is loosing sea ice faster than most parts of the Arctic, and the risks from climate change to ecosystems and species in these areas are high.

Rising temperatures will continue to result in a northward shift in the distribution of species and habitats. The Arctic species and habitats found in the region are gradually displaced by species and habitats that are currently found further south. Tundra areas north of the Arctic treeline are some of the terrestrial habitats that will continue to undergo the most dramatic changes as the permafrost thaws.

Marine ecosystems change as the sea temperature rises. Higher temperatures and the retreat of the sea ice allows more southerly species to move into Arctic sea areas, and purely Arctic species will meet growing competition, greater predation pressure and a higher risk of disease and parasites. Many seabird species are or will be expected to be negatively affected by

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[49]Quillfeldt, C.H.v., Øseth, E. (eds.). 2016. Klimaendringer på Svalbard - Effekter på naturmangfold og konsekvenser for den fremtidige naturforvaltningen; Forsgren, E., et al. 2015. Klimaendringenes påvirkning på naturmangfoldet i Norge. NINA Report 1210.

[50] Descamps, S., Aars, J., Fuglei, E., Kovacs, K.M., Lydersen, C., Pavlova, O., Pedersen, Å.Ø., Ravolainen, V. and Strøm, H. 2016. Climate change impacts on wildlife in a High Arctic archipelago - Svalbard, Norway. Global Change Biology - doi: 10.1111/gcb.13381.

[51] CAFF. 2017. State of the Arctic Marine Biodiversity: Key Findings and Advice for Monitoring. Conservation of Arctic Flora and Fauna International Secretariat, Akureyri, Iceland.

climate change. The distribution of commercially important fish species such as cod, haddock, herring and capelin have already changed, and may change more in the future.

The declining sea ice cover is making marine and coastal waters in the Arctic more accessible for fisheries, maritime transport, mining activities, cruise ships and oil and gas activities. If not managed properly, the increase in activity levels may lead to unsustainable harvesting, infrastructure development, habitat loss and fragmentation, the spread of invasive alien species, disturbance of the fauna, and the risk of pollution. Delegations from Canada, China, Denmark in respect of the Faroe Islands and Greenland, the European Union, Iceland, Japan, the Republic of Korea, Norway, Russia and the USA concluded negotiations in late 2017 on the draft *Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean*. Fishing in the The central Arctic Ocean, an area that is roughly 2.8 million square kilometers in size, has never been possible, nor is it likely to occur in the near future.

6.5.3 Vulnerability to climate change and expected impacts on society

In Svalbard, as in mainland Norway, climate change is increasing the risk of landslides, avalanches and floods, and result in more frequent and more severe extreme weather events, sea level rise and storm surges. Coastal erosion could also become a growing problem in Svalbard. Infrastructure such as roads, buildings and port facilities will be vulnerable to such natural hazards. Their isolation may make the settlements more vulnerable to climate-related events that disrupt critical infrastructure. Incidents of avalanches and landslides in or in close proximity of the settlements in Svalbard has happened in recent years. These incidents also effects outdoor activities and tourism.

The active layer (the soil layer above the permafrost that thaws each summer) is becoming increasingly deeper, which makes the ground unstable and is a threat to buildings and other infrastructure. Coastal erosion is also becoming a growing problem for buildings and cultural heritage sites near the shoreline in Svalbard, since wave action will increase as sea ice is lost.

Research and the travel and tourism industry are important sectors in Svalbard that will be affected by climate change. The increasing length of periods without sea ice in the summer is making areas more accessible to cruise ships. At the same time, an earlier spring thaw and a reduction in ice cover on the fjords will shorten the season for snowmobile-based tourism, and restrict the areas available for such activities. There will be less opportunity for visitors to observe ice-dependent species and the travel and tourism industry will have to adapt its activities to a situation in which many species are under stress as a result of climate change.

Svalbard is one of the most important sites for scientific research in the Arctic. However, climate change affects research in a number of ways, including through changes in natural conditions and the accessibility of areas and biodiversity. The opportunity to study climate change in the Arctic is one of the drivers behind the growing interest in research and teaching activities in the archipelago. The great socio-economic value attached to this research is influencing the willingness to invest in research infrastructure and carry out projects and field work in Svalbard.

The warmer climate and loss of sea ice are also resulting in changes in activity patterns in the waters around Svalbard. Such changes in activity patterns may make it necessary to upgrade fisheries inspection, maritime safety, oil spill preparedness and response, and search and rescue capacity in these waters. Changes in temperature, precipitation and extreme weather events will affect offshore activities and maritime transport.

6.5.4 Adaptation measures

6.5.4.1 Ecosystems

The speed of climate change in the Arctic highlights the need for adaptation measures. Reports from the AMAP-led Arctic Council project Adaptation Actions for a Changing Arctic (AACA) (e.g. AMAP 2017[52]) and a report from the Norwegian Polar Institute (Quilfeldt & Øseth 2016) have assessed possible adaptation measures in the Arctic, including the Norwegian Arctic. One of the findings in the AACA project is that it is increasingly important to recognize the significance of natural capital, ecosystem services and resilience in the context of adaptation.

Climate change will pose considerable challenges for nature management in Svalbard. In the same way as in mainland Norway, it will be necessary to strengthen instruments to safeguard threatened species and habitats that may come under increasing pressure as a result of climate change, and increased accessibility and human impact due to less severe sea-ice conditions. Some measures have already been introduced in Svalbard in response to areas now being more accessible due to reduced sea ice. Regulations in and outside protected areas have been adapted to meet the challenges posed by climate change and increased traffic. The cruise operators (Association of Arctic Expedition Cruise Operators, AECO) have developed site guidelines which aim at safeguarding the environment and cultural remains. To reduce the risk of a shipwreck or grounding, carrying heavy bunker oil is prohibited in most of Svalbards territorial waters, and cruise ships that call in the nature reserves in the eastern part of Svalbard may not carry more than 200 passengers. In addition, compulsory pilotage has been introduced, and charting of the waters around Svalbard is being improved. For the emergency preparedness towards an acute pollution incident, a tool (PRIMOS) has been developed which collates mapped information about the environmental values in Svalbard. Climate change adaptation of management practice is one of the elements of the management plans that are being drawn up for the protected areas in Svalbard. These protected areas cover most of Svalbards land and territorial waters. Furthermore, an action plan from 2017 to prevent the introduction and spread of invasive alien species in Svalbard is being implemented, in part as a response to the fact that climatic barriers to invasive species are weakened due to climate change. At the same time Norway is following up the Arctic Invasive Alien Species Strategy and Action Plan 2017 from CAFF and PAME under the Arctic Council.

Results from the extensive research, monitoring and mapping of species and ecosystems are reported through the environmental monitoring program for Svalbard and Jan Mayen (MOSJ), which includes several indicators of impacts of climate change in Svalbard. An ecosystem-based monitoring program for land ecosystems in the Norwegian (Arctic *Climate-ecological Observatory for Arctic Tundra - COAT*[53]) has been developed during the last years. COAT is particularly designed to be able to detect impacts on climate change.

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[52] AMAP, 2017. Adaptation Actions for a Changing Arctic (AACA) - Barents Area Overview report. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 24 pp

[53] http://www.coat.no/

6.5.4.2 **Human activities and settlements**

Climate changes add strain to critical infrastructure in Svalbard that is already vulnerable, thereby creating a need for upgrading and adaptation. Climate-related incidents can also pose a threat to life and health. It is therefore important that land-use and community planning in the planning areas take climate change into account. The guide to land-use planning under the Svalbard Environmental Protection Act is currently being revised. A description of how the planning areas in Svalbard should take climate change into account will be included in the revised guide.

As a follow-up of the white paper no 15 (2012) on floods, landslides and avalanches it was decided as of 2014 that the Norwegian Water Resources and Energy Directorate should support the local authorities on Svalbard on the same terms as on the mainland. The support in mapping, land use planning, early warning, protection and crisis management related to floods and landslides will be prioritized based on a cost-benefit approach.

The integrated management plans for the Barents Sea–Lofoten area and the Norwegian Sea are important tools for overall adaptation of the framework for activities in Arctic seas to changes in the climate, environmental conditions and patterns of activity.

6.5.4.3 **Cultural heritage**

The cultural heritage on Svalbard is affected by climate change both directly and indirectly. The rising temperature and increased precipitation are affecting the conservation conditions for archaeological sites as well as cultural heritage buildings and other standing structures. Incresed coastal erosion due to less sea-ice and more wave activity is also threatening sites in the coastal zone. Consequently, the Governor of Svalbard is monitoring erosion at exposed cultural heritage sites, and has developed an archeological research plan for selected sites. The permafrost is thawing rapidly, and there is reason to believe that the conservation conditions of graves, among other things, have deteriorated. The thawing of the permafrost each summer is destabilizing the soil and thus exposes and degrades cultural materials, previously preserved in the ice. There is a great need for more knowledge about the effects of climate change on conservation of cultural heritage on Svalbard.

6.5.4.4 **Emergency preparedness**

By increasing the accessibility of Arctic marine areas to human activities, the need for search- and rescue operations also increases. Most of the Arctic has already been divided into search and rescue regions (SAR regions), but in certain areas the division of responsibility is unclear or inappropriate. Norway, Denmark (Greenland) and Russia have therefore agreed on a more suitable delimitation of our SAR regions. In response to the increase in activity and the wider geographical area of responsibility, it has been decided that the Governor of Svalbard's helicopter service is to be expanded from one large helicopter and one medium-sized helicopter to two large helicopters. In addition, a new search and rescue vessel of a suitable size for the new helicopters was planned to be available from 2014. This will strengthen search and rescue capacity in Svalbard and nearby sea areas.

Surveillance of ship traffic in the Arctic is established with national AIS-satellites and access to other AIS-satellite services. New AIS-satellites with enhanced functionalities will be added to the present constellation. Moreover, the global International Maritime Organization (IMO) introduced obligatory long-range identification and tracking of passenger ships, cargo ships

(300 gross tonnage and upwards) and mobile offshore drilling units (LRIT) also provides information on ship traffic. This means that Norway has access to information on maritime activity in Arctic waters, valuable for search and rescue operations, and other purposes.

Through the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (MOSPA), the Arctic countries have also strengthened cooperation, coordination and mutual assistance on oil pollution preparedness and response in the Arctic in order to protect the marine environment from pollution by oil.

The Pilotage Act and associated regulations are applicable to Svalbard. This means that the rules relating to the state pilotage service, compulsory pilotage and pilot exemption certificates are the same as for mainland Norway in the waters around Svalbard.

6.5.4.5 **Internationally**

There is effective, binding international cooperation in the High North, which promotes environmental protection and sound resource management. The Arctic Council is the most important arena for dealing with common challenges in the Arctic. In May 2017, all member states of the Arctic Council signed the Agreement on Enhancing International Arctic Scientific Cooperation, aiming at developing and expanding international Arctic scientific cooperation.

The Arctic Council has published a number of reports that synthesize and assess new knowledge on climate change and adaptation in the Arctic. Key drivers of change in the Arctic and possibilities for adaptation have been identified in projects on adaptation, resilience, ocean acidification, freshwater as well as snow, water, ice and permafrost, marine biodiversity and invasive alien species.

7 Financial resources and transfer of technology, including information under articles 10 and 11 of the Kyoto protocol

7.1 Introduction

Norwegian climate finance is mainly concentrated in three areas; reducing emissions from deforestation and forest degradation, renewable energy, and climate adaptation including risk reduction. Norway has long emphasised the strong inter-linkages between climate change and development.

Norway has made a wide range of financial contributions related to the implementation of the Convention, including through multilateral institutions such as The Global Environment Facility, The Green Climate Fund and the Intergovernmental Panel on Climate Change, as well as other financial institutions that fund climate change adaptation, mitigation, capacity building and technology cooperation programmes in developing countries.

Historically Norway has been a major contributor of climate finance to developing countries. In 2016, total public development climate finance amounted to NOK 4 339 million. Of this, 3 554 million was earmarked climate change, and 785 million was estimated climate shares of core support to a selection of multilateral organisations. In 2015, total public development climate finance amounted to NOK 5 257 million. Of this, 4 354 million was earmarked climate change, and 903 million was estimated climate shares of core support to selection of multilateral organisations.

The Norwegian Government's White Paper to Parliament "Common Responsibility for Common Future" (April 2017) establishes that Norway will continue to be at the forefront of efforts to safeguard climate and environment in line with developing countries' own plans. According to the guidance for preparation and approval of Norwegian support, an assessment should be made of the relevance of the project or programme to the recipient country and/or cooperation partner's priorities and plans. If the cooperation partner is not the authorities of the grant recipient country, the guidance underlines that it might be relevant to assess the project's relevance to the target group and the needs in the recipient country. This is aiming at ensuring that the resources effectively address the needs of developing country parties. When relevant and possible, multi-annual agreements are entered into for better predictability in the flow of funds.

7.2 Provision of 'new and additional' financial resources

The overall objective of Norwegian development cooperation is to fight poverty, save lives and alleviate suffering, in accordance with the humanitarian imperative. The strong inter-linkages between climate change and development has been emphasised, as well as the linkages between the Paris agreement, the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction.

There is no internationally agreed definition of what constitutes "new and additional" resources under Article 4.3 under the Convention. One frequently used definition, supported by many countries, is that climate financing should be additional to the international development aid goal of 0.7per cent of gross national income. Norwegian total ODA has exceeded 0.7 per cent of Gross National Income (GNI) for many years. According to the definition above, Norway's climate finance could be viewed as new and additional. The volume of the Norwegian ODA budget has steadily increased as the economy has been growing. The increase has covered the increase in climate finance, including the Government of Norway´s International Climate and Forest Initiative, which since 2008 has contributed new and additional climate resources (see 7.4.3 below.)

Furthermore, as is underlined in the 2030 agenda, we acknowledge the importance of taking into account the three dimensions (social, economic and environmental) of sustainable development. Well-designed actions can produce multiple local and global benefits, including those related to climate change. Efforts are being made, where relevant, to integrate climate change concerns into all our development efforts. This is not always captured in the report or in the numbers. It is sometimes difficult to single out assistance for adaptation from more general development assistance, which often also contributes to improving resilience to climate change.

7.2.1 Global Environment Facility

The Norwegian government`s contribution to the Global Environment Facility for the period 2013-2016 was approximately NOK 430 million. In addition, NOK 74 million was disbursed to The Least Developed Countries Fund and The Special Climate Change Fund. In GEF 6 (2014-18), the climate change focal area receives approximately 26 per cent of GEF resources. In addition, a fast growing number of multi focal area projects and programmes are being introduced, mainly involving the focal areas of climate change, biodiversity and land degradation.

Table 7.1 *Financial contributions to the Global Environment Facility (GEF)*

	Contribution (millions of NOK disbursed)			
	2013	2014	2015	2016
Global Environment Facility	106	108	108	108
GEF - LDCF - Least Developed Countries Trust Fund	22	22		
GEF - SCCF - Special Climate Change Fund	15	15		

7.2.2 The Green Climate Fund

The Green Climate Fund (GCF) was established to support the efforts of developing countries to respond to the challenge of climate change. GCF helps developing countries limit or reduce their greenhouse gas (GHG) emissions and adapt to climate change. It seeks to promote a paradigm shift to low-emission and climate-resilient development, taking into account the needs of nations that are particularly vulnerable to climate change impacts. Norway has entered into a four-year agreement to support the GCF with NOK 400 million annually[54], in total NOK 1.6 billion in the period 2015-2018.

***Table 7.2** Financial contributions to the Green Climate Fund (GCF)*

	Contribution (millions of NOK disbursed)			
	2013	2014	2015	2016
Green Climate Fund			400	400

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

Norwegian funding prioritizes support to reducing vulnerability and developing robust societies. The main recipients of Norwegian bilateral climate finance are least developed countries, except for Norway's International Climate and Forest Initiative. Regarding Norwegian multilateral climate finance, one of the main channels is the Green Climate Fund.

7.4 Provision of financial resources, including financial resources under Article 11 of the Kyoto Protocol

The report covers our bilateral and multilateral support for climate change action in developing countries, including both official development assistance (ODA) and other official flows (OOF). All Norwegian climate relevant OOF are interventions by Norfund, Norway's development finance institution, which provides equity, loans and guarantees to companies operating in the world's most challenging markets.

Norway's climate finance is tracked by The Norwegian Agency for Development Cooperation (Norad), using Norwegian Aid Statistics. It should be noted that the information, like all other Norwegian development assistance, is based on the OECD/DAC reporting system, which in this case uses markers for climate change mitigation and adaptation. The markers indicate degree of relevance only and, consequently, the figures should be interpreted with some caution. It is not possible to establish the exact percentage of the support to a given project/programme marked with "significant climate objective", that is directed to climate relevant activities. As a conservative estimate, and in line with other major donors, we have calculated 40 per cent of the total support to such projects and programmes as climate finance.

[54] The figures do not correspond to the GCF figures in table 7.5, as the figures in table 7.2 are total contributions whereas the figures in table 7.5 are climate relevant share of core contributions.

This is a change from earlier reporting where we treated main and significant climate objectives as equal.

In addition, we report imputed climate-related shares of Norwegian core support to a selected number of multilateral organisations that is climate relevant. This estimation is based on the organisations' own reporting to OECD/DAC (see section 7.4.2 *Support to multilateral organisations*). This is a change from earlier reporting where we reported total core contributions to a selection of multilateral organisations.

We report on sectors by using the sector classification (purpose codes and names) in OECD DACs Creditor Reporting System (CRS).The tables include both ODA and OOF.

Table 7.3 provides a summary of Norwegian public financial support for climate change action in developing countries in the years 2015 – 2016. Total public development climate finance amounted to NOK 4 339 million in 2016 and 5 257 million in 2015. Table 7.3 is a concise summary of table 7.4 and table 7.5. Table 7.4 provides information on public bilateral support and table 7.5 provides information on public support through multilateral organisations. The tables cover the years 2015-2016. For the years 2013-2014, see Norway's second Biennial Report (BR2).

Because the tables are predefined they do not give the complete picture when it comes to distinguishing between support to climate change adaptation and mitigation. In table 7.4 we report finance targeted at climate change mitigation, adaptation and cross-cutting in separate rows for each recipient country/region. Table 7.5 however, allows one row only for each multilateral organisation. To provide as much information as possible in Table 7.5 we report the percentage of funds allocated to mitigation, adaptation and cross-cutting for each multilateral organisation in column *Type of support*. In the summary table, Table 7.3, a large amount is reported as *Type of support=other*. This is because contributions in table 7.5 to multilateral organisations targeted at several type-of-support categories (adaptation, mitigation, cross-cutting) are reported as *other* in the summary tables.

All items in the tables are disbursed during the year reported for. All contributions are ODA and OOF net disbursements and reported in NOK and USD based on average exchange rates (NOK–USD): 2015: 8.0643 and 2016: 8.4002.

Table 7.3 (a) *Provision of public financial support: summary information in 2015*

Year - 2015										
Allocation channels	NOK mill.					USD mill.				
	Climate-related share of multilateral core contributions	Climate-specific				Climate-related share of multilateral core contributions	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels	902,6	75,7		48,6	1371,0	111,9	9,4		6,0	170,0
Multilateral climate change funds	402,9					50,0				
Other multilateral climate change funds	94,7				619,8	11,7				76,9
Multilateral financial institutions, including regional development banks	332,7	68,5		27,6	150,6	41,3	8,5		3,4	18,7
Specialized United Nations bodies	72,3	7,2		21,0	600,7	9,0	0,9		2,6	74,5
Total contributions through bilateral, regional and other channels		2159,5	279,9	419,5			267,8	34,7	52,0	
Total	**902,6**	**2235,2**	**279,9**	**468,1**	**1371,0**	**111,9**	**277,2**	**34,7**	**58,0**	**170,0**

Table 7.3(b) *Provision of public financial support: summary information in 2016*

Year - 2016										
Allocation channels	NOK mill.					USD mill.				
	Climate-related share of multilateral core contributions	Climate-specific				Climate-related share of multilateral core contributions	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels	784,7	38,7			1074,9	93,4	4,6			128,0
Multilateral climate change funds	370,6					44,1				
Other multilateral climate change funds	56,8				76,7	6,8				9,1
Multilateral financial institutions, including regional development banks	271,6	33,5			409,8	32,3	4,0			48,8
Specialized United Nations bodies	85,7	5,2			588,4	10,2	0,6			70,0
Total contributions through bilateral, regional and other channels		1941,5	228,3	270,5			231,1	27,2	32,2	
Total	**784,7**	**1980,2**	**228,3**	**270,5**	**1074,9**	**93,4**	**235,7**	**27,2**	**32,2**	**128,0**

7.4.1 Bilateral Climate Finance

Table 7.4 (a) and (b) provide a summary of public bilateral climate finance in 2015 and 2016 (for 2013-2014 see Norway's BR2). Bilateral finance is funding through NGOs, private sector and public sector; all funds that are not channelled through a multilateral organisation.

Total bilateral finance directed at climate change amounted to NOK 2 440 million in 2016 and 2 859 million in 2015. The figures do not reflect the total climate change support to the recipient country, as they do not include the support through multilateral channels. This is to avoid double counting, as these contributions are already included in the table for multilateral reporting.

For each recipient country/region, we report on finance targeted climate change mitigation, adaptation and cross-cutting in separate rows.

Norwegian bilateral finance directed at climate change covers a wide variety of areas and sectors. Norway offers development cooperation in areas where Norway has particular expertise as renewable energy (capacity building, production, especially hydropower, and distribution) and long-term management of natural resources. Norwegian climate finance is mainly concentrated in three areas; reducing emissions from deforestation and forest degradation, renewable energy and climate adaptation including risk reduction.

Table 7.4(a) *Provision of public financial support: contribution through bilateral, regional and other channels in 2015*

Region	Recipient country or region	Total amount (NOK mill.)	Total amount (USD mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	10.02	1.24	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (3 %); 311 - Agriculture (15 %); 740 - Disaster prevention and preparedness (82 %)
	Africa Regional	2.88	0.36	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (37 %); 151 - Government and civil society, general (11 %); 322 - Mineral resources/ mining (51 %)
	Africa Regional	5.04	0.62	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (3 %); 311 - Agriculture (15 %); 410 - General environmental protection (82 %)
	Angola	0.54	0.07	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Angola	2.53	0.31	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Benin	0.15	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Burundi	0.39	0.05	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)

	Cameroon	3.44	0.43	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (15 %); 312 - Forestry (16 %); 410 - General environmental protection (70 %)
	Cameroon	0.33	0.04	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (42 %); 410 - General environmental protection (58 %)
	Central African Rep.	0.47	0.06	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Congo, Dem. Rep.	0.88	0.11	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (100 %)
	Congo, Dem. Rep.	32.36	4.01	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (27 %); 311 - Agriculture (3 %); 312 - Forestry (2 %); 410 - General environmental protection (69 %)
	Congo, Dem. Rep.	3.50	0.43	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (11 %); 410 - General environmental protection (89 %)
	Congo, Rep.	0.34	0.04	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Ethiopia	7.84	0.97	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (26 %); 140 - Water and sanitation (13 %); 151 - Government and civil society, general (0 %); 311 - Agriculture (59 %); 430 - Other multisector (2 %)
	Ethiopia	14.59	1.81	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (3 %); 232 - Energy generation, renewable sources (9 %); 240 - Banking and financial services (3 %); 311 - Agriculture (3 %); 410 - General environmental protection (82 %)

	Ethiopia	36.93	4.58	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (22 %); 151 - Government and civil society, general (1 %); 311 - Agriculture (56 %); 410 - General environmental protection (21 %)
	Gabon	0.53	0.07	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Ghana	0.06	0.01	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Ghana	0.65	0.08	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (19 %); 410 - General environmental protection (81 %)
	Kenya	0.90	0.11	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (13 %); 410 - General environmental protection (87 %)
	Kenya	25.11	3.11	Disbursed	ODA (10 %); OOF (90 %)	Grant (10 %); Equity (90 %)	Mitigation	151 - Government and civil society, general (3 %); 231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (92 %); 236 - Heating, cooling and energy distribution (1 %); 410 - General environmental protection (2 %)
	Kenya	5.69	0.71	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (6 %); 232 - Energy generation, renewable sources (19 %); 311 - Agriculture (46 %); 410 - General environmental protection (29 %)
	Liberia	0.38	0.05	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)

	Liberia	82.44	10.22	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %); 410 - General environmental protection (0 %)
	Madagascar	6.04	0.75	Disbursed	ODA	Grant	Adaptation	232 - Energy generation, renewable sources (2 %); 313 - Fishing (20 %); 410 - General environmental protection (79 %)
	Madagascar	0.88	0.11	Disbursed	ODA	Grant	Cross-cutting	313 - Fishing (98 %); 410 - General environmental protection (2 %)
	Malawi	6.84	0.85	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (12 %); 410 - General environmental protection (88 %)
	Malawi	12.47	1.55	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (83 %); 312 - Forestry (1 %); 410 - General environmental protection (16 %)
	Malawi	54.41	6.75	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (93 %); 410 - General environmental protection (1 %); 740 - Disaster prevention and preparedness (6 %)
	Mali	32.11	3.98	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (1 %); 311 - Agriculture (65 %); 430 - Other multisector (22 %); 740 - Disaster prevention and preparedness (12 %)
	Mali	0.13	0.02	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Mozambique	30.70	3.81	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (0 %); 236 - Heating, cooling and energy distribution (0 %); 311 - Agriculture (44 %); 313 - Fishing (52 %); 410 - General environmental protection (3 %)

	Mozambique	17.15	2.13	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (62 %); 232 - Energy generation, renewable sources (9 %); 312 - Forestry (28 %); 313 - Fishing (2 %)
	Mozambique	10.43	1.29	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Namibia	1.40	0.17	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Namibia	0.17	0.02	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Niger	0.90	0.11	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nigeria	2.23	0.28	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (28 %); 322 - Mineral resources/ mining (63 %); 410 - General environmental protection (9 %)
	Rwanda	0.72	0.09	Disbursed	ODA	Grant	Mitigation	113 - Secondary education (100 %)
	Rwanda	0.16	0.02	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Somalia	8.12	1.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (2 %); 311 - Agriculture (39 %); 740 - Disaster prevention and preparedness (59 %)
	Somalia	1.00	0.12	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)

	South Africa	-23.07	-2.86	Disbursed	ODA (-19 %); OOF (119 %)	Grant (-19 %); Equity and loan (119 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (-17 %); 232 - Energy generation, renewable sources (118 %); 410 - General environmental protection (-2 %)
	South Africa	19.02	2.36	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (1 %); 410 - General environmental protection (93 %); 430 - Other multisector (6 %)
	South of Sahara Regional	3.12	0.39	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (78 %); 430 - Other multisector (12 %); 740 - Disaster prevention and preparedness (10 %)
	South of Sahara Regional	32.64	4.05	Disbursed	ODA (101 %); OOF (-1 %)	Grant (101 %); Equity (-1 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (7 %); 312 - Forestry (1 %); 313 - Fishing (2 %); 322 - Mineral resources/ mining (4 %); 410 - General environmental protection (86 %)
	South of Sahara Regional	45.72	5.67	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (12 %); 311 - Agriculture (88 %)
	South Sudan	2.95	0.37	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (81 %); 231 - Energy generation, distribution and efficiency – general (19 %)
	South Sudan	0.16	0.02	Disbursed	ODA	Grant	Cross-cutting	112 - Basic education (100 %)
	Sudan	0.66	0.08	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	Tanzania	15.95	1.98	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (18 %); 151 - Government and civil society, general (13 %); 311 - Agriculture (34 %); 410 - General environmental protection (35 %)
	Tanzania	24.73	3.07	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (11 %); 311 - Agriculture (6 %); 312 - Forestry (1 %); 410 - General environmental protection (79 %)
	Tanzania	25.26	3.13	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (16 %); 151 - Government and civil society, general (2 %); 160 - Other social infrastructure and services (0 %); 232 - Energy generation, renewable sources (13 %); 250 - Business and other services (7 %); 311 - Agriculture (23 %); 312 - Forestry (0 %); 410 - General environmental protection (38 %)
	Togo	1.07	0.13	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Togo	0.12	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Tunisia	0.88	0.11	Disbursed	ODA	Grant	Adaptation	232 - Energy generation, renewable sources (9 %); 311 - Agriculture (91 %)
	Tunisia	1.58	0.20	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Uganda	25.06	3.11	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (17 %); 232 - Energy generation, renewable sources (77 %); 311

								- Agriculture (3 %); 410 - General environmental protection (3 %)
	Uganda	38.55	4.78	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (18 %); 232 - Energy generation, renewable sources (12 %); 236 - Heating, cooling and energy distribution (65 %); 312 - Forestry (4 %); 410 - General environmental protection (1 %)
	Uganda	11.01	1.37	Disbursed	ODA (99 %); OOF (1 %)	Grant (99 %); Equity (1 %)	Cross-cutting	114 - Post-secondary education (40 %); 151 - Government and civil society, general (8 %); 231 - Energy generation, distribution and efficiency – general (1 %); 232 - Energy generation, renewable sources (16 %); 311 - Agriculture (5 %); 410 - General environmental protection (12 %); 740 - Disaster prevention and preparedness (18 %)
	Zambia	7.21	0.89	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Zambia	0.77	0.10	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Zambia	41.92	5.20	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (2 %); 311 - Agriculture (97 %); 410 - General environmental protection (0 %)
	Zimbabwe	0.74	0.09	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Zimbabwe	1.94	0.24	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (9 %); 311 - Agriculture (91 %)

America	America Regional	1.43	0.18	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (45 %); 410 - General environmental protection (55 %)
	Bolivia	0.47	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Brazil	963.13	119.43	Disbursed	ODA (126 %); OOF (-26 %)	Grant (126 %); Equity (-26 %)	Mitigation	151 - Government and civil society, general (0 %); 232 - Energy generation, renewable sources (-26 %); 311 - Agriculture (1 %); 410 - General environmental protection (124 %)
	Brazil	6.92	0.86	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (14 %); 311 - Agriculture (75 %); 410 - General environmental protection (11 %)
	Chile	46.67	5.79	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Colombia	4.75	0.59	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Colombia	0.44	0.05	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Costa Rica	0.34	0.04	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Costa Rica	0.25	0.03	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Costa Rica	0.45	0.06	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)

	Cuba	0.13	0.02	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Ecuador	0.23	0.03	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Ecuador	2.42	0.30	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	El Salvador	0.38	0.05	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Guatemala	4.85	0.60	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (10 %); 311 - Agriculture (30 %); 410 - General environmental protection (15 %); 430 - Other multisector (37 %); 740 - Disaster prevention and preparedness (8 %)
	Guatemala	2.00	0.25	Disbursed	ODA	Grant	Mitigation	236 - Heating, cooling and energy distribution (100 %)
	Guatemala	1.29	0.16	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (62 %); 410 - General environmental protection (38 %)
	Guyana	0.63	0.08	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Guyana	14.55	1.80	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Haiti	0.80	0.10	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)

	Haiti	0.51	0.06	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (53 %); 232 - Energy generation, renewable sources (47 %)
	Honduras	0.84	0.10	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Honduras	31.07	3.85	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.51	0.06	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Mexico	2.37	0.29	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (17 %); 410 - General environmental protection (83 %)
	Mexico	3.92	0.49	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (87 %); 410 - General environmental protection (13 %)
	Nicaragua	0.52	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nicaragua	0.67	0.08	Disbursed	ODA	Grant	Mitigation	312 - Forestry (52 %); 410 - General environmental protection (48 %)
	Nicaragua	9.29	1.15	Disbursed	ODA	Grant	Cross-cutting	113 - Secondary education (11 %); 311 - Agriculture (89 %)
	North & Central America Regional	8.07	1.00	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	North & Central America Regional	0.30	0.04	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	North & Central America Regional	0.47	0.06	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Panama	24.49	3.04	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Peru	393.03	48.74	Disbursed	ODA (3 %); OOF (97 %)	Grant (3 %); Equity (97 %)	Mitigation	151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (97 %); 410 - General environmental protection (2 %)
	Peru	0.55	0.07	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	South America Regional	0.47	0.06	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	South America Regional	10.00	1.24	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
Asia	Afghanistan	8.12	1.01	Disbursed	ODA	Grant	Adaptation	430 - Other multisector (100 %)

	Afghanistan	0.27	0.03	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (100 %)
	Afghanistan	3.50	0.43	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Armenia	0.30	0.04	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Armenia	0.08	0.01	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (100 %)
	Asia Regional	42.87	5.32	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (2 %); 410 - General environmental protection (86 %); 740 - Disaster prevention and preparedness (12 %)
	Asia Regional	2.41	0.30	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Asia Regional	7.01	0.87	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Azerbaijan	0.04	0.00	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Bangladesh	0.79	0.10	Disbursed	ODA	Grant	Adaptation	122 - Basic health (16 %); 151 - Government and civil society, general (46 %); 311 - Agriculture (32 %); 410 - General environmental protection (6 %)
	Bangladesh	0.12	0.01	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Bangladesh	0.62	0.08	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (87 %); 740 - Disaster prevention and preparedness (13 %)

	Bhutan	0.05	0.01	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Bhutan	2.82	0.35	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Bhutan	0.97	0.12	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (74 %); 311 - Agriculture (15 %); 410 - General environmental protection (11 %)
	Cambodia	0.22	0.03	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (61 %); 311 - Agriculture (39 %)
	Cambodia	2.37	0.29	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (4 %); 410 - General environmental protection (96 %)
	China	12.26	1.52	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (16 %); 231 - Energy generation, distribution and efficiency – general (15 %); 410 - General environmental protection (45 %); 430 - Other multisector (24 %)
	China	2.99	0.37	Disbursed	ODA	Grant	Cross-cutting	321 - Industry (6 %); 332 - Tourism (9 %); 410 - General environmental protection (85 %)
	Far East Asia Regional	1.03	0.13	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Georgia	2.05	0.25	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	India	18.44	2.29	Disbursed	ODA	Grant	Adaptation	122 - Basic health (1 %); 410 - General environmental protection (39 %); 430 - Other multisector (59 %); 740 - Disaster prevention and preparedness (2 %)

	India	-78.71	-9.76	Disbursed	ODA (-6 %); OOF (106 %)	Grant (-6 %); Equity (106 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (0 %); 232 - Energy generation, renewable sources (106 %); 321 - Industry (0 %); 410 - General environmental protection (-4 %); 430 - Other multisector (-2 %)
	India	7.22	0.90	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (16 %); 430 - Other multisector (84 %)
	Indonesia	44.33	5.50	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (6 %); 151 - Government and civil society, general (1 %); 311 - Agriculture (4 %); 410 - General environmental protection (89 %)
	Indonesia	10.50	1.30	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (0 %); 232 - Energy generation, renewable sources (2 %); 410 - General environmental protection (98 %)
	Kazakhstan	0.75	0.09	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Kyrgyz Rep.	1.12	0.14	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Laos	22.64	2.81	Disbursed	ODA (4 %); OOF (96 %)	Grant (4 %); Loan (96 %)	Mitigation	232 - Energy generation, renewable sources (99 %); 410 - General environmental protection (1 %)
	Laos	1.41	0.17	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (3 %); 410 - General environmental protection (97 %)

	Malaysia	0.57	0.07	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Maldives	0.01	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	1.11	0.14	Disbursed	ODA (99 %); OOF (1 %)	Grant (99 %); Equity (1 %)	Adaptation	122 - Basic health (12 %); 232 - Energy generation, renewable sources (1 %); 410 - General environmental protection (87 %)
	Myanmar	18.48	2.29	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (46 %); 232 - Energy generation, renewable sources (13 %); 410 - General environmental protection (41 %)
	Myanmar	9.40	1.17	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (43 %); 312 - Forestry (47 %); 410 - General environmental protection (11 %)
	Nepal	3.24	0.40	Disbursed	ODA	Grant	Adaptation	112 - Basic education (0 %); 114 - Post-secondary education (48 %); 122 - Basic health (6 %); 151 - Government and civil society, general (12 %); 311 - Agriculture (32 %); 410 - General environmental protection (2 %)
	Nepal	0.97	0.12	Disbursed	ODA (2133 %); OOF (-2033 %)	Grant (2133 %); Equity (-2033 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (102 %); 232 - Energy generation, renewable sources (-96 %); 410 - General environmental protection (95 %)

	Nepal	2.94	0.37	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (7 %); 311 - Agriculture (24 %); 331 - Trade policy and regulations and trade-related adjustments (10 %); 410 - General environmental protection (59 %)
	Pakistan	1.50	0.19	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (2 %); 410 - General environmental protection (4 %); 740 - Disaster prevention and preparedness (94 %)
	Pakistan	0.44	0.05	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Pakistan	3.00	0.37	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Philippines	4.14	0.51	Disbursed	ODA (7 %); OOF (93 %)	Grant (7 %); Equity (93 %)	Mitigation	232 - Energy generation, renewable sources (93 %); 410 - General environmental protection (7 %)
	Sri Lanka	2.02	0.25	Disbursed	ODA	Grant	Adaptation	122 - Basic health (4 %); 151 - Government and civil society, general (21 %); 311 - Agriculture (13 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (59 %)
	Sri Lanka	-0.69	-0.08	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Sri Lanka	0.28	0.03	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (67 %); 311 - Agriculture (33 %)

	Thailand	0.11	0.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (117 %); 160 - Other social infrastructure and services (31 %); 313 - Fishing (-48 %)
	Thailand	0.04	0.01	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Uzbekistan	0.38	0.05	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Viet Nam	3.61	0.45	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (76 %); 121 - Health, general (3 %); 151 - Government and civil society, general (10 %); 160 - Other social infrastructure and services (3 %); 311 - Agriculture (2 %); 740 - Disaster prevention and preparedness (6 %)
	Viet Nam	3.64	0.45	Disbursed	ODA	Grant	Mitigation	121 - Health, general (1 %); 151 - Government and civil society, general (9 %); 231 - Energy generation, distribution and efficiency – general (6 %); 232 - Energy generation, renewable sources (12 %); 410 - General environmental protection (72 %)
	Viet Nam	1.80	0.22	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (18 %); 311 - Agriculture (54 %); 410 - General environmental protection (16 %); 740 - Disaster prevention and preparedness (13 %)
Europe	Europe Regional	2.00	0.25	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)

	Macedonia (Fyrom)	0.01	0.00	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Montenegro	-1.47	-0.18	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (133 %); 232 - Energy generation, renewable sources (-33 %)
	Serbia	0.62	0.08	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (46 %); 250 - Business and other services (4 %); 430 - Other multisector (44 %); 730 - Reconstruction relief and rehabilitation (5 %)
	Ukraine	4.39	0.54	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (48 %); 232 - Energy generation, renewable sources (52 %)
Oceania	Papua New Guinea	13.47	1.67	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (34 %); 410 - General environmental protection (66 %)
The Middle East	Lebanon	0.92	0.11	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Middle East Regional	1.35	0.17	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Palestine	1.20	0.15	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
Not geographically allocated	Global Unspecified	20.44	2.53	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (9 %); 322 - Mineral resources/ mining (2 %); 410 - General environmental protection (76 %); 720 - Emergency Response (14 %); 740 - Disaster prevention and preparedness (0 %)

	Global Unspecified	343.30	42.57	Disbursed	ODA (71 %); OOF (29 %)	Grant (71 %); Loan and other (29 %)	Mitigation	140 - Water and sanitation (0 %); 151 - Government and civil society, general (0 %); 231 - Energy generation, distribution and efficiency – general (4 %); 232 - Energy generation, renewable sources (38 %); 311 - Agriculture (2 %); 312 - Forestry (0 %); 410 - General environmental protection (56 %); 998 - Unallocated/unspecified (0 %)
	Global Unspecified	55.96	6.94	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (4 %); 311 - Agriculture (14 %); 410 - General environmental protection (76 %); 430 - Other multisector (6 %)
Total contributions through bilateral, regional and other channels		**2 858.82**	**354.50**					

Table 7.4(b) *Provision of public financial support: contribution through bilateral, regional and other channels in 2016*

Region	Recipient country or region	Total amount (NOK mill.)	Total amount (USD mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	9.46	1.13	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (1 %); 311 - Agriculture (19 %); 740 - Disaster prevention and preparedness (80 %)
	Africa Regional	3.81	0.45	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (35 %); 232 - Energy generation, renewable sources (13 %); 322 - Mineral resources/ mining (52 %)
	Angola	1.77	0.21	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Angola	1.55	0.18	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Benin	0.15	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Burundi	2.60	0.31	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (81 %); 321 - Industry (4 %); 740 - Disaster prevention and preparedness (15 %)
	Burundi	1.72	0.20	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Cameroon	1.53	0.18	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (33 %); 312 - Forestry (41 %); 410 - General environmental protection (26 %)

	Cameroon	0.06	0.01	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (100 %)
	Central African Rep.	0.63	0.07	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Congo, Dem. Rep.	1.47	0.18	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (100 %)
	Congo, Dem. Rep.	24.69	2.94	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (24 %); 311 - Agriculture (4 %); 312 - Forestry (1 %); 410 - General environmental protection (71 %)
	Congo, Dem. Rep.	0.34	0.04	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (118 %); 410 - General environmental protection (-18 %)
	Congo, Rep.	0.89	0.11	Disbursed	ODA	Grant	Mitigation	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Egypt	4.83	0.57	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Ethiopia	11.66	1.39	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (6 %); 140 - Water and sanitation (11 %); 311 - Agriculture (83 %); 430 - Other multisector (0 %)
	Ethiopia	7.18	0.85	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (5 %); 240 - Banking and financial services (7 %); 311 - Agriculture (7 %); 410 - General environmental protection (80 %)
	Ethiopia	59.47	7.08	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (17 %); 151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (0 %); 311 -

								Agriculture (23 %); 410 - General environmental protection (60 %)
	Gabon	0.89	0.11	Disbursed	ODA	Grant	Mitigation	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Ghana	0.12	0.01	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Kenya	0.73	0.09	Disbursed	ODA	Grant	Adaptation	250 - Business and other services (2 %); 410 - General environmental protection (98 %)
	Kenya	0.35	0.04	Disbursed	ODA (42 %); OOF (58 %)	Grant (42 %); Equity (58 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (-15 %); 232 - Energy generation, renewable sources (58 %); 410 - General environmental protection (57 %)
	Kenya	5.59	0.67	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (6 %); 250 - Business and other services (1 %); 311 - Agriculture (77 %); 410 - General environmental protection (15 %)
	Liberia	0.47	0.06	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (100 %)
	Liberia	16.41	1.95	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (62 %); 410 - General environmental protection (38 %)
	Madagascar	5.66	0.67	Disbursed	ODA	Grant	Adaptation	313 - Fishing (17 %); 410 - General environmental protection (83 %)
	Madagascar	0.14	0.02	Disbursed	ODA	Grant	Cross-cutting	313 - Fishing (100 %)

	Malawi	2.92	0.35	Disbursed	ODA (92 %); OOF (8 %)	Grant (92 %); Equity (8 %)	Adaptation	111 - Education, level unspecified (10 %); 311 - Agriculture (22 %); 410 - General environmental protection (69 %)
	Malawi	9.82	1.17	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (76 %); 410 - General environmental protection (24 %)
	Malawi	68.81	8.19	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (99 %); 410 - General environmental protection (1 %)
	Mali	20.23	2.41	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (42 %); 430 - Other multisector (39 %); 740 - Disaster prevention and preparedness (20 %)
	Mozambique	22.08	2.63	Disbursed	ODA	Grant	Adaptation	236 - Heating, cooling and energy distribution (1 %); 311 - Agriculture (76 %); 313 - Fishing (19 %); 410 - General environmental protection (5 %)
	Mozambique	8.59	1.02	Disbursed	ODA (93 %); OOF (7 %)	Grant (93 %); Equity (7 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (82 %); 232 - Energy generation, renewable sources (7 %); 312 - Forestry (9 %); 313 - Fishing (2 %)
	Mozambique	7.41	0.88	Disbursed	ODA	Grant	Cross-cutting	250 - Business and other services (1 %); 311 - Agriculture (99 %)
	Namibia	-0.08	-0.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Niger	10.00	1.19	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	Nigeria	4.68	0.56	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (13 %); 232 - Energy generation, renewable sources (57 %); 322 - Mineral resources/ mining (30 %)
	Rwanda	1.71	0.20	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Somalia	10.82	1.29	Disbursed	ODA	Grant	Adaptation	152 - Conflict prevention and resolution, peace and security (0 %); 311 - Agriculture (17 %); 720 - Emergency Response (37 %); 740 - Disaster prevention and preparedness (46 %)
	South Africa	0.03	0.00	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	South Africa	7.35	0.88	Disbursed	ODA (3 %); OOF (97 %)	Grant (3 %); Equity and loan (97 %)	Mitigation	232 - Energy generation, renewable sources (100 %)
	South Africa	9.46	1.13	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (2 %); 410 - General environmental protection (98 %); 430 - Other multisector (0 %)
	South of Sahara Regional	2.62	0.31	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	South of Sahara Regional	46.09	5.49	Disbursed	ODA (101 %);	Grant (101 %);	Mitigation	231 - Energy generation, distribution and efficiency – general (5 %); 312 - Forestry (1 %); 322 - Mineral

					OOF (-1 %)	Equity (-1 %)		resources/ mining (3 %); 410 - General environmental protection (91 %)
	South of Sahara Regional	-4.87	-0.58	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	South Sudan	2.53	0.30	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (87 %); 231 - Energy generation, distribution and efficiency – general (13 %)
	Tanzania	17.67	2.10	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (22 %); 311 - Agriculture (34 %); 410 - General environmental protection (44 %)
	Tanzania	12.10	1.44	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (0 %); 232 - Energy generation, renewable sources (26 %); 311 - Agriculture (-1 %); 410 - General environmental protection (75 %)
	Tanzania	13.69	1.63	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (15 %); 151 - Government and civil society, general (1 %); 160 - Other social infrastructure and services (0 %); 232 - Energy generation, renewable sources (10 %); 250 - Business and other services (14 %); 311 - Agriculture (16 %); 410 - General environmental protection (45 %)
	Togo	1.07	0.13	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Togo	0.12	0.01	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)

	Tunisia	0.88	0.10	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Uganda	1.88	0.22	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (54 %); 311 - Agriculture (4 %); 410 - General environmental protection (42 %)
	Uganda	75.69	9.01	Disbursed	ODA (87 %); OOF (13 %)	Grant (87 %); Loan (13 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (9 %); 232 - Energy generation, renewable sources (16 %); 236 - Heating, cooling and energy distribution (75 %); 312 - Forestry (0 %); 410 - General environmental protection (1 %)
	Uganda	11.88	1.41	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (62 %); 151 - Government and civil society, general (8 %); 232 - Energy generation, renewable sources (6 %); 311 - Agriculture (5 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (17 %)
	Zambia	8.69	1.03	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Zambia	1.37	0.16	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (71 %); 311 - Agriculture (29 %)
	Zimbabwe	0.37	0.04	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Zimbabwe	2.43	0.29	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (7 %); 311 - Agriculture (93 %)

America	America Regional	1.07	0.13	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	America Regional	0.83	0.10	Disburs ed	ODA	Grant	Cross-cutting	312 - Forestry (43 %); 410 - General environmental protection (57 %)
	Bolivia	0.28	0.03	Disburs ed	ODA	Grant	Adaptatio n	311 - Agriculture (100 %)
	Brazil	887.31	105.63	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Brazil	1.41	0.17	Disburs ed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Chile	37.08	4.41	Disburs ed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Colombia	115.10	13.70	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Colombia	0.81	0.10	Disburs ed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Costa Rica	0.17	0.02	Disburs ed	ODA	Grant	Adaptatio n	311 - Agriculture (100 %)
	Cuba	-0.84	-0.10	Disburs ed	ODA	Grant	Mitigation	140 - Water and sanitation (128 %); 232 - Energy generation, renewable sources (-28 %)
	Dominican Republic	0.15	0.02	Disburs ed	ODA	Grant	Adaptatio n	160 - Other social infrastructure and services (100 %)
	Ecuador	1.11	0.13	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)

	Ecuador	-0.05	-0.01	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	El Salvador	0.41	0.05	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Guatemala	3.21	0.38	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (30 %); 311 - Agriculture (35 %); 430 - Other multisector (19 %); 740 - Disaster prevention and preparedness (16 %)
	Guatemala	0.02	0.00	Disbursed	ODA	Grant	Mitigation	236 - Heating, cooling and energy distribution (100 %)
	Guatemala	1.02	0.12	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (37 %); 160 - Other social infrastructure and services (63 %)
	Guyana	15.95	1.90	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Guyana	4.40	0.52	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Haiti	1.19	0.14	Disbursed	ODA	Grant	Adaptation	160 - Other social infrastructure and services (82 %); 740 - Disaster prevention and preparedness (18 %)
	Haiti	0.40	0.05	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.50	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	Honduras	25.92	3.09	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.33	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Mexico	-0.03	0.00	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Nicaragua	0.25	0.03	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nicaragua	0.20	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Nicaragua	2.45	0.29	Disbursed	ODA	Grant	Cross-cutting	113 - Secondary education (39 %); 311 - Agriculture (61 %)
	North & Central America Regional	4.25	0.51	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	North & Central America Regional	0.37	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Panama	3.79	0.45	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Peru	49.53	5.90	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (3 %); 410 - General environmental protection (97 %)

	South America Regional	-0.33	-0.04	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
Asia	Afghanistan	1.47	0.17	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Asia Regional	42.56	5.07	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (82 %); 740 - Disaster prevention and preparedness (18 %)
	Asia Regional	0.10	0.01	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Asia Regional	5.91	0.70	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (85 %); 410 - General environmental protection (15 %)
	Bangladesh	0.99	0.12	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (96 %); 250 - Business and other services (1 %); 410 - General environmental protection (3 %)
	Bangladesh	0.94	0.11	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (93 %); 410 - General environmental protection (7 %)
	Bangladesh	0.20	0.02	Disbursed	ODA	Grant	Cross-cutting	112 - Basic education (47 %); 410 - General environmental protection (53 %)
	Bhutan	0.02	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Bhutan	0.69	0.08	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Bhutan	0.27	0.03	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (100 %)

	Cambodia	0.01	0.00	Disbursed	ODA	Grant	Adaptation	313 - Fishing (100 %)
	China	-1.27	-0.15	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	China	25.84	3.08	Disbursed	ODA (102 %); OOF (-2 %)	Grant (102 %); Equity (-2 %)	Mitigation	114 - Post-secondary education (9 %); 250 - Business and other services (2 %); 321 - Industry (-2 %); 410 - General environmental protection (79 %); 430 - Other multisector (12 %)
	China	-0.86	-0.10	Disbursed	ODA	Grant	Cross-cutting	332 - Tourism (-30 %); 410 - General environmental protection (130 %)
	Georgia	2.24	0.27	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	India	15.00	1.79	Disbursed	ODA	Grant	Adaptation	250 - Business and other services (0 %); 410 - General environmental protection (23 %); 430 - Other multisector (74 %); 740 - Disaster prevention and preparedness (3 %)
	India	8.26	0.98	Disbursed	ODA (54 %); OOF (46 %)	Grant (54 %); Equity (46 %)	Mitigation	121 - Health, general (-7 %); 232 - Energy generation, renewable sources (57 %); 410 - General environmental protection (48 %); 430 - Other multisector (2 %)
	India	20.15	2.40	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (0 %); 250 - Business and other services (0 %); 410 - General environmental protection (0 %); 430 - Other multisector (99 %)

	Indonesia	114.33	13.61	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (2 %); 410 - General environmental protection (98 %)
	Indonesia	2.29	0.27	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Laos	4.14	0.49	Disbursed	ODA (8 %); OOF (92 %)	Grant (8 %); Loan (92 %)	Mitigation	232 - Energy generation, renewable sources (92 %); 410 - General environmental protection (8 %)
	Malaysia	0.19	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Maldives	0.00	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	0.00	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	30.83	3.67	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (4 %); 231 - Energy generation, distribution and efficiency – general (45 %); 232 - Energy generation, renewable sources (7 %); 410 - General environmental protection (44 %)
	Myanmar	7.00	0.83	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (100 %)
	Nepal	1.29	0.15	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (30 %); 250 - Business and other services (0 %); 311 - Agriculture (57 %); 313 - Fishing (9 %); 410 - General environmental protection (3 %)

	Nepal	1.89	0.23	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (53 %); 232 - Energy generation, renewable sources (25 %); 410 - General environmental protection (22 %)
	Nepal	0.98	0.12	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (0 %); 250 - Business and other services (4 %); 311 - Agriculture (66 %); 331 - Trade policy and regulations and trade-related adjustments (18 %); 410 - General environmental protection (11 %)
	Pakistan	0.63	0.07	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (5 %); 410 - General environmental protection (5 %); 740 - Disaster prevention and preparedness (91 %)
	Pakistan	3.32	0.40	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Pakistan	1.90	0.23	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Philippines	2.41	0.29	Disbursed	ODA (8 %); OOF (92 %)	Grant (8 %); Equity (92 %)	Mitigation	232 - Energy generation, renewable sources (92 %); 410 - General environmental protection (8 %)
	South Asia Regional	0.21	0.02	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Sri Lanka	1.01	0.12	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (21 %); 311 - Agriculture (17 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (59 %)

	Sri Lanka	0.04	0.00	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (100 %)
	Thailand	0.17	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Viet Nam	6.71	0.80	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (9 %); 114 - Post-secondary education (58 %); 151 - Government and civil society, general (30 %); 740 - Disaster prevention and preparedness (4 %)
	Viet Nam	3.46	0.41	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (16 %); 160 - Other social infrastructure and services (0 %); 410 - General environmental protection (84 %)
	Viet Nam	0.34	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (135 %); 740 - Disaster prevention and preparedness (-35 %)
Europe	Europe Regional	0.40	0.05	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Europe Regional	0.20	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Macedonia (Fyrom)	0.01	0.00	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Montenegro	0.40	0.05	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Serbia	0.25	0.03	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (78 %); 250 - Business and other services (22 %)

	Ukraine	3.55	0.42	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (32 %); 232 - Energy generation, renewable sources (68 %)
Oceania	Papua New Guinea	6.41	0.76	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (32 %); 410 - General environmental protection (68 %)
The Middle East	Jordan	2.15	0.26	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Lebanon	0.53	0.06	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Palestine	0.08	0.01	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
Not geographically allocated	Global Unspecified	18.88	2.25	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (11 %); 151 - Government and civil society, general (2 %); 410 - General environmental protection (85 %); 740 - Disaster prevention and preparedness (3 %)
	Global Unspecified	360.77	42.95	Disbursed	ODA (64 %); OOF (36 %)	Grant (64 %); Loan, equity and other (36 %)	Mitigation	140 - Water and sanitation (0 %); 151 - Government and civil society, general (0 %); 231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (39 %); 410 - General environmental protection (59 %); 740 - Disaster prevention and preparedness (0 %)
	Global Unspecified	40.53	4.82	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (1 %); 410 - General environmental protection (99 %)
Total contributio		**2 440.30**	**290.50**					

ns through bilateral, regional and other channels								

The tables above show that environment and climate change have high priority in our bilateral cooperation with several countries. Below follows a description of Norwegian cooperation with a selection of countries. The examples are referring to 2015 and 2016.

Ethiopia
Norwegian support to Ethiopia for agriculture, food security, environment and climate was almost 142 million NOK in the period 2015-2016. This contributed to the implementation of Sustainable land management in 1 820 micro watersheds covering 507 068 ha, through constructions of various biophysical soil and water conservation measures. More than 150 208 households received land use right certificates, providing farming households with security and incentives to develop and protect their land holdings. Institutional cooperation between Ethiopian universities and universities abroad supported 98 MSc and PhD students involved in watershed management, agroforestry, climate smart agriculture, renewable energy sources and crop and livestock production. Norwegian support also contributed to the establishment of the Institute of Mountain Research and Development.

Norway has further supported hydropower development, feasibility studies at Abay River, formulation of an off-grid electrification plan and the implementation of the national cook stoves programme.

Malawi
Norwegian support to Malawi for agriculture, food security and environment was almost NOK 165 million in 2016. Eight projects in this sector, out of nine projects, contained substantive components focussing on adaptation to climate change. This included climate smart agriculture, switching to energy efficient cook stoves and restoration of degraded forests. A particular priority has been to provide extension advice to farmers to switch to conservation agriculture (more than 300 000 farmers) and rice intensification (around 15 000 farmers). More than 77 500 households have switched to energy efficient cook stoves. Support to build capacity to teach and to carry out research on different climate challenges affecting Malawi was, and still is, a key part of Norwegian support to the Lilongwe University of Agriculture & Natural Resources (LUANAR). Tree planting and support to natural regeneration are components of many of the mentioned projects. The combined efforts of two NGOs led to around 9 million trees being planted in 2015-16.

Tanzania
Norway's climate related support to Tanzania has been for projects on REDD+, as well as research and policy development in relation to climate -smart and sustainable agricultural development and energy. Other than REDD+ projects, the support has consisted of support to the SAGCOT Centre for environmentally sustainable increased agricultural productivity, support for research and capacity building for climate smart innovative agricultural methods through Sokoine University of Agriculture, and support for developing alternative livelihoods for forest dwellers through the Eastern Arc Mountains Conservation Endowment Fund (EAMCEF).

7.4.2 Support to multilateral organisations

Table 7.5(a-b) provide estimates of Norwegian financial support channelled through multilateral organisations and targeting climate change for the years 2015 – 2016 (for 2013-2014, see Norway's BR2).

Climate-specific amounts are finance earmarked climate change (adaptation, mitigation or cross-cutting). Total support earmarked climate change through multilateral organisations amounted to NOK 1 495 million in 2015 and NOK 1 114 million in 2016.

In addition, we report imputed climate-related shares of Norwegian core support to a selected number of multilateral organisations that is climate relevant. This is a change from earlier reporting where we reported total core contributions to a selection of multilateral organisations. Figures for the climate relevant share of Norway's core contributions are based on OECD/DAC methodology for "imputed multilateral shares"; linking reported multilateral climate-related outflows, to donor countries' reported core contributions (multilateral inflows). Only the climate-relevant shares of core contributions are included in the tables. Imputed climate shares of core support to multilateral organisations was NOK 903 million in 2015 and NOK 785 million in 2016. It is, however, worth mentioning that not all multilateral organisations report data on climate relevant shares of their outflows from received core contributions. Examples of multilateral organisations receiving core contributions from Norway, but which are omitted from the tables, are CGIAR (NOK 151 million in core contributions in 2015-2016), UNEP (NOK 145 million in core contributions in 2015-2016) and UNDP (NOK 1 165 million in core contributions in 2015-2016). In earlier reporting, total core support to UNEP and UNDP were included.

The tables are a descriptive breakdown of Norwegian support to a selection of multilateral organisations, including both ODA and OOF. Below the tables follows a description of support provided to some of these organisations. There might be discrepancies between the table figures and the narrative below. This is because the tables report multilateral support earmarked climate change and estimated climate shares of core support to multilateral organisations, while the figures in the narrative show total contributions to selected multilateral organisations/programmes.

Table 7.5(a) Provision of public financial support: contribution through multilateral channels in 2015

Year - 2015									
Donor funding	Total Amount				Status	Funding source	Financial instrument	Type of support	Sector
	Climate relevant share of core contributions		Climate-specific						
	NOK mill.	USD mill.	NOK mill.	USD mill.					
Multilateral climate change funds									
1. Global Environment Facility	67.2	8.3			Disbursed	ODA	Grant		
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund	335.8	41.6			Disbursed	ODA	Grant		
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									

NDF - Nordic Development Fund	37.0	4.6			Disbursed	ODA	Grant		
SCF - Strategic Climate Fund	10.0	1.2			Disbursed	ODA	Grant		
GGGI - Global Green Growth Institute	37.3	4.6	50.3	6.2	Disbursed	ODA	Grant	Mitigation (74 %); Cross-cutting (26 %)	410 - General environmental protection
Multilateral Fund for the Implementation of the Montreal Protocol	10.4	1.3			Disbursed	ODA	Grant		
Other	Not available	Not available	569.5	70.6	Disbursed	ODA	Grant	Adaptation (2 %); Mitigation (93 %); Cross-cutting (5 %)	231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (2 %); 311 - Agriculture (4 %); 410 - General environmental protection (90 %); 740 - Disaster prevention and preparedness (2 %)
Subtotal	497.6	61.7	619.8	76.9					
Multilateral financial institutions, including									

regional development banks									
1. World Bank			78.0	9.7	Disbursed	ODA	Grant	Adaptation (26 %); Mitigation (44 %); Cross-cutting (31 %)	231 - Energy generation, distribution and efficiency – general (33 %); 311 - Agriculture (56 %); 410 - General environmental protection (10 %)
2.International Finance Corporation			10.0	1.2	Disbursed	ODA	Grant	Mitigation	321 - Industry
3.African Development Bank	7.7	1.0			Disbursed	ODA	Grant		
4.Asian Development Bank			49.0	6.1	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (39 %); 232 - Energy generation, renewable sources (61 %)
5. European Bank for Reconstruction and Development			9.5	1.2	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general
6. Inter-American Development Bank	0.8	0.1	27.6	3.4	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection
7. Other									

AFDF - African Development Fund	126.4	15.7			Disbursed	ODA	Grant		
ASDF - Asian Development Fund	14.7	1.8			Disbursed	ODA	Grant		
IBRD - International Bank for Recontruction and Development	6.0	0.7	72.6	9.0	Disbursed	ODA	Grant	Mitigation (90 %); Cross-cutting (10 %)	231 - Energy generation, distribution and efficiency – general (2 %); 410 - General environmental protection (98 %)
IDA - HIPC	20.4	2.5			Disbursed	ODA	Grant		
IDA - International Development Association	156.8	19.4			Disbursed	ODA	Grant		
Subtotal	332.7	41.3	246.7	30.6					
Specialized United Nations bodies									
1. United Nations Development Programme	Not available	Not available	280.1	34.7	Disbursed	ODA	Grant	Adaptation (5 %); Mitigation (74 %); Cross-cutting (21 %)	410 - General environmental protection (91 %); 430 - Other multisector (8 %); 740 - Disaster prevention and preparedness (1 %)
2. United Nations Environment Programme	Not available	Not available	49.0	6.1	Disbursed	ODA	Grant	Mitigation (30 %); Cross-	231 - Energy generation, distribution and efficiency – general (8 %); 410 -

								cutting (70 %)	General environmental protection (92 %)
3. Other									
IFAD - International Fund for Agricultural Development	63.2	7.8	21.0	2.6	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture
UNFCCC - United Nations Framework Convention on Climate Change	9.1	1.1			Disbursed	ODA	Grant		
ILO - International Labour Organisation	0.05	0.01	7.2	0.9	Disbursed	ODA	Grant	Mitigation	321 - Industry
Other	Not available	Not available	271.6	33.7	Disbursed	ODA	Grant	Adaptation (13 %); Mitigation (80 %); Cross-cutting (8 %)	151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (1 %); 311 - Agriculture (1 %); 410 - General environmental protection (81 %); 430 - Other multisector (4 %); 740 - Disaster prevention and preparedness (12 %)
Subtotal	72.3	9.0	628.9	78.0					
Total contributions through multilateral channels	902.6	111.9	1 495.3	185.4					

Table 7.5(b) *Provision of public financial support: contribution through multilateral channels in 2016*

Year - 2016									
Donor funding	Total Amount				Status	Funding source	Financial instrument	Type of support	Sector
	Climate relevant share of core contributions		Climate-specific						
	NOK mill.	USD mill.	NOK mill.	USD mill.					
Multilateral climate change funds									
1. Global Environment Facility	34.8	4.1			Disbursed	ODA	Grant		
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund	335.8	40.0			Disbursed	ODA	Grant		
6. UNFCCC Trust Fund for Supplementary Activities									

7. Other multilateral climate change funds									
NDF - Nordic Development Fund									
SCF - Strategic Climate Fund	30.0	3.6			Disbursed	ODA	Grant		
GGGI - Global Green Growth Institute	16.4	1.9	20.6	2.5	Disbursed	ODA	Grant	Mitigation (90 %); Cross-cutting (10 %)	410 - General environmental protection
Multilateral Fund for the Implementation of the Montreal Protocol	10.4	1.2			Disbursed	ODA	Grant		
Other	Not available	Not available	56.1	6.7	Disbursed	ODA	Grant	Adaptation (23 %); Mitigation (65 %); Cross-cutting (12 %)	231 - Energy generation, distribution and efficiency – general (12 %); 232 - Energy generation, renewable sources (11 %); 311 - Agriculture (12 %); 410 - General environmental protection (42 %); 740 - Disaster prevention and preparedness (23 %)
Subtotal	427.4	50.9	76.7	9.1					
Multilateral financial institutions, including regional development banks									

1. World Bank			302.8	36.0	Disbursed	ODA	Grant	Adaptation (7 %); Mitigation (85 %); Cross-cutting (8 %)	231 - Energy generation, distribution and efficiency – general (5 %); 311 - Agriculture (15 %); 410 - General environmental protection (81 %)
2. International Finance Corporation			3.4	0.4	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (52 %); 232 - Energy generation, renewable sources (48 %)
3. African Development Bank	3.0	0.4			Disbursed	ODA	Grant		
4. Asian Development Bank			30.2	3.6	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (66 %); 236 - Heating, cooling and energy distribution (34 %)
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other									
AFDF - African Development Fund	80.6	9.6			Disbursed	ODA	Grant		
ASDF - Asian Development Fund	10.7	1.3			Disbursed	ODA	Grant		

IBRD - International Bank for Reconstruction and Development			107.0	12.7	Disbursed	ODA	Grant	Mitigation (99 %); Cross-cutting (1 %)	410 - General environmental protection
IDA - HIPC	20.4	2.4			Disbursed	ODA	Grant		
IDA - International Development Association	156.8	18.7			Disbursed	ODA	Grant		
Subtotal	271.6	32.3	443.3	52.8					
Specialized United Nations bodies									
1. United Nations Development Programme	Not available	Not available	390.8	46.5	Disbursed	ODA	Grant	Adaptation (1 %); Mitigation (96 %); Cross-cutting (3 %)	410 - General environmental protection (97 %); 430 - Other multisector (2 %); 740 - Disaster prevention and preparedness (1 %)
2. United Nations Environment Programme	Not available	Not available	33.2	3.9	Disbursed	ODA	Grant	Adaptation (42 %); Mitigation (31 %); Cross-cutting (26 %)	
3. Other									
IFAD - International Fund for Agricultural Development	85.6	10.2			Disbursed	ODA	Grant		
UNFCCC - United Nations Framework Convention on Climate Change									

ILO - International Labour Organisation	0.05	0.01	5.2	0.6	Disbursed	ODA	Grant	Mitigation	321 - Industry
Other			164.4	19.6	Disbursed	ODA	Grant	Adaptation (15 %); Mitigation (81 %); Cross-cutting (4 %)	410 - General environmental protection (94 %); 740 - Disaster prevention and preparedness (6 %)
Subtotal	85.7	10.2	593.6	70.7					
Total contributions through multilateral channels	784.7	93.4	1 113.6	132.6					

UNFCCC Secretariat
Norway has contributed substantial amounts of supplementary funding to the Secretariat for activities not covered by the core budget and for developing country participation in the process. Over the last few years, Norway has been one of the largest contributors in absolute figures. For the period 2014-2016, the actual contributions were NOK 75 million.Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC).

Norway became a member of the CCAC in 2012, and contributed NOK 102 million in the period 2013-16 as support to the UNEP secretariat and project support related to the reduction of short lived climate pollutants in developing countries aiming at promoting development and protecting public health

The UN Partnership for Action on the Green Economy (PAGE)
PAGE supports nations and regions reframing economic policies and practices around sustainability. Norway has supported PAGE with a total of NOK 38 million between 2013 and 2016.

The Global Green Growth Institute (GGGI)
GGGI is an inter-governmental organisation dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies. Norway's total support to The Global Green Growth Institute (GGGI) in the years 2014-2016 amounted to NOK 224 million.

The Intergovermental Panel on Climate Change (IPCC)
Norway has consistently supported the work of the IPCC and developing country participation therein. For 2014, 2015 and 2016 a total of NOK 4.5 million were transferred to the IPCC Trust Fund.

Fossil fuel subsidies reform. Global Subsidies Initiative.
Norway takes part in the Friends of Fossil Fuel Subsidy Reform (FFFSR), an informal group of non-G20 countries aiming to build political consensus on the importance of fossil fuel subsidy reform. The FFFSR works closely with the Global Subsidies Initiative (GSI) within the International Institute for Sustainable Development (IISD). GSI is dedicated to analysing subsidies and how they support or undermine efforts to achieve sustainable development. It provides analytical and administrative support to the FFFSR and promotes fossil fuel subsidy reform internationally - including SWAPS, where countries implement fossil fuel subsidy reform and allocate savings from reform toward sustainable energy and development (e.g. renewables, energy efficiency and public transport). Norway's contribution to the Global Subsidies Initiative was NOK 9.6 million in the period 2014-2016.

7.4.3 The Government of Norway´s International Climate and Forest Initiative

Norway's International Climate and Forest Initiative (NICFI) supports global efforts that reduce greenhouse gas emissions from deforestation and forest degradation in developing countries (REDD+). Forest and land use emissions are estimated to account for about 10 per cent of global net anthropogenic greenhouse gas emissions. It represents an even bigger part of the near term potential solution by simultaneously halting forest loss and restoring forest lands. Forest and land use emissions are a necessary part of the solution of the ambitious target of the Paris-agreement of limiting the global warming to below 2 degrees Celsius. This is also among the most cost-effective ways to mitigate climate change, and contributes to most of the sustainable development goals.

From 2008 through 2016 Norway had disbursed 20 billion NOK through Norway's International Climate and Forest Initiative, and is committed to continue allocating NOK 3 billion a year. These funds are used to pay for verified emission reductions in partner countries, to finance efforts to build up global and national REDD frameworks, build satellite technology to monitor global forests in real time, and to support civil society and indigenous peoples around the world. See table below for details of the disbursements.

7.4.3.1 **Transparency, civil society and private sector**

Since 2009 NICFI has contributed to a technology revolution that provides completely new opportunities for monitoring the forest. Satellite pictures have improved massively, and pictures are made available more frequently. The Global Forest Watch website is developed with support from Norway, providing forest countries with free data on forests, deforestation over time, forest fires etc. It is also a key priority to support the countries' own forest monitoring systems, so that they can better manage their resources.

Access to information otherwise has increased and improved the framework conditions for civil society and indigenous peoples organisations. With the support of NICFI, they can report on illegalities, thus imposing responsibility for both authorities and private actors. Law enforcement institutions have furthermore received training of by UN and INTERPOL.

Civil society organisations receive around 300 mill. NOK from NICFI yearly. Between 2013-2015 42 civil society actors received support. Priority areas were sustainable landscapes, sustainable commodity supply chains, analysis and knowledge production and global consensus on REDD+. A new portfolio of organisations was selected in 2015 through a call for proposals for the period 2016-2020. Priority areas are transparency, deforestation free supply chains, indigenous peoples and global consensus on REDD+.

NICFI aims at developing innovative models for public-private cooperation. An example of this is the fund &Green, established in 2017. The fund will promote deforestation-free business models by absorbing private sector risks that want to change, as well as encouraging individual jurisdictions to raise their standards to qualify for &Green financing. Meeting places between public and private sectors for deforestation supply chains are established through, among others, the Tropical Forest Alliance and the Business and Sustainable Development Commission, established with the support of Norway's Ministry of Climate and Environment.

7.4.3.2 **Bilateral partnerships**

In 2008 Norway pledged to contribute up to 1 billion USD to the Amazon Fund in Brazil until 2015, if Brazil could show that deforestation in the Amazon went down. From 2008 to 2014, Brazil reduced deforestation in the Amazon by around 60 per cent. Based on these results, by the end of 2015 Norway fulfilled its 2008-commitment to contribute 1 billion USD to the Brazilian Amazon Fund in recognition of Brazil's massive reductions of deforestation in its Amazon region. The observed increase in deforestation in 2015 and the 2016 is concerning. Brazil is strengthening its efforts to bring deforestation down again, and still committed to reaching its target of 80 per cent reduction in deforestation in the Amazon by 2020. Norway is committed to the partnership with Brazil on reducing deforestation and will continue its support until 2020 based on achieved results, in accordance with the rules set up in the partnership, as agreed during the Paris climate summit in 2015.

At the climate summit in Paris in 2015, Colombia, Germany, Norway and the UK announced a partnership[55] to protect Colombia's rainforest. Colombia will implement an ambitious package of cross-sectoral actions and strengthened self-governance of ethnic territories to reduce deforestation and promote sustainable development. To support that commitment, Germany, Norway and the United Kingdom will contribute close to 300 million USD through the REM-program, primarily through results-based payments for reduced deforestation. In 2016 Norway disbursed the first payment to Colombia of 105 mill. NOK through the REM-program, rewarding reduced emissions from deforestation in Colombia's Amazon rainforest in 2013 and 2014.

In 2014, Peru, Germany and Norway entered into a partnership to support Peru's efforts in reducing greenhouse gas emissions from deforestation and forest degradation in the Peruvian Amazon. Peru will take immediate and decisive action to reduce its forest related emissions towards making the forest and agriculture sector carbon neutral within 2021 and recognize millions of hectares of indigenous peoples' land claims. Norway commits to pay for verified results with up to 1,5 billion NOK for the period up until 2020.

Norway and Guyana signed a climate and forest partnership in November 2009[56]. So far, Norway has paid Guyana about 1 billion NOK for results relating to low deforestation and improved governance. Approximately half of it has been channelled through the Guyana REDD+ Investment Fund (GRIF), administered by the World Bank. Guyana spends the money on projects to realise Guyana's low carbon development strategy.

In May 2010, Norway signed a partnership with Indonesia to support the country's efforts to reduce greenhouse gas emissions from deforestation, forest degradation and the destruction of peat with up to 1 billion USD. Norway will mainly pay Indonesia for achieved results. Norway has so far disbursed about NOK 920 million to climate and forest efforts in Indonesia. Indonesia has made substantial policy changes in the partnership period, e.g. by adopting a moratorium on the destruction of forests on peat lands. 2016 the Peat Restoration Agency (BRG) was established with support from NICFI.

In 2012, Norway entered into a climate- and forest agreement with Vietnam. The agreement includes a support of 180 million Norwegian kroner to strengthen Vietnam's capacity to reduce greenhouse gas emissions from forests, strengthen sustainable forest management in six pilot provinces, and contributing to increased collaboration with neighbouring countries to combat illegal logging and trade in timber. Norway has so far disbursed NOK 135 million to Vietnam through the UNDP Multi Partner Trust Fund[57].

[55] https://www.regjeringen.no/en/aktuelt/norway-and-colombia-join-forces-to-protect-rainforest/id2422635/

[56] https://www.regjeringen.no/no/aktuelt/solheim-signerer-historisk-regnskogavtal/id584986/

[57] http://mptf.undp.org/

In 2013 Norway and Ethiopia entered into an agreement to reduce emissions from deforestation and forest degradation and increase the uptake of carbon in forests. Norway has pledged to support REDD+-efforts in Ethiopia with up to 20 mill. USD yearly, depending on progress and results. The agreement builds on a broader climate cooperation signed during the UN climate summit in Durban in 2011. During phase 1 of the partnership a REDD+ strategy has been designed, a framework for safeguards developed, and focus has been on institution building and developing a system for monitoring and reporting carbon emission from deforestation. Phase 1 was concluded in 2017. In phase 2 Ethiopia will develop concrete projects to reduce deforestation, restore forest and enhance the legal framework in the forest sector. Through 2016 Norway has disbursed 234 mill. NOK to Ethiopia under the partnership.

In 2014 Liberia and Norway entered into a partnership with the aim of facilitating green growth through emphasize on community forests, sustainable forest management and the development of a "deforestation free" agricultural sector. Norway will support Liberia's efforts with up to 1 billion NOK, including supporting improved management and enhancing sustainable economic activities in priority forest landscapes, delivering multiple benefits such as resilient livelihoods, income generating activities, and emissions reductions. An innovative public private model is developed for deforestation free palm oil, through using public funds to support project development and leverage private investments for community outgrowers, in return for multi-party commitment to protect natural forest. So far Norway has disbursed NOK 144 million under the partnership with Liberia.

The Congo basin is the world's second largest rainforest. Central African Forest Initiative (CAFI) was established in 2015. CAFI's[58] goals are to recognize and preserve the value of the forests in the region to mitigate climate change, reduce poverty, and contribute to sustainable development. CAFI is the largest international collaboration to protect the Congo Basin. It consists of six Central African countries (DRC, Republic of Congo, Gabon, Cameroon, Equatorial Guinea and the Central African Republic), five donors (UK, France, Germany, EU and Norway) and international organisations (UN and the World Bank). In 2016, CAFI and the Minister of Finance of the DR Congo signed a letter of intent[59] (LOI) for 200 million US dollars to address deforestation and forest degradation in the country and to promote sustainable development. This LOI[60] is the first signed between CAFI and a country of the Central Africa region, and the largest one ever concluded on REDD+ in Africa. CAFI is the main channel for Norwegian support to the Congo basin forests. In addition Norway supports civil society organisations and multilateral initiatives that operate in the region.

7.4.3.3 **Multilateral collaboration**

The UN-REDD Programme is the United Nations Collaborative Initiative on Reducing Emissions from Deforestation and forest Degradation (REDD+) in developing countries. The Programme was launched in 2008 and builds on the convening role and technical expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations

[58] http://www.cafi.org/

[59] https://www.regjeringen.no/globalassets/departementene/kld/kos/drc/undp-pr-cafi-drc.pdf

[60] https://www.regjeringen.no/globalassets/departementene/kld/kos/drc/letterofintent_drc_cafi.pdf

Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The UN-REDD Programme supports nationally led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including indigenous peoples and other forest-dependent communities, in national and international REDD+ implementation. For the period 2013 through 2016, the contributions totalled NOK 703 993 000 .

The Readiness Fund of the World Bank's Forest Carbon Partnership Facility (FCPF) supports tropical and sub-tropical developing countries in preparing themselves to participate in a future, large-scale, system of positive incentives for REDD+. This includes: adopting national REDD+ strategies; developing reference emission levels (RELs); designing measurement, reporting, and verification (MRV) systems; and setting up REDD+ national management arrangements, including proper environmental and social safeguards. For the period 2013 through 2016, Norway contributed NOK 252 200 000.

The Carbon Fund of the World Bank's Forest Carbon Partnership Facility (FCPF). Countries that have made significant progress in their REDD+ readiness endeavours may be selected to participate in the Carbon Fund, through which the FCPF will pilot incentive payments for REDD+ policies and measures in developing countries. The Carbon Fund will remunerate the selected countries in accordance with negotiated contracts for verifiably reducing emissions more than in the reference scenario. The Carbon Fund's payments are intended to provide an incentive to the recipient countries and the various stakeholders—including forest-dependent indigenous peoples, other forest dwellers or the private sector—within each of these countries, to achieve long-term sustainability in financing forest conservation and management programs. This would help reduce the negative impact on the global climate from the loss and impoverishment of forests. For the period 2013 through 2016, Norway contributed NOK 510 000 000 (63.242 mill USD).

The Forest Investment Program (FIP) under the CIF provides financing at scale to pilot countries to support the implementation of their national REDD+ strategies. Over time, the intention is to assist countries access result-based REDD+ payments. In 2013, Norway contributed NOK 220 000 000 to the FIP.

The BioCarbon Fund Initiative for Sustainable Forest Landscapes collaborates with forest countries around the world to reduce emissions from the land sector through smarter land use planning, policies, and practices. The ISFL is pioneering work that enables countries and private sector actors to adopt changes in the way farmers work on the ground to the way policies are made at the international level. This work supports sustainable landscapes, climate-smart land use, and green supply chains. The ISFL will remunerate the selected countries in accordance with negotiated contracts for verifiably reducing emissions more than in the reference scenario. For the period 2013 through 2016, Norway contributed NOK 748 350000.

Table 7.6 *Disbursements from* Norway's International Climate and Forest Initiative (NICFI)

NICFI disbursements *1000 NOK*	**2016**	**2008-2016**
Brazil	860 300	7 369 180
Indonesia	375 000	919 690
Guyana	11 660	1 032 338
Colombia	105 435	105 435
Tanzania	14 749	354 369
Vietnam	35 000	135 000
Ethiopia	38 513	234 111
Peru	55 484	56 504
Liberia	103 808	143 808
Congo Basin*	361 602	1 086 306
Civil Society and indigenous peoples	306 573	1 886 144
Green economy initiatives	44 533	377 084
Public-private[61] initiatives	45 400	84 850
UN-REDD program	80 000	1 569 675
FCPF – Readiness and Carbon fund	20 000	1 918 821
BioCarbon Fund (T3 and +)	0	748 350

[61] https://www.regjeringen.no/no/tema/klima-og-miljo/klima/klima--og-skogsatsingen/kos-innsikt/regnskogen-og-naringslivet/id2345594/

FIP	0	855 000
Other	95 049	522 296
Total	**2 553 106**	**19 488 963**
Administration[62]	94 945	470 732

**Central African Forest Initiative (CAFI), Congo Basin Forest Fund (CBFF), CARPE*

7.4.4 Norwegian assistance to Climate Adaptation

Norway's funding to climate adaptation is partly earmarked support, including climate smart agriculture and food security, strengthening resilience and early warning systems.

In terms of the earmarked support, funding has been directed towards the strengthening of climate services, capacity building and technology as well as disaster risk reduction. In 2015, the total amount allocated to climate adaptation only was NOK 360 million. In addition, NOK 653 million has been marked as cross-cutting, targeting both climate adaptation and climate mitigation. This includes both ODA and OOF. In 2015, the four largest areas for our earmarked climate adaptation support was General environmental protection (NOK 368 million), Agriculture (NOK 367 million), Disaster prevention and preparedness (NOK 88 million) and Other multisector (NOK 60 million). In 2016, the total amount allocated to climate adaptation only was NOK 304 million. In addition, NOK 331 million has been marked as cross-cutting, targeting both climate adaptation and climate mitigation. This includes both ODA and OOF. In 2016, the four largest areas for our earmarked climate adaptation support was Agriculture (NOK 225 million), General environmental protection (NOK 224 million), Disaster prevention and preparedness (NOK 59 million) and Other multisector (NOK 48 million).

Africa received the largest share of this support, about 59 per cent of the total adaptation budget in 2016. Among countries, Ethiopia, Malawi and India received the highest amount of funding for climate change adaptation in 2016.

The major part of Norway's support for adaptation, however, is core support channelled through multilateral institutions, including the GCF. In line with the mandate of GCF, about half of Norway's support to the GCF, NOK 800 million in the period 2015-2016, will go to adaptation to climate change in developing countries with a floor of 50 per cent of the adaptation allocation for particularly vulnerable countries. Support to the GEF and United Nations Environment Programme (UNEP) also includes adaptation to climate change.

While a large part of total Norwegian climate finance is allocated to REDD+ and renewable energy programmes, both of which are classified as mitigation, several REDD projects may have strong adaptation components, since forest conservation in many cases will increase

[62] https://www.regjeringen.no/no/tema/klima-og-miljo/klima/klima--og-skogsatsingen/kos-innsikt/klima--og-skogsatsingens-ansatte/id734275/

climate change resilience. Further, renewable energy projects may promote climate change adaptation.

Below are some examples of measures and programmes that Norway supports and which are relevant to adaptation:

International Centre for Integrated Mountain Development (ICIMOD)
Norway has supported ICIMOD's work aiming at improved well-being for the people of the Hindu Kush Himalayas. The funds cover core support and support to Regional Programmes on Adaptation to Change, Cryosphere and Atmosphere and Transboundary Landscapes. This includes pilot projects like the pilot on Resilient Mountain Villages in Kavre, Nepal that has been implemented in 8 villages, with 1089 households and 83 per cent women participants. The approach has been a basis for the Government of Nepal's climate smart villages programme, which is to be implemented in 14 districts and 116 villages.

Global Framework for Climate Services (GFCS)
Norway has supported GFCS programmes on improving the quality and availability of climate services in Africa. GFCS provides basic data on climate and hydrology that are important to avert immediate loss and damage, but it is also an important planning tool for infrastructure investment, agriculture and energy. It has aimed at increasing the resilience of people most vulnerable to the impacts of weather and climate-related hazards in the climate sensitive sectors such as disaster risk reduction, food security, and health.

Asian Disaster Preparedness Center (ADPC)
Norway has supported ADPC's Disaster Risk Reduction Initiative on National and Regional Level in Asia. The programme has aimed at building technical capacity of national governments, disseminating knowledge and building partnerships. This has included strengthening weather and climate services of Myanmar, Bangladesh and Viet Nam to deal with hydro meteorological hazards. Activities have included improving flood forecasting capacity to strengthen the flood early warning system in Myanmar, strengthening of landslide risk management practices in Nepal and Myanmar and building capacity in resilient development in at risk coastal areas in Viet Nam. Further, technical capacity of national and local governments in utilizing satellite technology to enhance disaster preparedness has been strengthened.

7.4.5 Norwegian Assistance to Renewable Energy

Norway has been supporting renewable energy projects in developing countries for many years. The funds are primarily used to support the generation of renewable energy, access to energy, building of transmission and distribution systems and strengthening of institutions and increased capacity in the energy sector.

In 2016, Norway channelled NOK 658 million to renewable energy. Out of this, Africa received 57 per cent, Asia 22 per cent, Latin America 2 per cent, whereas 13 per cent where distributed globally through multilateral and regional organisations and initiatives, civil society and commercial development. Not all of these projects have been coded with climate markers. Furthermore, Norfund – which serves as the commercial investment instrument of Norway's development policy – invested NOK 870 million in renewable energy in 2016, and supported the completion of the construction of new power plants with a total of 450 MW production capacity with hydropower, solar and wind. According to Norfund this represents 1 million tonnes of CO_2 avoided emissions on an annual basis.

The main focus in Norway's development cooperation on renewable energy has been measures that facilitate private and commercial investments, especially in generation of renewable energy. Key areas are policy dialogue and cooperation on reform, legislation, institution-building, planning and regional cooperation. Based on the private investments in new generation, access to electricity has been supported through development support to the extension of the grid as well as support to off grid solutions. Norfund is the primary vehicle to support large-scale projects for generation of renewable energy.

The only way to overcome the major challenges of ensuring global access to electricity services is to accelerate investment in long-term solutions making use of the renewable energy resources available in each country. Norway aims at leveraging funds for the reduction of energy poverty. Public and donor funds are not alone able to finance the significant amounts needed to boost energy sector development; thus Norwegian assistance for clean energy uses public sources to mobilise and incentivise commercial investment that lead to increased energy access and energy efficiency. Only by including the private sector is it realistic for renewable energy to become an important tool in the fight against global climate change.

Table 7.7 *Assistance for the energy sector in the period 2015-2016 that was coded with the climate markers:*

		2015	**2016**
		NOK mill.	**NOK mill.**
Climate change mitigation (only)	Main objective	378	299
	Significant objective	229	138
Total mitigation (only)		**607**	**436**
Climate change adaptation (only)	Main objective	1	
	Significant objective	19	0
Total adaptation (only)		**21**	**0**
Both climate change mitigation and adaptation		**19**	**2**
Total bilateral (incl. multi-bilateral) finance directed at climate change		**647**	**439**

Some examples from bilateral and multilateral partnerships follow below:

Liberia
Norway has contributed with more than NOK 500 million in the period 2014-2016. The areas of cooperation has been capacity building, hydrological network and electrification. The biggest investment by Norway, however, is the contribution to the reconstruction of the Mt. Coffee hydropower plant. With a capacity of 88 MW Mt. Coffee will substitute diesel powered generators in Liberia with clean hydropower, reduce emissions of climate gases and contribute to economic and social development.

Mozambique
Norway has been a partner to the energy sector in Mozambique for 40 years. The Contribution for 2016 was NOK 44 million. For support to electrification, capacity building and technical assistance for investments in the energy sector. Support to a transmission line and upgrading of a transformer station contributed to the decision to start construction of Mozambique's first grid connected solar power plan Mocuba (40 MW) in the Zambesia Province.

Tanzania
Norway has been an important partner for Tanzania in the energy sector since the 1970's. On the mainland and in Zanzibar, Norway has been key in the promotion of renewable energy by financing the development of hydropower plants, building capacity on renewable energy production and maintenance within key government institutions, as well as distribution of electricity and other energy sources. In 2013 Norway and Tanzania signed an agreement through which Norway will contribute NOK 700 million for improved access to energy in

Tanzania's rural areas. This is one of Norway's largest bilateral assistance agreements and contributes to Tanzania's ambitious goal of electrifying the countryside by 2025.

IRENA (The International Renewable Energy Agency)

Norway has been an active member of IRENA, the leading global centre of excellence on renewable energy, since its establishment. In addition to Norway's core assessed contribution, there has been a voluntary contribution of NOK 30 million over three years (2014-2016) to IRENA's Work Programme and Budget, in particular to three thematic areas: 1) Islands: lighthouses for renewable energy deployment/Partnerships for Action in SIDS 2) Planning for the global energy transition, including Renewable Readiness Assessments for a number of African countries, and 3) Gateway to knowledge on renewable energy (REsource).

Climate Investment Funds (CIF, World Bank)

Norway was active in the design and consultation process leading up to the establishment in 2008 of the umbrella framework for climate funds, the Climate Investment Funds (CIF) in the World Bank. The CIF is governed through a structure by which the Board consists of equal representation from recipients and contributors, and observers from, amongst others the UN, NGOs and the private sector. Norway contributed NOK 230 million for 2014–2016 to the SREP (Scaling up Renewable Energy in Low Income Countries). SREP opened up for 14 new pilot countries in 2014, mostly in Africa, bringing SREP countries to 27 plus one region.

The Energy Sector Management Assistance Program (ESMAP)

The ESMAP is a global technical assistance program aimed at promoting environmentally renewable energy solutions and economic growth. Norway has supported ESMAP with altogether NOK 55 million 2015–2016.

Clean Energy Financing Partnership Facility (Asian Development Bank)
Norway contributed in total NOK 50 million in 2015 and 2016 to the Clean Energy Fund under the Clean Energy Financing Partnership Facility, which aims at improving energy security in ADB developing member countries through increased use of clean energy.

EnDev

Norway is one of the contributors to the partnership Energising Development (EnDev), which has reached 18.2 million people with modern energy services since 2005. Through EnDev 18.2 million people, 19.900 social institutions and 42.200 small enterprises have benefitted from access to modern energy services. It has been estimated that 1.9 million tons of CO_2 is saved per year. Sustainability is one of EnDevs key criteria for support, both regarding the climate, the environment and commercially. Norway's contribution to EnDev has been NOK 102 million 2014 - 2016.

International Centre for Hydropower (ICH)
International Centre for Hydropower is based in Norway and has members from the hydropower industry as well as Norwegian public institutions. Its aim is to support development of sustainable hydropower with courses and training on planning and operations of responsible hydropower in emerging markets and developing countries. Institutional frameworks and

capacity building as well as technological transfer are central in ICH's programmes.

7.5 Activities related to transfer of technology and capacity building

Many of the elements already reported in this chapter of the Seventh National Communication, which has focused on ODA, also facilitate transfer of technology and capacity building. Capacity building is part of most of the examples given under adaptation or bilateral support above. Transfer of technology and expertise in order to promote development, availability and efficiency of energy constitutes an important element of ODA and has significant environmental co-benefits that are consistent with the promotion of the Convention on Climate Change. In addition, Norway supports a wide range of technology transfer efforts, of which a few are described in more detail below.

7.5.1 Support to transfer of technology

Support to the Technology mechanism
The Climate Technology Centre and Network (CTCN) is the operational arm of the technology mechanism under the UN's Framework Convention on Climate Change and serving the Paris Agreement. Norway has since the establishment of the CTCN been a major donor. The Centre promotes the accelerated transfer of environmentally sound technologies for low carbon and climate resilient development at the request of developing countries. Over 100 requests from developing countries have been/are in the process of receiving technical assistance to provide technology solutions, capacity building and advice on policy, legal and regulatory frameworks tailored to the needs of individual countries.

Private Finance Advisory Network (PFAN, UNIDO)
Private Finance Advisory Network (PFAN) is a multilateral cooperative activity that identifies and nurtures promising, innovative clean and renewable energy projects by bridging the gap between investors, clean energy entrepreneurs and project developers. PFAN is one of few actors in the climate finance field addressing the barriers for small and medium enterprises (SMEs) in developing countries and emerging economies, by leveraging private sector investment with a small amount of public funds. PFAN was developed by the Climate and Technology Initiative established at the first Conference of the Parties to the UNFCCC in 1995 under an implementing agreement with the International Energy Agency. UNIDO and REEEP have taken over the hosting of the PFAN initiative.

The Clean Energy Ministerial
Norway is a member of the Clean Energy Ministerial (CEM). CEM is a high-level global forum for promotion of policies and programmes that advance clean energy technology, for sharing lessons learned and best practices, and for encouraging the transition to a global clean energy economy. Initiatives are based on areas of common interest among participating governments and other stakeholders. The CEM focuses on three global climate and energy policy goals: Improving energy efficiency worldwide; Enhancing clean energy supply and; Expanding clean energy access

The main object is to improve policies and enhance deployment of clean energy technologies. Focused dialogue can accelerate the global clean energy transition. CEM initiatives focus on empowering energy decision-makers around the world with the up-to-date information and tools they need to improve the policy environment for clean energy. This low-cost, high-impact technical work also facilitates international coordination that amplifies each government's clean energy deployment efforts.

Mission Innovation

Norway has participated in Mission Innovation since the start of the initiative in November 2015. Today, 22 countries and the European Union participate in the initiative. Mission Innovation aims to reinvigorate and accelerate public and private global clean energy innovation with the objective to make clean energy widely affordable. Each participating country will seek to double its governmental and/or state-directed clean energy R&D investment over five years. New investments will be focused on transformational clean energy technology innovations that can be scalable to varying economic and energy market conditions that exist in the participating countries and in the broader world.

By 2020, Norway will seek to double the already considerable public resources devoted to developing and demonstrating clean energy technologies and solutions. This means increased efforts on renewable energy technologies, energy efficiency and carbon capture and storage. Important stakeholders will be the Research Council of Norway (RCN) and our two state energy enterprises, Enova and Gassnova, as well as energy research institutions and the private sector.

Norway has always given high priority to the development, use and deployment of environmentally sound technologies. Mission Innovation will put the world on a faster route to the point where we can secure energy access for all, while at the same time curbing global emissions of greenhouse gases.

7.5.2 International support and activities related to carbon capture and storage

Both the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change have pointed out that CO_2 capture and storage (CCS) will be an important mitigation tool. In order for CCS to become a viable mitigation tool, countries and companies need to invest in technology development and demonstration of CO2 capture and storage projects.

International cooperation on developing and commercialising new technology is also essential. Norway therefore provides funding for CCS projects abroad in cooperation with other countries and through existing programmes and institutions.

Norway is participating actively in a range of regional and international initiatives. For example, Norway is involved in the North Sea Basin Task Force, the World Bank CCS Capacity Building Trust Fund, the Zero Emission Plattform (the European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP)) and the Carbon Sequestration Leadership Forum. Norway is also working with international organisations like the International Energy Agency (IEA).

Norway have participated in the EU-commission's co-operation with China on CCS, the "Near Zero Emission Coal" initiative (NZEC). Pre-feasibilty studies for three CCS-projects in China have been conducted.

Norway has supported the South African CCS-centre for many years. The Centre has published a CO_2-storage atlas for South Africa. The next step is a test-injection of CO_2 to map the qualities of potential storage reservoars. Norway supports this project via earmarked grants to the World Bank's CCS-fund (see below). The government also granted support to DNV GL's feasibility studies on CCS for new coal power plants in Mosambique.

Below follows a few examples of our support.

The Carbon Sequestration Leadership Forum
The Carbon Sequestration Leadership Forum (CSLF) has 23 member states including China, India, South Africa, Mexico, the Republic of Korea, Brazil, Saudi Arabia, and United Arab Emirates; and is today one of the most important arenas for promoting CO_2 capture and storage. The CLSF has a policy group and a technical group. The CSLF has established a capacity building fund, to which Norway has contributed NOK 5 million.

The World Bank CCS Capacity Building Trust Fund for developing countries
Together with Norway and other donors, the World Bank has established a fund to support CCS in developing and emerging countries. Norway has contributed with NOK 97 million since 2009. Measures include mapping of geological storage sites and development of national legal frameworks and other capacity building and knowledge-sharing activities. The fund has chosen South Africa and Mexico as countries prioritised for further work. The Norwegian government will continue this co-operation. Norway is open to consider supporting large scale CCS-projects in developing countries in co-operation with other contributors.

CO2 Technology Centre Mongstad (TCM)
The Technology Centre Mongstad (TCM) is the world's largest facility for testing and improving CO2 capture technologies. TCM has been operating since 2012, providing an arena for targeted development, testing and qualification of CO2 capture technologies on an industrial scale. It is a collaborative project between the Norwegian Government, Statoil, Shell and Total.

TCM helps to spread knowledge about CO_2 capture by presenting results at international conferences, receiving visitors from around the world and releasing publications in professional forums.

In addition to cooperation within the partnership and with technology providers, TCM is working actively to establish cooperation with companies and institutions involved in the development of CO_2 capture technology.

TCM has also taken the initiative to form a global knowledge-sharing network for large test centres for CO_2 capture. TCM's initiative is important as international cooperation and information exchange will ensure faster progress in the CCS field.

8 Research and systematic observation

8.1 General policy on research and systematic observation

The most recent white paper on research; Meld. St. 7 (2014-2015) *Long-term plan for research and higher education 2015–2024* outlines a framework for how the Government will reinforce research and education to meet the challenges and seize the opportunities in the Norwegian knowledge society in the period from 2015 to 2024. The Government has increased public research and development (R&D) appropriations to 1 per cent of the gross domestic product (GDP). The Government will scale up appropriations to research and higher education within six long-term priority areas:

- Seas and oceans
- Climate, environment and clean energy
- Public sector renewal, better and more effective welfare, health and care services
- Enabling technologies
- Innovative and adaptable industry
- World-leading academic groups

International cooperation is a prerequisite for carrying out high-level research. Norway is part of the global knowledge development trend and participates extensively in international cooperation on research and education with countries throughout the world. Norway is participating in Horizon 2020, EUs Research and Innovation programme (2014- 2020) and is well-integrated in the European collaboration on research and higher education. Norway has taken part in this competitive arena as an associate member for more than 20 years.The Government states in the white paper that it will continue its work to stimulate institution-based, long-term international collaboration.

The most recent white paper on climate policy Meld. St. 41 (2016-2017), emphasizes the development of knowledge through research and innovation to combat climate change. Research, innovation and technology development is also a main area in the government's strategy for green competitiveness from 2017. The government will emphasise:

- Targeted research programs and emphasise climate and the environment in public financing of all relevant research, innovation and technology development
- European and international research and innovation cooperation
- Long term and interdisciplinary research of high quality
- Cooperation and dialogue between authorities, academic and industry.

In 2016, the goal on public allocations to research was achieved; surpassing one per cent of Norway's gross domestic product.

In 2017, the Norwegian government adopted new national guidelines on open access to scientific articles from public-funded research with a goal to reach full and free open access within 2024.

The Research Council of Norway (RCN)
Unlike many other countries, Norway has a single research council, which is the national strategic and funding agency for research and innovation activities. Nearly one-quarter of public allocations were channelled through the Research Council of Norway, with a budget of approximately NOK 9.3 billion in 2016. The other channel consists of basic funding to universities and institutes. In 2016, the RCN also received its largest budget increase to date – over NOK 1 billion. The Research Council supports basic research, strategic basic and applied research in addition to research for innovation and technology, and covers all disciplines.

The Research Council has four key objectives:

- To enhance the capacity and quality of Norwegian research.
- To strengthen research in areas of particular importance for research, trade and industry, and society at large.
- To promote constructive cooperation, allocation of responsibility and structure in the research system.
- To transform research results into action.

The Research Council's main strategy for 2015–2020 *Research for Innovation and Sustainability* sets out the guidelines for the Research Council's activities for the period from 2015 to 2020. The strategy takes its point of departure in two overarching challenges: Society must expand its innovation capacity, in both the private and the public sectors, and it must enhance sustainability in all areas.

The Research Council has developed an international strategy with five main action points:

1 All of the Research Council's activities (programmes, open competitive arenas, special initiatives, institution-oriented measures and other forms of support) must include clearly-defined objectives and plans for international cooperation.

2 The Research Council will promote Norwegian participation in joint programmes across national boundaries when this is crucial to cope with common challenges or to strengthen Norwegian research and knowledge-based industry.

3 The Research Council will develop financial instruments to support the establishment of long-term institutional cooperation between Norwegian institutions and similar institutions in other countries.

4 The Research Council will refine and strengthen stimulation packages to encourage Norwegian researchers, companies and research institutions to participate more actively in international collaborative and competitive arenas.

5 The Research Council will focus greater attention on international cooperation and researcher mobility in its internal grant application review processes.

In 2017 The Research Council of Norway's Strategy for Sustainability 2017-2020 "Research for Sustainable Societal and Industrial Development" was published. [63]

[63] https://www.forskningsradet.no/servlet/Satellite?pagename=ForskningsradetNorsk%2FHovedsidemal&cid=1212565796096&c=InnholdsKontainer&p=1220788264903&querystring=Research+for+Sustainable+Societal+and+Industrial+Development+&sortby=title&sortorder=asc&hits=30&configuration=nfrcspublikasjonsppublished&publicationType=ALLE

The Research Council has a critical role to play in generating the knowledge Norway needs and supporting the research and academic communities who are to produce and develop a more sustainable society and business sector. This strategy is a follow-up to the main strategy Research for Innovation and Sustainability (2015–2020), and shows the actions that the Research Council will take to realise its role as part of the broader Norwegian effort to achieve the UN Sustainable Development Goals, both nationally and globally.

8.2 Research and innovation on climate

The Research Council covers all disciplines of climate research, i.e. the climate system and how it changes, the effects of the changes on society and nature and how society can transform to meet the climate challenges (adaptation and mitigation). Within the latter, research on the development of technology to reduce greenhouse gas emissions and the development of low emission energy systems is given high priority. Innovation Norway and Enova support innovation and technology development of low emission and environmental technologies in the phase of demo and pilot projects. This funding has increased substantially the last years. Gassnova and the Norwegian Research Council jointly provide funding for research, development and demonstration of technologies for CCS through the CLIMIT programme.See chapter 4 for more information about Innovation Norway and Enova.

Norwegian climate researchers are active in international research cooperation, e.g. under the Nordic framework, the Arctic Council, the EU Framework programmes and initiatives and programmes related to ERA (European Research Area). Norway participates in all ten JPIs (Joint Programming Initiatives) and the SET-plan (Strategic Energy Technology Plan) as well as Belmont Forum, IIASA (The International Institute for Applied Systems Analysis) and Future Earth. International collaboration outside these established frameworks is also important, and bottom-up international and bilateral cooperation within research projects is quite common. For instance, projects within the Large-scale Programme on Climate Research KLIMAFORSK in 2016 included partners from 34 countries. In addition, the Research Council has several programmes to facilitate bilateral cooperation. Two of these have been established to facilitate cooperation with China and India, respectively.

In 2012, an international expert committee concluded a large-scale evaluation of Norwegian climate research[64]. The report states that Norwegian climate scientists are the world's most prolific in terms of publications per capita. In Norway, the number of research articles on climate research being published is very high. Furthermore, the international citation rate for Norwegian articles on climate research indicates that Norwegian climate research has a widespread international reputation and impact.

The Norwegian Earth System Model (NorESM) is highly recognized and was one of five European earth system models developing climate scenarios for the fifth assessment report from IPCC. NorESM has generated more than 300 publications/papers. The number of Norwegian researchers serving as authors for the Intergovernmental Panel on Climate Change (IPCC) working group reports is also very high. Eleven scientists from Norwegian research

[64] Norwegian climate research. An evaluation. 2012

institutions are currently contributing as Coordinating Lead Author, Lead Author or Review Editor for three special reports and one methodology report that are to be produced within the IPCCs Sixth Assessment Cycle. The nomination of authors for the preparation of the IPCC Sixth Assessment Report is ongoing and the participation of scientists from Norway is expected to be as high as for the IPCC Fifth Assessment Report, where 39 scientists from Norway contributed to the report. Norwegian scientists participated also as convening lead authors and contributing authors in the Arctic Biodiversity Assessment (ABA) presented in 2013 by the biodiversity working group of the Arctic Council (CAFF - Conservation of Arctic Flora and Fauna) and in the SWIPA report (Snow, Water, Ice and Permafrost in the Arctic) presented in 2017 by the Arctic Monitoring and Assessment programme (AMAP) under the Arctic Council.

The total funding through the Research Council related to Climate Research, including low emission energy was approximately NOK 1.2 billion in 2016, a substantial increase since 2008. In addition, the Research Council funding for carbon capture and storage was NOK 230 million. In addition, there are also considerable research efforts funded by the private sector within low emission and on carbon capture and storage. Climate research performed with basic public funding and funding through private sector is of about the same magnitude as that funded via the Research Council

The Executive board of the Research Council Norway states in its annual report for 2016, with reference to political intentions and goals stated in the white paper to the Parliament on research and higher education (Meld. St. 18, 2012 – 2013) that challenges in the area of the environment and climate change require further prioritisation. The executive board also states that the Research Council has further potential when it comes to integrating climate and environmental research, as well as integrating environmental sustainability into additional research programmes. An assessment by The Nordic Institute for Studies in Innovation, Research and Education (NIFU) in 2016, states that the research sector in Norway has capacity for increased activities in climate and environmental research.

The Research Council of Norway plans, organises and funds climate research through an array of different instruments, such as research programmes, centres of excellence, Centres for Environment-friendly Energy Research and individual projects. Approximately half of the research efforts funded by the Research Council are organised under the auspices of research programmes. More than 40 of the programmes and other activities at the Research Council include elements of climate research. The largest and most relevant ones are described below. All programmes aim at increasing international cooperation and promoting sharing and use of research infrastructure and data.

8.2.1 Research and innovation programmes under the research council

Climate research (KLIMAFORSK)The Large-scale Programme on Climate Research (KLIMAFORSK) is the Research Council’s most important funding instrument for achieving wide-ranging, high-quality Norwegian climate research. The KLIMAFORSK programme will provide new, future-oriented knowledge of national and international significance.

The KLIMAFORSK programme is divided into three broad research fields aiming to enhance knowledge on:

- Natural and anthropogenic climate change

- Impacts of climate change on nature and society
- The transition to a low-emission society and adaptation to climate change

The programme's strategic priorities include increasing international cooperation, promoting sharing and use of research infrastructure and data, recruitment of a new generation of climate researchers and dissemination of research results to relevant target groups.

Energy research (ENERGIX and FME)
The ENERGIX programme and the Centres for Environment-friendly Energy Research (Forskningssentre for Miljøvennlig Energi, FME) provide funding for research on renewable energy, efficient use of energy, energy systems and energy policy. These two large funding initiatives are central in Norway's research efforts on climate change mitigation. They encompass technological, natural and social sciences as well as humanities-related research and development activities.

The ENERGIX programme is the largest sector-focused funding programme at the RCN and is designed to provide support for the long-term development of the energy system in order to accommodate a greater supply of new renewable energy, improve efficiency and flexibility, and facilitate closer energy integration with Europe. Important secondary objectives for the programme are to:

- Achieve sustainable utilisation and consumption of domestic renewable energy resources;
- Reduce Norwegian and global emissions of greenhouse gases;
- Ensure Norway's security of supply;
- Strengthen innovation in Norwegian trade and industry and the public sector;
- Further develop Norwegian research and educational institutions.

Specifically, the programme aims to reduce Norwegian and global emissions of climate gases by:

- Enhancing knowledge relating to policy design, effective planning and decision-making processes, development of framework conditions, markets and reducing energy consumption;
- Developing new knowledge, technology and solutions in areas in which Norway has special expertise.

CO_2 capture and storage (CLIMIT),
CLIMIT is Norway's public programme to accelerate the commercialisation of CCS. Through the programme applications can be submitted for funding for research, development and demonstration of technologies for CCS. CLIMIT's focus areas include:

- CO_2 capture from power generation and industrial processes
- CO_2 transport
- Long-term storage of CO_2

The CLIMIT programme is administrated by both the Norwegian Research Council and Gassnova (a state enterprise for CCS activities) in unison. The Research Council manages research and development activities while Gassnova manages the development, piloting and demonstration of CCS technologies.

Polar research (POLARPROG)

The Polar Research Programme (POLARPROG) is the Research Council of Norway's most important funding instrument for achieving wide-ranging, high-quality Norwegian polar research. The activities of POLARPROG are divided into three thematic priority areas:

- "A changing climate and an environment under pressure" is targeted towards enhancing understanding of processes that govern climate and environmental change in the Polar Regions, and of their impact on the natural environment and society.
- "Natural resources and industrial activity" is targeted towards developing a basis for sustainable, knowledge-based industrial and social development in the Polar Regions.
- "Policy and management" is aimed at generating results that promote sustainable, knowledge-based environmental and resource management and policy development.

The programme aims at strengthening international cooperation, promoting sharing and use of research infrastructure and data, recruitment of a new generation of polar researchers and dissemination of research results. Within the Polar Research programme it is estimated that approximately 80 per cent of the projects are within climate research. In 2017, the Research Council completed an international evaluation of Norwegian polar research65. The evaluation committee found that Norwegian polar researchers publish world-class publications in many areas, such as the Arctic climate system and biogeochemical environment. Furthermore, the evaluation report states that the Norwegian polar research community is characterised by strong talent, easy access to resources and advanced infrastructure, with Svalbard playing an essential role as a research platform. The committee also pointed out that Norway, with its extensive scientific and technical capabilities, has the opportunity, a national need and an international responsibility to contribute actively to understanding and predicting the major changes taking place in the Arctic.

Drawing upon the knowledge generated during and after the scientific programme focusing on the Arctic and Antarctic, named the International Polar Year (IPY) in 2007-2009, a large consortium of Norwegian institutes and universities is about to start "The Nansen LEGACY". LEGACY will establish a novel and holistic Arctic research platform and provide the integrated scientific knowledge base required for the sustainable management of the environment and marine resources of the Barents Sea and adjacent Arctic Basin through the 21st century.

Environmental Research for a Green Transition (MILJØFORSK)

The research programme MILJØFORSK has a very wide thematical scope and is cross-disciplinary. It will generate more knowledge about key environmental challenges to the

[65] https://www.forskningsradet.no/prognett-polarforskning/Nyheter/High_quality_and_disciplinary_breadth_in_Norwegian_polar_research/1254029077266/p1231229969425

government administration, trade and industry, and society at large with a better foundation on which to take decisions to promote a green transition.

Marine research (MARINFORSK)
The research programme on Marine Resources and the Environment (MARINFORSK) is responsible for research related to ocean and coastal areas, and is the Research Council's most important thematic initiative in the field of marine research. The MARINFORSK programme is designed to provide the government administration with a sound knowledge base and promote increased value creation based on marine resources, with sustainability as an underlying principle throughout. Core activities are to contribute to improve knowledge about marine ecosystems and how they are affected by climate change, pollution and other anthropogenic factors.

Agriculture and forestry (BIONÆR)
The research programme on Sustainable Innovation in Food and Bio-based Industries (BIONÆR) aims to promote research that increases the level, profitability and sustainability of production in the bio-based industries. The programme covers research to promote innovation and management of the value chains for agriculture, forestry and nature-based industries, and for seafood and marine resources from the time raw materials are taken out of the sea until they reach the consumer.

<u>Joint efforts on research and innovation within the non-ETS-sector</u>. From this year, 2017, there will be a major boost to follow-up the Paris agreement and the Norwegian national climate targets within research and innovation to reduce greenhouse gas emissions from non-ETS sector. Under this new initiative, the Research Council of Norway will be funding research and innovation to reduce greenhouse gas emissions mainly from transport and agriculture sectors. Calls on research and innovation will be channeled through different research programs above such as ENERGIX, KLIMAFORSK and BIONÆR. This initiative is planned to run for several years.

North-South Cooperation (NORGLOBAL-2)
With funds from the Ministry of Foreign Affairs, the program on north-south cooperation, NORGLOBAL-2, will be continued for the period 2017-2024. NORGLOBAL-2 will stimulate innovative high quality and relevant research in support of global efforts towards the UN's Sustainable Development Goals (SDGs). The programme aims to strengthen the competences and capacities of Norwegian research institutions in development research. The ambition is to enhance Norway's contribution to global research and knowledge production. It will encourage and support cooperation with leading international researchers and institutions, including those in developing countries. Adopting a challenge-based approach, the programme places great emphasis on research that has the potential to lead to positive impacts on development ideas, policies and aid. NORGLOBAL-2 will strengthen communication and dialogue between researchers, policy makers and other stakeholders both nationally and internationally. It will seek cooperation with relevant international initiatives and programs, as well as other programs within the Research Council of Norway. NORGLOBAL-2 aims to contribute to progress towards the SDGs by research-based knowledge of high quality on poverty reduction and sustainable development informing development policies, development programs, private sector investments and further research. Dissemination of research-based knowledge to policy makers, relevant stakeholders and the public in Norway and internationally will be emphasized as well as contribution to more research-based knowledge translated into

policy and practice and increased and improved dialogue and cooperation between researchers, policy makers, private sector and civil society.

8.2.2 Energy technology research, development and demonstration

Research, development, and demonstration (RD&D) on energy and petroleum is one of the Norwegian government's priorities. Norway's public funding for energy and petroleum RD&D has multiple objectives. It should contribute to long-term value creation and a secure, cost-effective, and sustainable utilisation of Norway's energy and petroleum resources, strengthen the development of new technology and competence building, and contribute to an increased competitiveness in the energy and petroleum industry. The government's vision is to make Norway a global leader in green energy, and to develop and implement new solutions is a key element in fulfilling this ambition.

The Research Council of Norway is responsible for managing most of the public funding available for energy research. The funding is allocated to various programmes and funding schemes that together cover the entire energy field. The Norwegian government also funds energy technology development and demonstration through several other bodies, mainly Enova, Innovation Norway and Gassnova.

In an effort to develop national RD&D strategies for the petroleum and the energy sector, the Ministry of Petroleum and Energy launched the OG21 (Oil and Gas in the 21st century) strategy in 2001 and the Energi21 strategy in 2008. These strategies and the related major RD&D programmes are detailed below.

OG21
The OG21 strategy was established on the initiative of the Ministry of Petroleum and Energy in 2001. It aims to provide a unifying national technology strategy for the oil and gas industry. It also aims to contribute to an efficient and environmentally friendly value creation from the Norwegian continental shelf (NCS), and to develop world-class petroleum expertise and industry enterprises. The OG21 strategy was last updated in 2016. It now includes cross-thematic topics such as digitalisation and barriers to technology implementation and adoption. The main priorities in the new strategy are reflected through the following four technology target areas:

- energy efficiency and environment
- exploration and increased recovery
- drilling, completions, and intervention
- production, processing, and transport.

Energi21
Energi21 was established by the Ministry of Petroleum and Energy in 2008 and is Norway's national strategy for research, development, demonstration and commercialisation of new energy technology.

Energi21 encompasses the whole energy sector, and gives advice to the authorities on the strategic use of public research funding. Energi21 has a permanent board including representatives from energy and supplier companies, industry associations, research and educational institutions, and public authorities. The Research Council of Norway serves as the secretariat.

The revised Energi21 strategy, published in 2014, recommends giving priority to the following thematic areas: hydropower, flexible energy systems, solar power, offshore wind power, energy efficiency and carbon capture and storage. The board recommends devoting special attention to hydropower and flexible energy systems. Norway will have competitive advantages in all these areas in future energy markets thanks to its natural energy resources, energy-related technology base and expertise and extensive industrial experience.

The OG21 and Energi21 strategies are implemented through four main programmes and the centre schemes. The OG21 strategy is implemented through the PETROMAKS 2 and DEMO 2000 programmes, while the Energi21 strategy is implemented mainly through the ENERGIX programme and the FMEs. The CLIMIT programme has been set up for the RD&D in CCS.

Participation in international cooperation on energy research is a high priority and an important supplement to national research programmes. Close and productive cooperation across national borders enables us to find solutions to joint problems, improves the quality of Norwegian research and technology activities, builds up the knowledge base and opens the way for business cooperation. Norway participates in multilateral co-operation within the IEA, the European Union, and the Nordic countries. It also participates in Mission Innovation and has bilateral RD&D agreements with countries such as the United States and Brazil.

Norway is a founding member of Nordic Energy Research, an institution under the Nordic Council of Ministers that aims to promote and extend regional co-operation in energy RD&D on topics such as energy market integration, sustainable energy, and energy efficiency. Through the European Economic Area agreement, Norwegian research institutions and companies can participate fully in EU Horizon 2020 – the EU Framework Programme for Research and Innovation (2014-20). Energy is one of the priority thematic areas that focus on energy efficiency, low emission energy, and smart cities and communities, among others.

8.2.3 Low Emission Industry – Process21

Low emission industry is one of the priority areas in the Norwegian climate policy. To decrease emissions further there is a need to develop new technology. A strategic forum for low emission industry PROSESS21 is under establishment. In the forum stakeholders form industry, academia, the Research Council, Enova, Innovation Norway, Gassnova and Miljødirektoratet will work together to give strategic advices and suggestions on how Norway can minimize emissions from the processing industry in 2050 and at the same time lay the foundation for sustainable growth in the industry.

8.2.4 Research and observation infrastructure

The objective of the national financing initiative for research and observation infrastructure is to provide researchers with the equipment they need in order to perform high-quality science and efficiently meet the needs of the business as well as public sector for high-level research. In addition, the initiative aims to enhance the Norwegian research community's international reputation as a provider of outstanding research and observation infrastructure.

The national funding initiative for research infrastructure (earlier named “Tools for research”) has since the first call in 2009 allocated NOK 1 billion to new infrastructure in all fields of research, including climate relevant infrastructure such as polar buoys, infrastructure for high-precision palaeoecological analyses, databases for remote sensing, satellite products and time series relevant to climate change research.

Norway also takes an active part in the ESFRI-work (European Strategy Forum on Research Infrastructures). Norway is hosting the ECCSEL (European Carbon Dioxide Capture and Storage Laboratory Infrastructure) Preparatory Phase project. The main objective is to address the primary tasks necessary to establish a new distributed, goal-oriented, integrated pan-European infrastructure for state-of-the-art research on technologies enabling CO_2 capture, transport and storage (CCS). The consortium team is from 10 countries across Europe.

Of particular importance to Norwegian climate research is the ESFRI Argo drifting buoy, the European networks Integrated Carbon Observation System (ICOS), ACTRIS (Aerosols, Clouds, and Trace gases Research Infrastructure Network), and the Svalbard Integrated Arctic Earth Observing System (SIOS). SIOS is an international infrastructure project and observing system for long-term measurements in and around Svalbard addressing Earth System Science questions. SIOS is currently in its interim phase, and has a consortium consisting of 14 institutions from 10 nations. The interim phase is financed by the Ministry of Education and Research, and is coordinated by The University Centre in Svalbard (UNIS) and the Norwegian Polar Institute (NPI). Furthermore, the Council has funded a Climate-Ecological Observatory for Arctic Tundra (COAT), concentrating on long term effects of climate change on land areas in North-East Norway and Svalbard.

The leading Norwegian position in climate modelling is recently strengthened with research infrastructure support from the Research Council of Norway, which will assure upgrading the current version of NorESM. The state-of-the-art version will be used extensively by Norwegian and international climate researchers in the CMIP6 (Coupled Model Intercomparison Project Phase 6), in order to qualify for active Norwegian contribution also to the IPCC sixth assessment cycle.

The Norwegian contribution to the global ARGO observation floats has recently received a significant improvement with the new infrastructure funding from the Research Council of Norway. The new ARGO floats will contribute with better monitoring of ocean state and climate variability in Norwegian waters (Norwegian sea, Icelandic sea, the Greenland and Barents seas and the polar ocean). This fits well with the UNESCO-merited Norwegian support to build ocean research capacity, and the new buoys will provide high quality and relevance to Norwegian and international ocean and environmental research.

The Norwegian Polar Institute and The Fram Centre
Norway's central governmental institution for scientific research, mapping and environmental monitoring in the Arctic and the Antarctic. The Institute advises Norwegian authorities on matters concerning polar environmental management and is the official environmental management body for Norwegian activities in Antarctica.

The Fram Centre is the short name for FRAM - High North Research Centre for Climate and the Environment. The Fram Centre consists of scientists from 21 institutions involved in interdisciplinary research and outreach in the fields of natural science, technology and social sciences. It contribute to Norway's sound management of the environment and natural resources in the north. The centre contributes to strengthening the connection between research and education. The Fram Centre is an important arena nationally as well as internationally and contributes with inputs on climate-related issues.

8.3 Norwegian Systematic observation

The Norwegian Environment Agency is responsible for management and funding of a number of environmental monitoring programmes. One of the monitoring programs that are conducted by the agency includes the monitoring of greenhouse gases, ozone layer thickness, UV-radiation levels, aerosols and other air pollutants[66]. Other monitoring programs that relate to climate change includes coastal monitoring of flora and fauna, ocean acidification and terrestrial observations. These programmes are assigned to research institutions and in some cases combined with observations in the context of distributed European research infrastructures (e.g. Integrated Carbon Observation System (ICOS) and Aerosol, Clouds and Trace gases Research Infrastructure (ACTRIS)) and monitoring obligations (EU Water Framework Directive, European Monitoring and Evaluation Programme (EMEP) under the Convention on Long-range Transboundary Air Pollution (CLRTAP) or other international networks (e.g. Advanced Global Atmospheric Gases Experiment (AGAGE)). This is elaborated in the following.

8.3.1 Meteorological and atmospheric observations

The Norwegian Meteorological Institute (MET Norway) provides expertise on climate conditions on the global and national scale and provides climatological information for monitoring and planning purposes, and as input to the formulation of national climate policies.

MET Norway has included 10 existing meteorological surface observing stations and two upper air station (Jan Mayen and Bjørnøya) as part of the Global Climate Observing System (GCOS). The goal of GCOS is to provide comprehensive information on the total climate system, involving a multidisciplinary range of physical, chemical and biological properties, and atmospheric, oceanic, hydrological, cryospheric and terrestrial processes. The stations report to the World Meteorological Organisations (WMO) international data exchange according to standard procedures. Norway does not have a separate national GCOS programme.

MET Norway operates six upper air stations, including two stations at the Arctic islands of Jan Mayen and Bjørnøya, and a station at the Ekofisk oil field in the North Sea. These stations make soundings twice daily measuring temperature, humidity and wind every 2 sec up to a height of approximately 28 km. The institute also collects upper air data from a station operated at Ny-Ålesund, Spitsbergen by the Alfred Wegener Institute.

The surface-based meteorological network for real time synoptic observations comprises approximately 270 stations, including the manned Arctic stations at Jan Mayen, Bjørnøya, Hopen, Svalbard Airport and 11 automatic meteorological stations on Svalbard. In addition, MET Norway collects data from 8 oil rigs and 14 ships in the Norwegian and Barents sea.

[66] http://miljodirektoratet.no/no/Tema/Miljoovervakning/Naturovervaking/Klima/Klima-ozon-og-atmosfariske-forurensninger/

Many of these stations report on an hourly basis. A synoptic meteorological station has also been set up at Troll, the Norwegian Research Station in Antarctica.

Real-time data from the Norwegian meteorological stations are exchanged internationally through the WMO international data exchange and are sent to the World Data Centres according to standard procedures.

The institute also operates a network of manual precipitation stations consisting of 282 stations. Approximately 70 per cent of these stations report the data on a daily basis. The rest only report on a weekly basis.

MET Norway has operated meteorological observing stations for more than 100 years at a number of locations. The climate database of the Norwegian Meteorological Institute therefore includes very long records of climate data. This database is now freely available on the web at www.eklima.no. This web site includes both real-time data and long historical climate series.

Norway contributes to the development of the European Climate Assessment and Dataset (ECA&D), a project intended to produce a consistent climate database covering most of Europe. The project is an European collaborative effort within the European Meteorological Services Network (EUMETNET), as well as being co-funded by several FP7 (The EU 7th Framework Programme for Research and Technological Development) and projects within H2020 (Horizon 2020, The EU Framework Programme for Research and Innovation). Norway also contribute to the Nordic Climate Data Set (NKDS). This dataset contains high-quality monthly climate series back to the 1890s, and is established in the project NORDKLIM within the framework of the national meteorological services in the Nordic countries (NORDMET). NORDMET aims to achieve better cost efficicency by sharing resources in such area as observation, information management, production and education. Furthermore, the Nordic Framework for Climate Services (NFCS) within NORDMET has the main objective to boost the availability of climate information in the Nordic countries, by developing and sharing best practices in data handling, climate service products and communication with users. Norway was also leading a EUMETNET-project (EUMETGRID) aiming at producing fine-scale climate maps for Europe. This initiative is now partly continued as one component in the Copernicus Climate Change Services (C3S), in which Norway has the responsibility to provide high-resolution regional gridded climate data for the Fennoscandia (Nordic Gridded Climate Dataset - NGCD).

The Norwegian Institute for Air Research (NILU) has the main responsibility for performing the monitoring of greenhouse gases and aerosols (particles) in the atmosphere above Norway. Air sampling and measurements of meteorological parameters are mainly performed at two sites in Norway: Birkenes in the Southern part of Norway, and at the Norwegian Polar Institute Zeppelin Station at Ny-Ålesund, Spitsbergen (Svalbard) in the Arctic. The unique location of the Zeppelin Observatory at Svalbard together with the infrastructure of the scientific research community at Ny-Ålesund makes it very suitable for monitoring the hemispheric changes of the atmosphere. There are few local sources of emissions, and the location is important as the Arctic is a particularly vulnerable region. The observations at the Birkenes Observatory complement the Arctic site. Birkenes Observatory is located in a forest area with few local anthropogenic sources of greenhouse gases and climate-relevant air pollutants, but occasionally receiving polluted air downwind from Europe.

NILU also operates the Trollhaugen Observatory in Antarctica, which also has a comprehensive measurement program related to atmospheric composition.

The main objective of the monitoring programmes is to observe, analyse and interpret the changes in the atmospheric concentrations of the gases included in the Montreal protocol and the Kyoto protocol. Furthermore, the programme includes observations of aerosol properties and chemical composition. Information on these short-lived climate forcers provide increased understanding of climate change. The data provided from the monitoring programme are used for trend analysis and are also being used for a wide range of both Norwegian and international climate research projects and programmes.

A wide range of greenhouse gases are monitored at the Zeppelin Observatory. This include CO_2, CH4 , N2O, CO and more than 30 halocarbons, a wide range of halogenated species (including CFC, HFC and HCFC gases, SF6), some volatile organic carbon (VOC) compounds, and tropospheric and stratospheric ozone. In addition, the programme includes measurements of aerosol absorption (black carbon) and chemical composition, and Aerosol Optical Depth (AOD), which describes the total amount of aerosols in the atmosphere above the Zeppelin observatory. The Zeppelin Observatory is also the basis for measurements of aerosol properties performed by Stockholm University, funded by the Swedish Environmental Protection Agency and the Swedish Polar Research Secretariat. The station is a part of the WMO Global Atmosphere Watch (GAW) programme, and EMEP67 site under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) under United Nations Economic Commission for Europe (UNECE). Furthermore, there are contributions to the Advanced Global Atmospheric Gases Experiment Network (AGAGE) and to the international Network for the Detection of Atmospheric Composition Change (NDACC).

NILU measures CO_2, CH4, CO, tropospheric ozone and aerosol chemical, optical and physical properties (including aerosol optical depth) at the Birkenes site in Southern Norway.

NILU also operates a number of background sites with air and precipitation chemistry observations in support of EMEP.

NILU hosts the EMEP database and is the WMO-GAW World Data Centres for Aerosols and reactive gases. NILU also hosts the data from the large EU infrastructure project *ACTRIS - Aerosols, Clouds, and Trace gases Research InfraStructure Network* (all atmospheric in situ trace gases and aerosol data) and *InGOS -Integrated non-*CO_2 *greenhouse gases observing system* (all halocarbon measurements) that ended in 2015. Finally, NILU hosts the European part of the NDACC database and operates the European database for stratospheric ozone (NADIR), which contains data from several projects on stratospheric ozone founded by the European Commission.

Data generated from the atmospheric monitoring program are reported online in the EBAS-database[68]. Three annual data reports are produced from this programme: one for greenhouse

[67] EMEP: European Monitoring and Evaluation Programme: www.emep.int

[68] http://ebas.nilu.no/

gases and aerosols, a second report for long-range transboundary air pollution and particles, and a third report for atmospheric ozone and UV-radiation levels. Annual reports are available at the Norwegian environmental agency web page[69].

8.3.2 Oceanographic observations

The Institute of Marine Research (IMR) has an extensive monitoring programme on physical and biological oceanographic parameters. Temperature and salinity observations are made at 9 fixed coastal stations from Skagerrak to the Barents Sea with vertical profiles occupied 2-4 times per month. The monitoring started in 1936. IMR also occupies standard sections along the Norwegian coast between 2 and 4 times per year monitoring physical, chemical and biological oceanographic parameters. Most of these time series have been maintained since 1970s. IMR has a close collaboration with the Russian sister organisation PINRO in Murmansk, which maintain the hydrographic section Kola in the eastern Barents Sea and make the data available for IMR. The section is the most comprehensive oceanographic time series in the world, started by the Russians in year 1900 and taken monthly since the 1920s. In addition to fixed hydrographic stations and sections, IMR conduct regional physical, chemical and biological oceanographic monitoring on annual surveys covering the North, Norwegian and Barents Sea.

The ocean plays a key role in the global carbon cycle and absorbs about 25 per cent of the anthropogenic-emitted CO_2 to the atmosphere. This again leads to acidification of the oceans and may have major consequence for the marine ecosystem. On behalf of the Norwegian Environment Agency, the IMR, The Norwegian Institute for Water Research (NIVA) and Uni Research monitor the carbonate system in Norwegian Seas including the areas in northern Barents Sea and Svalbard, since the Arctic is deemed particularly sensitive to ocean acidification. The program started in 2010. Data from ocean acidification monitoring are reported to CARINA (Carbon dioxide in the Atlantic Ocean), CDIAC (Carbon Dioxide Information Analysis Center) and SOCAT (Surface Ocean Carbon dioxide Atlas).

The ECOCOAST-monitoring program covers oceanographic coastal observations along the Norwegian coast from the border of Sweden in the south to the border of Russia in the north. It applies monthly sampling of key chemical and biological parameters in different water types, as well as annual biodiversity monitoring on hard- and soft-bottom. The monitoring program is a continuation of the coastal monitoring program along the southern coast with startup in the year 1990, and is funded and coordinated by the Norwegian Environmental Agency. The older data from the southern coast have proven to be very useful for assessing effects of climate change on biodiversity. Data from ECOCOAST are primarily reported to OSPAR, with ICES as data host. These data are also shared via ICES with the European Environment Agency (EEA) through the Eionet cooperation arena. It is also the intention that the same data should be included in our reporting to the EU Water Framework Directive (WFD).

The Norwegian Polar Institute (NPI) maintains a monitoring programme in Fram Strait, monitoring the oceanic output from the Arctic Ocean to sub polar seas. The programme is a collaborative effort with the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine

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[69] http://miljodirektoratet.no/no/Tema/Miljoovervakning/Naturovervaking/Klima/Klima-ozon-og-atmosfariske-forurensninger/

Research (AWI). The latter institution is responsible for monitoring the input of heat and salt to the Arctic, while NPI monitors the export of freshwater. Since 1990, ice thickness have been continuously monitored with two to four upward looking sonars. The Norwegian Polar Institute also monitors the marine living environment and sea ice properties in Kongsfjorden, Svalbard, as well as sea ice and snow thickness in Storfjorden and Hopen, Svalbard.

The Joint Assessment and Monitoring Programme (JAMP) adopted by OSPAR 2005 (MASH 05/6/Info.2) has been developed to provide the basis for considering OSPAR's requirements for monitoring the species and habitats. Norway also contributes to a reporting and coordinating mechanism for WMO operational marine activities, the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM).

SEAPOP (Seabird Population Management and Petroleum Operations) is a national seabird mapping and monitoring programme. The programme, which has been developed in collaboration with research institutes, oil industry and management, will provide improved data on seabirds. In addition to helping to implement ecosystem-based management, this will also provide valuable information on the possible impact of climate change on biodiversity. The programme now covers the whole Norwegian coast.

A national programme for mapping of coastal marine biodiversity started in 2007 as a joint venture project between the Ministry of Climate and Environment and the Ministry of Fisheries and Coastal affairs. The mapping is foreseen to be completed by 2018 and will result in a classification of marine habitats and key areas that are significant for biological diversity at a local, regional or national level in all the Norwegian counties along the coast.

MAREANO is an integrated mapping programme for the Norwegian seas and coastal areas carried out by the Institute of Marine Research (IMR), the Geological Survey of Norway (NGU) and the Norwegian Mapping Authority Hydrographic Service (NHS). The programme initiates a detailed baseline mapping of the physical, chemical, biological environment of the sea bottom in Norwegian offshores areas. The programme started mapping the Barents Sea in 2006, the Norwegian Sea in 2012. At the end of 2017 MAREANO has mapped approximately 195.000 km^2.Norway has large natural resources in the coastal and shelf regions that are managed by different bodies within the government, counties and local communities. The MAREANO programme collects and compiles knowledge about offshore areas into an integrated database, and make the results available on the Internet using state-of-the-art GIS technology (www.mareano.no). The goal is to provide society with up-to-date, quality-controlled data for management, sustainable development and exploitation, making baseline data for any future changes in the composition of benthic communities that may reflect and quantify the biological effects of climatic change, among other factors.

Sea level observations

The Norwegian Mapping Authority (NMA) provides expertise on tides, sea level extremes (storm surges), reference levels for use in planning, and observed and projected changes in sea level. The authority is also responsible for the operation and maintenance of Norway's sea level observing system. The system is comprised of the national tide gauge network and a network of GNSS (Global Navigation Satellite System) stations (supplemented by other geodetic measurements). Observations from these networks are useful for climate, oceanographic and coastal sea level research.

The NMA operates a network of 23 permanent tide gauges on mainland Norway, one on Svalbard, and one on Jan Mayen. The longest records from Oslo and Bergen date back to the early 1900s. The modern tide gauge network continuously monitors water levels along the coast of Norway. In addition to the permanent network, several hundred data series from temporary tide gauges help improve the spatial coverage of the observations. Both real-time and historical data from the network are freely available to view or download from www.kartverket.no/sehavniva. All data from the network is stored at NMA. A number of the Norwegian tide gauge stations contribute to the Global Sea Level Observing System (GLOSS). The core GLOSS network provides an evenly distributed sampling of global coastal sea level variations, and contributes to monitoring long-term trends and accelerations in global sea level. Additionally, annual and monthly mean sea level data from the Norwegian tide gauges are delivered to the Permanent Service for Mean Sea Level (PSMSL). PSMSL is a global bank for long-term sea level change information and facility for climate research.

As tide gauge observations record the sea surface relative to the nearby land, local vertical land motion can be a significant contribution to the measured sea-level change. This is of particular importance for Norway where the Earth is rebounding following the last glacial. The Norwegian GNSS network thus provides important observations and constraint on land motion. The network was established in the 1990s and contributes to the Baseline Inferences for Fennoscandian Rebound Observations, Sea level, and Tectonics (BIFROST) project. Currently the network is comprised of ~200 GNSS stations, the longest data series are over 20 years. All data from the network is stored at NMA and are freely available.

8.3.3 Terrestrial observations

Norway has a great amount of terrestrial monitoring programmes that include climate parameters or indicators, which also may be used to evaluate the effects of climate change. Mass balance of glaciers and snow distribution in Svalbard (MOSJ), arctic tundra biodiversity (COAT), changes in ground vegetation communities and epiphytic lichens in mountains, sub alpine birch forests and coniferous forests (TOV), changes in populations of passerine birds and small mammals in sub alpine birch forests (TOV, bird index), palsa mire changes, changes in forest growth and vitality in coniferous forests (Forest monitoring) and changes in water chemistry and biota are some of the parameters or indicators that are useful to monitor with respect to climate responses.

Ongoing monitoring programmes of special interest with respect to climate change:

- Terrestrial Monitoring Programme (TOV) in birch and coniferous forests (Norwegian Institute for Nature Research). The data from eight study areas (birch forests) in the Terrestrial monitoring programme (TOV) are reported to the Global Terrestrial Observing System (GTOS). GTOS is a programme for observations, modelling, and analysis of terrestrial ecosystems, and facilitates access to information on terrestrial ecosystems so that researchers and policy makers can detect and manage global and regional environmental change.

- The Bird Index is a national bird monitoring programme. This programme gives representative data on bird observations from a national network (fully established from 2013) to a "common bird index" for Norway, and is included in the European common bird index, reported by Norwegian Environment Agency/Norwegian Institute for Nature Research). Bird data are reported to EEA (European Environment Agency).

- Monitoring of palsa peatlands (Norwegian Environment Agency/ Norwegian Institute for Nature Research)

- The Global Observation Research Initiative in Alpine Environments (GLORIA) is an international long-term monitoring program and site-based network studying high-mountain vegetation and its biological diversity under the impact of accelerating anthropogenic climate change. Norway participates with six mountain sites in a coast – inland gradient in central Norway and Northern Norway. (Norwegian Environment Agency/Norwegian University of Science and Technology/ Norwegian Institute of Bioeconomy Research)

- Forest monitoring programme (Norwegian Institute for Bioeconomy Research). Data on state/vitality of forest ecosystems are reported to ICP Forests, which is the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests operating under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP). Data from monitoring of forest resources, Pan-European Criteria & Indicators are reported to the United Nations Economic Commission for Europe (UNECE)/Food and Agriculture Organization of the United Nations (FAO).

- National Forest Inventory (inventory of forest stocks and various environmental variables on permanent plots all over the country at 5-year intervals) (Norwegian Institute for Bioeconomy Research)

- Ecosystem monitoring in freshwater (ECOFRESH – Norwegian Environment Agency/Norwegian institute for Water Research/Norwegian Institute for Nature Research) consists of two parts:

    - Monitoring of effects of acidification on chemistry and biology inn small acidified lakes and catchments. Time series from 1980s and 1990s. Although originally designed to monitor effects of acidification, the program also includes climate relevant parameters.

    - Reference monitoring of small to medium-size lakes according to the Water Framework Directive (Norwegian Environment Agency). Started in 2009. Some of the lakes have been selected as long-term monitoring sites to study effects of climate change.

Data from ECOFRESH are reported to the European Environment Agency (EEA), some sites are also reported to ICP Waters and ICP Integrated monitoring (CLRTAP-ECE).

- Ecosystem monitoring of large lakes (ECOLARGE) according to the Water Framework Directive (Norwegian Environment Agency) started in 2015. Some of the lakes have been selected as annual long-term monitoring sites to study effects of climate change. Data are reported to the European Environment Agency (EEA).

- The Norwegian Area Frame Survey of Land Cover and Outfield Land Resources (AR18X18) (Norwegian Institute for Bioeconomy Research) which is a national survey of land cover resembling the Eurostat Land Use/Cover Area frame Survey (LUCAS).

- Environmental monitoring of Svalbard and Jan Mayen[70] (MOSJ) is managed by the Norwegian Polar Institute. MOSJ aims at collecting and interpreting monitoring data from both the central components of the ecosystem, including climate and the major types of human impact in the Norwegian Arctic.

- Climate ecological Observatory for Arctic Tundra (COAT)[71] - coordinated by the University of Tromsø, is an ecosystem-based observation system aiming at detecting, documenting and understanding the impacts of climate change on arctic tundra. Data from COAT/MOSJ will be reported to CBMP (Circumpolar Biodiversity monitoring programme) coordinated by the biodiversity working group of the Arctic Council (CAFF – Conservation of Arctic Flora and Fauna).

- The Riverine Inputs and Direct Discharges to Norwegian coastal waters (RID) Monitoring programme is carried out as a part of OSPAR’s Joint Assessment and Monitoring Programme (JAMP). The monitoring programme has been on-going since 1990 and reports loads to the sea of nutrients, metals, some organic contaminants as well as various additional climate sensitive parameters (temperature, suspended particulate matter, turbidity, pH, conductivity, and total organic carbon).

Existing national plans

A national plan for biodiversity monitoring was adopted in 1998. This plan includes different threats against biodiversity, including climate. Recommendations from this plan have been implemented to a varying degree in ongoing national programmes.

The Norwegian nature index is presented every 5th year from 2010, next presentation is in 2020. The nature index presents trends in biodiversity for the main ecosystems by aggregating data from about 300 indicators/indexes, responding to different pressures, including climate change.

Since 2016 Norway is a formal member of the International Long-Term Ecological Research Network (ILTER), coordinated nationally by the Norwegian Institute for Nature Research. ILTER aims to coordinate and harmonize site-based long-term ecological studies to elucidate the possible effects of external drivers, climate change included, on ecosystem processes and biodiversity.

The Norwegian Red Lists for species and ecosystems, and national risk assessment on alien and invasive species, including a black list of alien species that poses the most severe threats to Norwegian biodiversity, are produced and periodically revised by the Norwegian Biodiversity Information Centre. These systems provide important tools for nature management, including climate change assessments. The Norwegian Biodiversity Information Centre also presents map access to records of species occurrences in Norway (Species map service) and operates Species Observations System (a Citizen science project for recording species on maps into a national and freely accessible database).

Cryosphere climate observing systems

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[70] www.mosj.npolar.no/en

[71] http://www.coat.no/

Long-term monitoring programs of several glaciers on the Norwegian mainland is performed mainly by the Norwegian Water Resources and Energy Directorate (NVE). The monitoring program includes measurements of mass balance, glacier length change, glacier velocity, meteorology and other glaciological investigations. In 2016, monitoring of mass balance was performed on 13 glaciers and monitoring of length change on 36 glaciers. The annual results from mass balance and glacier length changes are reported to the World Glacier Monitoring Service (WGMS) in Switzerland.

The Norwegian Polar Institute monitors glacier mass balance annually on five glaciers in Svalbard: four near Ny-Ålesund, and one on Austfonna, together with the University of Oslo. These are long-term measurements; the shortest time series starts in 2004, and the longest in 1966, the latter being among the longest Arctic mass balance time series. In addition, the institute monitors other glaciers over shorter terms; currently an additional three glaciers' mass balance is being measured. These data are reported annually to the World Glacier Monitoring Service (WGMS). As a contribution to the Global Environment Monitoring System (GEMS/GTOS) of the United Nations Environment Programme (UNEP) and to the International Hydrological Programme (IHP) of the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the WGMS of the Commission on Cryospheric Sciences of the International Union of Geodesy and Geophysics (CCS/IUGG) and the Federation of Astronomical and Geophysical Data Analysis Services (FAGS/ICSU) today collect and publish worldwide standardised glacier data.

Frozen ground (as measured by permafrost temperatures and the thickness of the active layer) is sensitive to climate and environmental change in high latitude and high elevation regions. Changes in the thermal state of permafrost and subsurface conditions can have important impacts on terrain stability, coastal erosion, surface and subsurface water, the carbon cycle, and vegetation development. Combined monitoring of meteorological and hydrological variables, soil and vegetation parameters, carbon dioxide and methane fluxes, and the thermal state of the active layer and permafrost at upgraded "reference sites" is the recommended observing approach. On mainland Norway long term permafrost monitoring programs, measuring permafrost temperatures and the thickness of the active layer, are run mainly by University of Oslo and Norwegian Meteorological Institute (MET Norway) for 18 boreholes at 7 different sites and various depths. All the drilling sites have been carefully selected in order to avoid geothermal disturbance from undesirable sources. A significant upgrade and extension of the permafrost monitoring program on mainland Norway was performed by MET Norway in co-operation with University of Oslo in 2014 at three main sites (Juvvasshøe, Snøheim and Iskoras). They are now operational and a part of the official national network of real-time meteorological observations run by MET Norway. New official automatic weather stations (AWS) were also established at these sites. They serve as key-stations for the long-term permafrost and climate monitoring programs in Norway. On Svalbard more than 20 permafrost boreholes with continuous monitoring exist, mainly in central Spitsbergen (Longyearbyen-Adventdalen area). They are run mainly by The University Centre in Svalbard (UNIS), but also the Alfred Wegener institute (AWI) and MET Norway are responsible for some key reference sites. The Norwegian permafrost program is reported to the Global Terrestrial Network for Permafrost (GTN-P), coordinated by the International Permafrost Association (IPA), which forms a GCOS/GTOS baseline network for these variables. The GTN-P Secretariat maintains both borehole temperature and active layer thickness metadata and coordinates data management and dissemination. A network of GTN-P National

Correspondents (NC) was established in 2013. Currently 26 partner countries are involved through the involvement of National Correspondents and Young National Correspondents.

Snow cover is an indicator of climate change, since it is controlled by both temperature and precipitation. Snow cover is a complex unit to monitor, but at the same time very important both in the ecosystems and the climate system. Snow-covered ground greatly influences the exchange of energy to the atmosphere and is also a measure of an important feedback mechanism for climate, in that the ability of the ground to reflect (the albedo) is reduced when the snow-covered period is shortened. The observations are made in keeping with national and international guidelines for observations of snow cover. Monitoring of snow cover duration is monitored on Svalbard at selected manned stations within MOSJ.

The operational sea ice service (Norwegian Ice Service[72]) at MET Norway produces high resolution sea ice concentration charts based on a manual interpretation of satellite data. The ice charts are updated every weekday. MET Norway are also running several sea ice models with different coverage as well as time and spatial resolution in order to produce a regional forecast product. There is a continuously work going on to improve the sea ice forecasting models.

8.3.4 Space based observing programmes

8.3.4.1 Introduction

Observations from space provide information that greatly assists the understanding and management of climate change, also complementing the ground based monitoring. The Norwegian membership of the European space organisation ESA (European Space Agency) has been the main pillar of Norwegian space research, since Norway became a member in 1987. It has enabled Norway to develop its own technological capacity, and at the same time have the advantage of scale from cooperating within a large organisation. Since the member states combined their resources through ESA, they have achieved results the majority of the countries would not otherwise have been capable of.

Norway takes part in international cooperation in space through ESA, through EUs Galileo and Copernicus programs, as well as in bilateral contracts with different nations. This cooperation gives the Norwegian research communities, governance and industry a secure access to data and possibility to influence which data should be chosen within the different satellite programmes. It also helps Norway building scientific and technological knowledge and capacity in areas that are of great strategic importance for Norway.

During the last 25 years, a rapid change in what can be measured from satellites has taken place. Although almost all Earth-observing satellite systems were not specifically designed for climate monitoring, space agency efforts have initiated a remarkably comprehensive climate data record that is forming the basis for a better understanding of the Earth's climate system. Much has been accomplished, but more remains to be done. Significant gaps remain in measurement capabilities and their continuity. CEOS (Committee on Earth Observation Satellites) agencies currently operates107 satellites with an Earth observation mission

[72] http://polarview.met.no/

including instruments. A number of important indicators and figures used and presented in IPCCs 5th assessment report derive from satellite observations, e.g. sea surface temperature and height, sea ice, aerosols, ozone, emission data from fires and sea level.

8.3.4.2 Using satellites in climate and environmental monitoring

Climate and environmental issues have been on the political agenda for many years, both in Norway and internationally. Enhanced political interest entails a need for improved knowledge to ensure that political decisions are based on solid foundation. Observations from space provide information that greatly assists the understanding and management of climate change, also complementing the ground based monitoring. Norway is taking part, through ESA and EUMETSAT (EUropean organisation for the Exploitation of METeorological SATellites), in the development of the next generation of polar and geostationary meteorological satellites.

Copernicus is the European Programme for the establishment of a long-term European capacity for Earth Observation. The provision of Copernicus services is based on the processing of environmental data collected from a space component consisting of several Earth observation satellites and an in-situ component consisting of a multitude of sensors on the ground, at sea or in the air. The European Environment Agency (EEA) is responsible for the development of the *in situ* component and coordinates the gathering of data coming from both European and non-European organizations.

Norway takes an active part as a participant in the Copernicus programme and through ESA and EU's H2020 Space. The ESA is developing and operating six missions called Sentinels specifically for the operational needs of the EU Copernicus programme. Each Sentinel mission is based on a constellation of two satellites to fulfil revisit and coverage requirements to provide robust datasets for Copernicus services. The Sentinel missions will have a free and open data policy.

The Copernicus services component is organised in six thematic services, namely the Atmosphere Monitoring Service, Marine Environment Monitoring Service, Land Monitoring Service, Climate Change Service, Emergency Management Service, and Security Service. These Copernicus services support a wide range of downstream applications in various public and commercial domains.

The objective of the Climate Change Service that will be operational from 2017 is to build an EU knowledge base in support of mitigation and adaptation policies. The Copernicus Climate Change service is led by European Centre for Medium-Range Weather Forecasts (ECMWF) and will be of great importance to Norway. MET Norway and the Nansen Environmental and Remote Sensing Centre (NERSC) take part in these activities.

The CryoClim project supported by the Norwegian Space Centre and ESA and led by the Norwegian Computing Centre has developed a new operational and permanent service for long-term systematic climate monitoring of the cryosphere by satellite. The product production and the product depositories are hosted by mandated organisations (MET Norway, NVE and Norwegian Polar Institute), and the service is delivered through a state-of-the-art web service and web portal. The service provides sea ice and snow products of global coverage and glacier products covering Norway (mainland and Svalbard). Cryoclim has potential to be a Norwegian contribution into both the Copernicus Climate Change service and the WMO Global Cryosphere Watch Initiative.

The ESA's Climate Change Initiative (CCI) is making full use of Europe's Earth observation space assets to exploit robust long-term global records of essential climate variables. Norway is participating in CCI projects on sea ice (led by NERSC with MET Norway in the project team), aerosol (MET Norway and NILU), glaciers (University of Oslo and Norwegian Water Resources and Energy Directorate), ice sheets (NERSC and Science & Technology AS), ocean color (NERSC), sea level (NERSC) and sea surface temperature (MET Norway). CCI was cited in the IPCCs 5th assessment report with respect to glaciers, sea level and ice sheets, despite only preliminary results being available by the cut-off dates.

Norway currently operates two satellites that were launched on 14 July 2017, NorSat-1 and NorSat-2. NorSat-1 hosts a Total Solar Irradiance (TSI) instrument of high value for climate research.

Some other examples of how satellite observation is used in monitoring climate and research are shown below.

- Polar areas: Satellite measurements are unsurpassed in providing a quick overview of status in the polar areas. Sea ice is obviously applicable, since reliable measurement is in practice is impossible without data from satellites. In addition to edge, concentration, thickness and drift, information about the sea-ice as habitat and transport medium can be obtained. On land we can measure glaciers' characteristics, extent and volume as well as their dynamics (speed, changes over time). Snow cover can be mapped and wet snow (beginning of snow melt) determined. Change in vegetation, albedo and length of growth season can be determined.

- Oceans: Earth observation is particularity suitable over the open oceans, with limited needs for high spatial resolution. Satellites monitor sea level, sea ice, objects on the sea surface, height of waves, currents, ocean colour (for biological activity), sea surface salinity, sea surface temperature, for instance linked to content of particles, and extent of oil spill.

- Further, satellite measurements are essential for establishing data records on precipitation, earth radiation budget, upper air temperature, wind speed and direction, water vapour and cloud properties.

- Greenhouse gases and other climate drivers: The application is different for different gases, depending on their absorption characteristics. It is possible today to measure some greenhouse gases by satellite, and products for CO_2, CH_4 and H_2O are available. In Norway, satellite observation is used in combination with ground-based observations of CO and aerosols to detect and classify high aerosol episodes, like burning of agricultural waste and forest fires in Eastern Europe and Russia.

- Ozone, UV and insolation: Norway combines satellite-based monitoring of stratospheric ozone with ground-based observations of ozone and UV at 2-3 stations: Oslo, Andøya and Ny-Ålesund. The combined monitoring covers Norwegian territories and adjacent areas from 55 -80 degrees north. The results are shared with global observation networks and used for research in Norway and for international research activities on the development of UV radiation and the ozone layer. Satellite data provides valuable information on spatial distribution of ozone and UV radiation and makes it possible to monitor the geographical extent of low ozone episodes during spring and summer and thereby discover enhanced

UV intensity on a regional level. Satellite monitoring of ozone in Norway has been carried out since 1979.

- Air pollution, local and global: Satellite observation is increasingly used in combination with models and in-situ data on the ground. Measurement of NO_2, SO_2, CO, CH_2O and aerosols will be further developed in the next decade e.g. through the Copernicus Atmosphere service in synergy with national activities. The good spatial coverage and the improved spatial and temporal resolution will probably make the Sentinel 5p/5 satellites essential tools in future atmospheric monitoring in Norway and the Arctic. Sentinel- 5p is scheduled to be launched in October 2017. Work is also underway to evaluate the possibility of including a satellite measuring global CO_2 in the long-term scenario of the Copernicus program.

Sentinel data will provide the long-term measurements that climate change science requires.

8.3.4.3 **Geodesic Earth observations**

The Norwegian Mapping Authority (NMA) measures changes to and motion of the Earth with an accuracy of millimeters from its geodetic observatory at Ny-Ålesund in Svalbard.

This facility forms part of a global network that contributes to the global geodetic reference frame. This reference frame is crucial for society's satellite-based infrastructure and provides the basis for accurate climate monitoring. With its northernmost location in the global network, Norway's geodetic calculations are a strong contribution to the worldwide collaboration on geodetic Earth observation. The importance of the global geodetic reference frame is now also a part of the UN-GGIM (United Nations Committee of Experts on Global Geospatial Information Management) agenda. In February 2015, the UN General Assembly adopted the resolution "A Global Geodetic Reference Frame for Sustainable Development" – the first resolution recognizing the importance of a globally coordinated approach to geodesy.

Using geopositioning, one can locate a point or an object as it moves within the terrestrial reference frame on the millimeter level. Such exquisitely precise measurements provides critical information for many factors such as global and regional sea level changes, ocean currents, ice melting, and movements in the Earth's crust and Earth orientation.

The global geodetic reference frame is a very accurate reference frame for the whole Earth. It is a coordinate system that allows you relate measurements taken anywhere on the Earth. The reference frame is established by equipping selected reference points with a combination of radio telescopes (Very Long Baseline Interferometry), laser ranging systems (SLR), Global Navigation Satellite System receivers (GNSS) and radio beacons, and sometimes gravimeters. The new state-of-the-art space geodetic observatory that NMA is establishing in Ny-Ålesund, Svalbard is an example of such a modern geodetic site. The observatory is due to be opened in 2018.

Norway has participated in building the European satellite navigation systems Galileo and EGNOS (European Geostationary Navigation Overlay Service). Active Norwegian participation gives the Norwegian government, industry and institutions the opportunity to influence coverage, entry and use of services. A central aspect of participation in Galileo and EGNOS is to secure that the systems for satellite navigation and observation will perform sufficiently over Norwegian territories, especially in the Arctic.

8.4 Actions taken to support capacity-building related to research and systematic observations in developing countries

Cooperation between MET Norway and the NMHSs in Bangladesh, Myanmar and Vietnam on Capacity Building are supported and funded by the Norwegian Ministry of Foreign Affairs (MFA) and are in collaboration with Asian Disaster Preparedness Center (ADPC)[73]. The focus is on capacity building at the organizational and individual level, with emphasis on forecasting, forecast verification, climate services and ocean modelling, as well as to strengthen early warning systems as part of national prevention plans to prevent disasters by extreme weather. MET Norway's state-of-art facilities are used to strengthen and develop the operational forecasting and climate services through capacity building, by implementation of integrated forecasting tools and building and utilizing existing climate information in creating modern climate products and services. By working on digitization of climate data, quality control and establishing a climate database, the countries are now able to generate climate products and national climate reports.

8.5 Opportunities for and barriers to free and open international exchange of data and information

International exchange of data and information is facilitated by the formal requirements of EU research programmes and other international cooperative research initiatives. Increasing use of common data gathering platforms, like remote sensing and coordinated site-based networks, also contribute to better opportunities for reliable data exchange among researchers. However, there are still considerable challenges pertaining to free and open data exchange, including formal restrictions on data access, an unwillingness of scientists to share data, and incompatible methods and sampling protocols. Hence, increased efforts are needed to reduce such barriers to effective data exchange in research and management.

To secure a cost efficient exchange of information, data and products, data providers need to implement standardised licenses that are widely used and understood, not only in the community as such but also among all potential user groups. Standardised licenses, e.g. the Creative Common attribution license, makes it easy for the data providers to handle the formalities as the license is made ready to use out of the box. It is also easy to cater for the need for compatible conditions when putting together information or mashing up data sets when using standardised licenses.

One of the biggest barrier to sharing data is conversion of data formats to suit the different reporting systems. The development of IT solutions is required to overcome this challenge. The Norwegian Environment Agency has for instance been developing IT solutions that enable to extract and convert data from the Norwegian Water Information System (Vannmiljø) for reporting in the required formats to the relevant systems. However, reporting systems may require data that we do not have available.

[73] http://www.wmo.int/gfcs/node/957

9 Education, training and public awareness

9.1 Introduction

The text of the Convention on Climate Change (UNFCCC) refers directly to education, training and public awareness, and these issues have been important elements of the Norwegian climate policy since the 1990s. Several activities have been initiated to give the general public a better understanding of climate change and its effects. This in turn should result in support for policy measures to deal with climate change and also encourage public participation in climate-related measures; in accordance with national policy for the green shift.

9.2 Education

Awareness of issues related to sustainable development and climate change has long been embedded in the Norwegian education system. Norway takes part in the 2030 Agenda for Sustainable Development and UNESCO's the Global Action Programme on Education for Sustainable Development.

9.2.1 Primary and Secondary Education

The object clause, concerning the new objectives of education and training, includes the following sentence: “Pupils and apprentices are to learn to think critically and act ethically and with environmental awareness”.

In 2017 the Solberg Government decided on a new broader part of the curriculum. This broader part elaborates the object clause and defines important values and principles for Norwegian schools. Respect for nature and sustainability are key values included in the new broader part of the curriculum.

The Government is seeking renewal of the subjects taught in schools to enable pupils to achieve more in-depth learning and better understanding. Greater focus will also be placed on the schools’ broad education and qualification mission within the framework of the school day.

The Government recommends giving priority to three interdisciplinary topics when renewing the school subjects: democracy and citizenship, sustainable development, and public health and wellbeing. These are all topics of importance for social development. The interdisciplinary topics will be highlighted within the framework of the relevant school subjects.

The Sustainable backpack is an initiative between the Ministry of Education and Research and the Ministry of Climate and Environment in order to better implement sustainable development into mainstream education at schools. It has been developed in close cooperation with the NGOs. One important aim is to help the NGOs to better target their materials in line with the school curriculum. In this way, it provides schools and NGOs with improved opportunities to locally to cooperate. The work on providing teachers and schools with support materials has been continued. Extensive support material has been developed to give teachers the best possible guidelines for their work in this area – in particular through the Norwegian Environmental Education Network (https://www.miljolare.no/en/)

The Network is organised as a co-operation between schools at all levels, research institutions and environmental authorities. The goal is to combine sustainable development education with collecting data that can be useful to others. The results of the investigations are collected in a central database, searchable from the Networks web pages.

9.3 Information

9.3.1 Generation Green – Climate Ambassadors

The Generation Green-initiative with Climate Ambassadors was a National Climate lecture tour in Norwegian middle schools and upper secondary schools (high school). The goal was to enhance climate change education and public awareness by creating a balance between education and positive storytelling that legitimizes and strengthens climate change as an important part of the curriculum.

9.3.2 The Environmental Information Act

The Ministry of Climate and Environment uses all available channels and information activities to provide different target groups with relevant information. The Environmental Information Act entered into force on 1 January 2004. It aims to ensure public access to environmental information in accordance with *Section 112 of the Norwegian Constitution*[74] and Norway's obligations pursuant to the UNECE *Aarhus Convention*[75]. It provides all citizens with a legal right to obtain environmental information, both from the public authorities and from public and private enterprises. It obligates not only public authorities but also public and private enterprises to hold environmental information as defined in Section 2 and to provide access to such information.

Public authorities are obligated to hold general environmental information relevant to their areas of responsibility and functions, and make it accessible to the public. This obligation is implemented through a number of freely accessible websites such as *http://www.environment.no/*, *http://www.norskeutslipp.no/en/Frontpage/* and *http://www.erdetfarlig.no/*. Rejection of individual requests for access to environmental information from public authorities may be appealed to the authority immediately superior to the one rejecting the request, and a complaint may also be submitted to the Parliamentary Ombudsman.

The Act obligates public and private enterprises to hold information about factors relating to their operations that may have an appreciable effect on the environment and to supply such information to citizens on request. All areas of economic activity are included. It gives citizens the right to demand information on everything from production processes to the content of the products that are used and sold. Information on substances or product attributes harmful to health and the environment must be available at all stages of production and use and be readily available for the users of the products.

[74] https://www.stortinget.no/globalassets/pdf/english/constitutionenglish.pdf

[75] https://www.unece.org/env/pp/treatytext.html

Products that do not have any effects on the environment in Norway, may have environmentally harmful effects abroad during production and distribution. The new Act gives citizens the right to ask for this kind of information too.

An appeals board has been established to consider complaints related to the follow-up of this Act by public and private enterprises. Half the members of the appeals board are people with an industry background, and the other half are people with a background in an environmental organisation, a consumer organisation or the media. The existence of the appeals board ensures proper evaluation and control of whether requests for information from public and private enterprises are handled in accordance with the Act.

9.3.3 Public websites

State of the Environment Norway (www.miljostatus.no) aims to provide the public with the latest information about the state and development of the environment in Norway. The Ministry of Climate and Environment has assigned the production of State of the Environment Norway to the environmental authorities. The Norwegian Environment Agency has the overall editorial responsibility. The website covers twelve environmental topics which are further divided into several subtopics. Each topic is presented in a simple and easy-to-follow way and provides access to more detailed scientific presentations. The website includes an interactive map and environmental data available for download. Norway's environmental targets are also found here.

The Norwegian Environment Agency also has the editorial responsibility for the Norwegian Pollutant Release and Transfer Register (PRTR). The website www.norskeutslipp.no provides the public with information on chemical substances and pollutants released to air, water and soil from industrial activities in Norway, in addition to waste generated from industry. The data is searchable and can be presented by industry sector, by facility, by a chemical substance or groups of substances.

The Ministry of Climate and Environment has over the recent years built up extensive information resources on the Internet. On its web pages (www.miljo.no) news, publications, press releases and other relevant information are published on a daily basis. The site covers all environmental fields including an extensive page on climate change.

9.3.4 Statistics and guidance material to counties and municipalities

Municipalities and counties possess instruments to contribute to reductions in greenhouse gas emissions, and need a sound knowledge base to make informed decisions. The knowledge base should consist of both statistics or inventories to track progress, and methodologies to calculate the potential for greenhouse gas emission reductions for different mitigation actions. Statistics Norway publishes statistics on greenhouse gas emissions at the county level. An analysis of greenhouse gas emissions for municipalities is produced by Statistics Norway and published by the Norwegian Environment Agency at www.miljostatus.no.

The Norwegian Environment Agency provides guidance on climate and energy planning for municipalities[76]. This guidance includes, among other topics, guidance on:

- How to organize and develop climate and energy plans, and what are the formal requirements
- How to set goals and develop an action plan
- How to use statistics
- How to calculate the effect of mitigation actions
- Examples of measures to reduce greenhouse gas emissions and energy use

The Norwegian Environment Agency is currently in the process of refining statistics on greenhouse gas emissions at the municipal level, and to further develop the guidance on how counties and municipalities can quantify the potential effect of different mitigation actions. The results are scheduled to be published by the end of 2018.

9.4 Consumer information

Providing information about the environmental effects of products throughout their life cycles is an essential part of efforts to promote sustainable consumption patterns. The Nordic environmental label (Nordic Swan Label) is the predominant official eco-label in Norway, Sweden, Denmark, Finland and Iceland. The label is awarded only to those products in a product range that fulfil strict criteria for environmental impact throughout their life cycles. The Swan Label has been developed through cooperation between governments and business, environmental and consumer organisations, and the overall aim of the label is to stimulate both the supply of and demand for products with a reduced environmental impact. The label is available for 63 product groups. Everything from detergent to furniture and hotels can carry the Swan label. The Swan is a widely recognised eco-label in the Norwegian market. Polls have shown that as many as 90 per cent of adults know that the Swan is Norway's official eco-label, and about as many express that they prefer Swan-labelled products to those without the label.

Figure 9.1 *The EU flower*

[76] http://www.miljokommune.no/Temaoversikt/Klima/Klima--og-energiplanlegging/

Norway also takes part in the EU eco-labelling system (the Flower), which is the other official eco-label on the Norwegian market. The Norwegian foundation for eco-labelling is responsible for and actively promotes both label systems in Norway. There is a close and active cooperation and coordination between the Flower and the Nordic Swan.

The Swan Label is a member of the Global Eco-labelling Network (GEN), which is a non-profit association of eco-labelling organisations from around the world.

Figure 9.2 *The Nordic Swan Label*

Norway has implemented EU-directives relating to energy efficiency.

The EU Energy Labelling Directive (2010/30/EU) regards energy labelling of products such as televisions, lighting, refrigerators, freezers and their combinations, tumble driers, washing machines, combined washer-driers, and air-conditioners. The label shows the product`s energy efficiency performance according to a classification system under the directive.

The Energy Performance of Buildings Directive (2002/91/EC) introduces a system of energy labelling of buildings. All residential and commercial buildings built, sold or let out after 1.July 2010 need an energy certificate.

9.5 Public procurement policies

A revised law on public procurement was adopted by the Parliament in 2016. The law as well as revised regulations on public procurement procedures under the law entered into force from 1.1.2017. This regulatory reform includes implementation of the revised EU-directives on public procurement from 2014 into Norwegian legislation. The Norwegian law on public procurement includes a general duty for contracting authorities at central, regional and local administrative levels within the scope of the law, to ensure that the procurement policy of the authority does not cause adverse environmental effects and promotes climate friendly solutions where relevant. The law underlines life cycle cost assessments as particularly relevant tools when applying a cost-effective approach to the most economically advantageous tender and when assessing the best price-quality ratio. The regulations under the law stress the duty for the contracting authorities to minimise the environmental consequences of public procurement of works, supplies and services. The regulations allow for environmental aspects to be taken into account at various stages of the procurement process, including environmental requirements and environmental labels as technical specifications, the use of environmental management certification schemes as qualification criteria, and environmental aspects as award criteria. Furthermore, the regulations explicitly state that if a contracting authority uses environmental aspects as a part of the award criteria, the environmental criterion shall, as a main rule, be weighed at no less than 30 percent.

The national Agency for Public Management and e-Government (Difi) is responsible for developing guidelines, advice and guidance to public entities on green procurement. The Agency develops green procurement criteria within important categories such as the building, construction, transport and ICT sectors, and selected product groups such as food, textiles, furniture and office supplies. Furthermore, the Agency supports enhanced effectiveness and professionalism in green procurement through guidance on applicable green procurement procedures, best practices and integration of environmental criteria in digital procurement tools. Another priority is development of improved statistics on effectiveness of green procurement practices, in great demand by businesses, public administration and civil society.

9.6 Resource and information centres

The energy agency Enova is responsible for public information in the field of energy efficiency. Enova offers a number of information and advisory activities targeting businesses, municipalities, households, children and young people. An open line providing energy efficiency advice for households and commercial actors is one of the main instruments. The establishment of energy efficiency networks for specific sectors is an important part of Enova's energy efficiency strategy. During the last few years, information campaigns in media with nationwide coverage have helped to raise awareness of energy efficiency issues in private households and among other energy users. For more information on Enova, see 4.3.7.11.

9.7 Science Centers

Norway has established 10 regional science centers in different parts of the country. The Regional science centre programme aims to increase the interest in science among children, youth and the general public. A science centre is a centre for experience and learning, with a focus on mathematics, natural science and technology, where visitors learn by doing experiments themselves. A basic level of knowledge about natural science and technology is important for understanding the principals of sustainable development.

9.8 Involvement of the public and non-governmental organisations (NGOs)

Norway aims to have a high degree of transparency and broad involvement in environmental policymaking and implementation of regulations. Norwegian environmental authorities have a long tradition of including the civil society in environmental policymaking. For example, Norway provides annual financial support to a number of NGOs listed in the Government's annual budget.

Legal proposals (laws and regulations) are generally subject to open hearings where civil society can voice their opinion. Civil society can also interact with the government and the Parliament in relation to other policy tools, such as budget proposals and white papers. In 2014 the Ministry of Climate and Environment established a climate council ("Klimarådet") to provide advice related to climate policies, including advice on how Norway can become a low emission society by 2050. The council has participation from business, labour organisations, environmental NGOs, local government and the research community.

The Ministry of Climate and Environment also provides financial support for NGOs to participate in different international meetings. Norway also aims to involve the NGOs in the preparations for such meetings, and to give them the possibilities to contribute actively during the meetings. NGOs are represented in the official Norwegian delegation under UN Climate Negotiations, and under UNEP's board meetings.

European legislation through the EEA is an important pillar in Norwegian environmental policy, including on climate change. Norway also has an EEA environment reference group, where civil society is represented, together with governmental organisations. The purpose is to let the organisations participate in the consultation process before EEA environmental legislation is implemented in the EEA Agreement.

9.9 Monitoring, review and evaluation of the implementation of article 6 of the convention

Norway has no formal monitoring, review and evaluation process in place for assessing the implementation of Article 6 of the UNFCCC. However, implementation of Article 6 is taken into account as part of other commitments related to mitigation, adaptation and international cooperation.

10 Annexes

10.1 Annex I Summary tables on emission trends

This Annex contains 5 tables summarising the results of the latest greenhouse gas inventories for Norway 1990-2015. The tables are drawn from the annual submission under the Climate Convention and the Kyoto Protocol from April 7th 2017.[77]

CRF TABLE 10S1: NORWAY'S EMISSIONS AND REMOVALS OF CARBON DIOXIDE (CO_2) DURING THE PERIOD 1990-2015

CRF TABLE 10S2: NORWAY'S EMISSIONS OF METHANE (CH_4) DURING THE PERIOD 1990-2015

CRF TABLE 10S3: NORWAY'S EMISSIONS OF NITROUS OXIDE (N_2O) DURING THE PERIOD 1990-2015

CRF TABLE 10S4: NORWAY'S EMISSIONS OF INDUSTRIAL GREENHOUSE GASES (HCFS, PFCS AND SF_6) DURING THE PERIOD 1990-2015

CRF TABLE 10S5: NORWAY'S TOTAL EMISSIONS AND REMOVALS OF GREENHOUSE GASES DURING THE PERIOD 1990-2015

Note references in the tables:

(1) The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the COP. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

(2) Fill in net emissions/removals as reported in table Summary 1.A. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(3) In accordance with the UNFCCC reporting guidelines, for Parties that decide to report indirect CO_2 the national totals shall be provided with and without indirect CO_2.

(4) In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.

[77] The complete set of CRF tables are found at: http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php

(5) Includes net CO_2, CH_4 and N_2O from LULUCF.

The notation keys are as follows:

“NO” : Not Occurring,

“NE” : Not Estimated,

“NA” : Not Applicable,

“IE” : Included Elsewhere and

“C” : Confidential.

Table AI-1. CRF TABLE 10S1: NORWAY'S EMISSIONS AND REMOVALS OF CARBON DIOXIDE (CO_2) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total (net emissions)[2]	41279.43	41279.43	36745.10	34245.15	37113.65	37213.05	37576.70	38270.82	38174.59	35570.12	33960.25	31152.75	30427.22
1. Energy	30163.95	30163.95	29135.83	30025.21	31314.19	32910.53	32744.59	35927.60	35851.94	35911.69	36757.37	36125.49	37990.93
A. Fuel combustion (sectoral approach)	26688.76	26688.76	26261.40	26732.35	27757.90	29194.94	29143.49	31836.81	31938.73	31923.58	32186.77	31253.53	33328.56
1. Energy industries	7281.29	7281.29	7641.90	8202.55	8470.89	9177.54	9068.13	9964.90	10336.94	10019.28	9975.01	10945.62	12169.84
2. Manufacturing industries and construction	4026.98	4026.98	3830.63	3700.04	3935.64	4640.26	4403.90	4958.37	4877.39	4987.74	4566.70	4405.87	4535.67
3. Transport	10267.69	10267.69	10165.56	10442.27	11091.84	10820.83	11103.36	11468.47	11733.37	12156.36	12474.82	11847.66	12056.26
4. Other sectors	4646.10	4646.10	4203.30	3889.87	3873.55	4029.38	4094.37	5018.89	4546.12	4380.96	4759.10	3858.97	4254.44
5. Other	466.69	466.69	420.01	497.62	385.99	526.93	473.72	426.17	444.90	379.25	411.16	195.41	312.35
B. Fugitive emissions from fuels	3475.19	3475.19	2874.43	3292.86	3556.28	3715.59	3601.10	4008.79	3883.20	3982.91	4560.48	4862.64	4658.31
1. Solid fuels	183.85	183.85	179.64	159.50	162.18	158.28	154.12	153.12	141.38	142.08	159.88	166.55	156.01
2. Oil and natural gas and other emissions from energy production	3291.34	3291.34	2694.79	3133.36	3394.10	3557.30	3446.98	3855.66	3741.82	3840.83	4400.60	4696.09	4502.29
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	82.01	30.01	5.20	10.11	9.32	4.06
2. Industrial Processes	14497.79	14497.79	13248.11	10605.69	11381.00	11688.69	11602.03	11388.41	11488.65	11739.43	11947.31	12082.65	11599.11
A. Mineral industry	727.69	727.69	680.89	739.68	925.03	943.36	989.80	991.17	1049.07	1026.50	992.38	999.34	962.24
B. Chemical industry	3250.49	3250.49	2972.19	2384.82	2646.76	2802.32	2820.48	2803.48	2846.51	2763.90	2810.99	2886.24	2804.62
C. Metal industry	10113.29	10113.29	9186.33	7058.77	7360.75	7464.77	7285.46	7034.63	6923.59	7250.53	7373.19	7353.11	6910.47
D. Non-energy products from fuels and solvent use	287.45	287.45	265.05	263.68	268.07	265.66	235.72	247.97	247.80	222.64	218.73	207.19	204.72
E. Electronic industry	NO	NO	NO	NO	NO	NO	1.03	1.03	1.03	1.03	1.14	1.14	1.14
F. Product uses as ODS substitutes	0.04	0.04	9.91	19.95	31.64	49.88	92.00	129.48	191.50	244.07	316.02	383.27	473.31
G. Other product manufacture and use	87.53	87.53	90.80	97.56	105.61	119.90	130.59	133.87	172.82	175.07	178.06	189.59	171.45
H. Other	31.27	31.27	42.95	41.23	43.14	42.79	46.97	46.77	56.33	55.70	56.80	62.76	71.16
3. Agriculture	4823.94	4823.94	4755.95	4728.59	4721.61	4723.69	4708.88	4803.24	4745.87	4739.03	4756.25	4611.18	4558.68
A. Enteric fermentation	2422.05	2422.05	2396.35	2414.08	2397.34	2439.48	2383.84	2461.46	2424.08	2427.26	2465.21	2364.60	2349.27
B. Manure management	422.82	422.82	422.79	426.90	423.25	425.70	423.71	434.71	426.39	428.49	431.76	411.21	412.72
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	1712.00	1712.00	1707.68	1706.20	1686.19	1669.71	1688.78	1706.22	1700.10	1707.24	1686.38	1683.40	1645.50
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	35.53	35.53	27.93	15.20	21.01	15.08	18.69	20.39	14.67	15.41	13.84	14.75	11.63
G. Liming	230.97	230.97	200.64	165.65	193.27	173.17	193.31	179.91	180.07	160.07	158.51	137.11	139.48
H. Urea application	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.11	0.07
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry[2]	-10449.36	-10449.36	-12613.56	-13303.31	-12474.95	-14270.92	-13601.17	-15920.99	-15939.39	-18708.30	-21265.43	-23486.41	-25484.73
A. Forest land	-11993.43	-11993.43	-14299.26	-15375.69	-14690.99	-16300.17	-15535.36	-18185.82	-18619.29	-21455.73	-23947.66	-26658.42	-28758.64
B. Cropland	1829.47	1829.47	1834.94	1825.50	1821.16	1820.58	1861.74	1855.23	1949.87	1929.03	1933.76	1923.18	1967.71
C. Grassland	12.51	12.51	16.62	19.66	26.53	29.39	45.16	63.89	92.34	72.65	103.97	104.73	95.85
D. Wetlands	0.49	0.49	-0.91	6.24	-3.99	-13.49	8.68	11.09	11.77	6.92	-10.10	-9.01	-11.00
E. Settlements	694.90	694.90	749.64	804.08	858.25	912.22	1017.50	1147.38	1259.93	1437.66	1509.80	1677.72	1741.32
F. Other land	0.08	0.08	0.15	0.23	0.30	0.38	0.38	0.38	0.38	0.38	0.57	0.76	0.95
G. Harvested wood products	-1000.00	-1000.00	-922.00	-591.00	-494.00	-728.00	-1008.00	-822.00	-644.00	-709.00	-866.00	-536.00	-532.00
H. Other													
5. Waste	2243.12	2243.12	2218.76	2188.97	2171.80	2161.06	2122.37	2072.55	2027.52	1888.27	1764.74	1819.85	1763.23
A. Solid waste disposal	2061.76	2061.76	2047.81	2007.74	1994.91	1986.02	1939.91	1898.12	1850.94	1721.43	1582.96	1634.41	1565.57
B. Biological treatment of solid waste	5.53	5.53	5.55	5.57	7.96	10.34	12.73	14.79	18.86	23.17	36.00	46.71	57.74
C. Incineration and open burning of waste	0.21	0.21	0.22	0.24	0.22	0.24	0.21	0.21	0.24	0.29	0.29	0.20	0.19
D. Waste water treatment and discharge	175.62	175.62	165.18	175.42	168.71	164.45	169.52	159.44	157.47	143.39	145.49	138.53	139.74
E. Other													
6. Other *(as specified in summary 1.A)*													
Memo items:													
International bunkers	2117.14	2117.14	1828.75	2189.81	2333.71	2485.28	2867.72	3201.23	3808.12	3721.92	3653.77	3547.85	3461.08
Aviation	625.36	625.36	564.97	608.60	641.19	622.45	591.15	698.04	778.26	829.25	950.70	921.63	843.44
Navigation	1491.78	1491.78	1263.78	1581.21	1692.51	1862.83	2276.57	2503.19	3029.86	2892.67	2703.08	2626.22	2617.64
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	4481.60	4481.60	4381.95	4103.61	4418.07	4735.03	4840.06	4861.48	5065.02	4682.74	4861.71	4720.70	5166.73
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	4929.19	4929.19	5098.50	5260.92	5416.49	5565.21	5707.30	5847.62	5983.66	6117.24	6237.73	6351.58	6452.95
Indirect N_2O	283.17	283.17	272.95	271.16	277.34	284.59	288.98	304.67	317.75	317.42	321.61	306.29	303.61
Indirect CO_2 [3]	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE
Total CO_2 equivalent emissions without land use, land-use change and forestry	51728.79	51728.79	49358.66	47548.46	49588.60	51483.96	51177.87	54191.80	54113.98	54278.42	55225.67	54639.17	55911.95
Total CO_2 equivalent emissions with land use, land-use change and forestry	41279.43	41279.43	36745.10	34245.15	37113.65	37213.05	37576.70	38270.82	38174.59	35570.12	33960.25	31152.75	30427.22
Total CO_2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table AI-1 (continued). CRF TABLE 10S1: NORWAY'S EMISSIONS AND REMOVALS OF CARBON DIOXIDE (CO_2) DURING THE PERIOD 1990-2015

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt CO_2 eq)														%
Total (net emissions) [2]	28649.88	28300.63	29381.08	30513.92	29072.32	30963.17	28928.13	24217.00	29362.48	27735.34	28576.07	27899.65	28582.28	29588.66	-28.32
1. Energy	37628.30	38929.37	38820.16	38326.77	39043.56	40832.07	39539.10	39266.25	41127.00	40147.63	39730.53	39363.82	39019.07	39602.23	31.29
A. Fuel combustion (sectoral approach)	33588.88	34929.01	34941.37	34636.60	35504.10	35900.17	35377.46	35813.06	37425.29	36514.03	36150.98	35781.93	35673.89	36078.15	35.18
1. Energy industries	12439.06	13116.87	13216.03	13487.08	13433.51	13765.75	13805.44	14532.39	15032.16	14710.59	14372.54	14403.24	15107.53	15508.52	112.99
2. Manufacturing industries and construction	4277.59	4614.54	4429.03	4221.54	4536.92	4270.91	4370.63	3969.73	4328.22	4210.24	3974.03	3969.94	3787.78	3800.57	-5.62
3. Transport	11914.91	12157.12	12518.51	12652.11	13085.15	13563.85	13203.46	13086.43	13477.90	13430.11	13406.74	13227.73	13158.50	13230.05	28.85
4. Other sectors	4468.96	4835.82	4414.01	3953.60	4138.10	4058.26	3713.35	3929.10	4313.02	3914.40	4130.48	3906.85	3356.48	3303.05	-28.91
5. Other	488.36	204.66	363.79	322.28	310.42	241.40	284.57	295.41	273.98	248.69	267.19	274.17	263.61	235.96	-49.44
B. Fugitive emissions from fuels	4030.85	3975.44	3856.41	3682.98	3535.98	4853.98	4052.66	3396.77	3604.92	3542.43	3516.65	3548.36	3301.16	3482.11	0.20
1. Solid fuels	147.93	190.06	144.18	122.41	118.63	151.27	122.46	107.95	101.96	111.42	95.53	119.84	117.46	98.83	-46.25
2. Oil and natural gas and other emissions from energy production	3882.91	3785.39	3712.23	3560.56	3417.35	4702.71	3930.20	3288.83	3502.97	3431.01	3421.12	3428.51	3183.70	3383.29	2.79
C. CO_2 transport and storage	8.57	24.92	22.38	7.20	3.48	77.92	108.98	56.42	96.79	91.17	62.91	33.53	44.02	41.97	100.00
2. Industrial Processes	10991.65	10204.87	10955.08	10617.76	9745.16	9850.01	9708.70	7385.29	8203.14	8197.85	8201.57	8272.67	8432.12	8464.24	-41.62
A. Mineral industry	986.76	1038.64	849.04	913.95	953.18	1013.56	1038.39	1022.52	1038.31	1013.81	998.18	1055.06	1068.87	1001.09	37.57
B. Chemical industry	2935.37	2717.27	2968.34	2825.18	2608.64	2327.40	1957.93	1348.81	1374.57	1291.87	1272.09	1154.17	1074.89	1201.19	-63.05
C. Metal industry	6090.67	5514.84	6143.83	5872.06	5108.87	5401.04	5518.43	3792.72	4322.55	4382.84	4393.12	4497.23	4666.20	4640.44	-54.12
D. Non-energy products from fuels and solvent use	203.76	209.59	211.75	204.23	194.81	206.46	204.75	190.09	208.09	218.43	209.15	222.44	208.54	201.66	-29.85
E. Electronic industry	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	100.00
F. Product uses as ODS substitutes	578.22	557.60	597.10	614.26	678.03	715.30	806.08	856.15	1064.60	1105.82	1140.87	1155.17	1235.58	1232.90	2808441.08
G. Other product manufacture and use	121.85	80.77	95.54	94.41	114.60	95.87	91.63	89.79	98.94	83.40	82.42	86.35	77.00	77.27	-11.72
H. Other	73.90	85.03	88.35	92.53	85.88	89.23	90.35	84.08	94.94	100.54	104.61	101.11	99.89	108.55	247.11
3. Agriculture	4537.50	4611.93	4580.97	4588.96	4504.04	4497.59	4484.64	4469.95	4394.22	4367.74	4389.43	4435.18	4500.06	4547.87	-5.72
A. Enteric fermentation	2340.92	2378.08	2348.58	2358.20	2306.16	2286.75	2288.63	2322.91	2306.21	2248.00	2254.97	2276.44	2288.23	2311.96	-4.55
B. Manure management	409.25	420.35	419.62	425.56	422.57	424.19	426.64	438.15	439.20	430.19	437.97	440.89	444.23	444.12	5.04
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural soils	1642.55	1682.23	1693.09	1689.02	1665.64	1682.53	1667.87	1617.04	1566.37	1608.18	1613.12	1633.13	1675.31	1698.86	-0.77
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	8.71	7.32	8.21	6.89	5.75	5.46	5.77	3.58	4.11	3.11	3.27	2.89	3.53	4.11	-88.43
G. Liming	135.64	123.87	110.25	109.18	103.80	97.48	94.83	86.92	78.01	77.93	79.87	81.67	88.61	88.61	-61.64
H. Urea application	0.43	0.07	1.22	0.10	0.12	1.17	0.89	1.35	0.32	0.33	0.23	0.16	0.16	0.22	-60.94
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry [2]	-26183.82	-27113.09	-26635.91	-24592.25	-25811.70	-25798.23	-26324.83	-28437.69	-25870.94	-26468.87	-25234.42	-25628.17	-24749.14	-24319.53	132.74
A. Forest land	-29734.29	-30734.89	-30214.80	-27909.02	-29341.73	-29373.68	-30267.86	-33039.34	-31232.56	-31108.79	-29983.94	-30588.59	-29729.06	-28975.41	141.59
B. Cropland	1957.59	1962.26	1933.16	1954.17	2039.54	2011.18	2017.08	2060.42	2166.87	2042.75	2039.01	2034.87	2022.05	2012.50	10.00
C. Grassland	82.93	89.14	56.73	115.15	178.41	209.84	229.29	363.09	303.35	285.89	282.28	285.26	231.77	274.30	2092.70
D. Wetlands	-4.92	1.77	2.28	13.19	12.55	-8.49	12.22	22.93	18.10	22.81	23.36	56.42	47.19	34.32	6968.72
E. Settlements	1849.98	1687.20	1770.33	1701.24	1707.37	1710.90	1915.71	2076.66	2183.49	2190.73	2226.14	2161.25	2117.80	2107.10	203.22
F. Other land	1.14	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.25	1.18	1.10	1.02	0.95	0.95	1115.88
G. Harvested wood products	-348.00	-132.00	-197.00	-481.00	-422.00	-362.00	-246.00	63.00	674.00	82.00	163.00	407.00	546.00	212.00	-121.20
H. Other															
5. Waste	1676.26	1667.55	1660.78	1572.68	1591.26	1581.74	1520.53	1533.20	1509.05	1490.99	1488.95	1456.16	1380.17	1293.85	-42.32
A. Solid waste disposal	1490.75	1470.62	1458.18	1368.63	1387.47	1358.41	1298.54	1317.57	1291.13	1279.19	1234.94	1198.82	1169.91	1081.41	-47.55
B. Biological treatment of solid waste	56.55	55.05	67.97	63.54	63.71	81.16	78.76	71.55	72.51	60.76	109.53	113.95	72.11	72.15	1204.62
C. Incineration and open burning of waste	0.16	0.16	0.15	0.14	0.08	0.10	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.07	-67.55
D. Waste water treatment and discharge	128.80	141.72	134.47	140.37	139.99	142.07	143.11	143.97	145.32	150.97	144.42	143.32	138.09	140.22	-20.16
E. Other															
6. Other *(as specified in summary 1.A)*															
Memo items:															
International bunkers	2834.38	2829.98	2842.35	3231.43	3421.08	3265.59	3219.71	2877.23	2750.21	2724.17	2875.27	2996.19	2676.09	2343.71	10.70
Aviation	746.83	754.64	855.03	946.73	1135.91	1169.17	1118.44	1100.21	1268.27	1180.47	1391.90	1518.67	1628.86	1536.55	145.71
Navigation	2087.54	2075.34	1987.32	2284.69	2285.18	2096.42	2101.27	1777.02	1481.94	1543.70	1483.37	1477.52	1047.23	807.16	-45.89
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass	5289.81	5413.66	5203.29	5329.59	5409.52	5589.06	5834.94	5395.00	6490.47	6419.56	5777.68	5208.15	4044.62	4389.62	-2.05
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Long-term storage of C in waste disposal sites	6554.54	6652.04	6752.19	6847.05	6945.86	7046.88	7143.13	7207.22	7239.08	7253.22	7253.64	7253.84	7254.04	7254.24	47.17
Indirect N_2O	294.81	294.17	296.70	297.21	293.63	297.27	283.03	268.90	276.30	267.84	259.96	243.96	229.03	221.12	-21.91
Indirect CO_2 [3]	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,IE,NA	0.00
Total CO_2 equivalent emissions without land use, land-use change and forestry	54833.70	55413.72	56016.99	55106.17	54884.02	56761.40	55252.97	52654.69	55233.41	54204.21	53810.49	53527.82	53331.41	53908.19	4.21
Total CO_2 equivalent emissions with land use, land-use change and forestry	28649.88	28300.63	29381.08	30513.92	29072.32	30963.17	28928.13	24217.00	29362.48	27735.34	28576.07	27899.65	28582.28	29588.66	-28.32
Total CO_2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Total CO_2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00

Table AI-2. CRF TABLE 10S2: NORWAY'S EMISSIONS OF METHANE (CH_4) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1. Energy	29070.68	29070.68	28020.91	28808.79	29967.71	31510.50	31366.32	34491.51	34324.03	34456.02	35325.56	34576.45	36315.27
A. Fuel combustion (sectoral approach)	26188.82	26188.82	25782.64	26254.03	27253.03	28666.30	28614.93	31281.39	31365.59	31373.46	31630.23	30700.10	32752.65
1. Energy industries	7214.26	7214.26	7569.85	8124.82	8391.90	9095.32	8985.02	9676.24	10243.89	9929.33	9889.53	10851.82	12065.95
2. Manufacturing industries and construction	3987.33	3987.33	3793.06	3663.18	3897.33	4596.46	4359.24	4911.17	4826.70	4940.99	4518.60	4360.68	4488.32
3. Transport	10102.37	10102.37	10003.07	10280.26	10926.73	10654.23	10934.00	11298.85	11559.43	11985.55	12303.51	11681.59	11893.63
4. Other sectors	4422.54	4422.54	4000.58	3692.87	3654.60	3798.28	3867.33	4772.80	4294.68	4141.92	4511.20	3612.34	3995.12
5. Other	462.32	462.32	416.07	492.90	382.46	522.02	469.34	422.33	440.89	375.67	407.39	193.68	309.64
B. Fugitive emissions from fuels	2881.86	2881.86	2238.27	2554.76	2714.69	2844.20	2751.39	3128.12	2928.43	3077.36	3685.22	3867.03	3558.56
1. Solid fuels	20.43	20.43	20.15	17.75	18.24	17.84	17.40	17.35	15.90	16.06	18.38	19.27	17.92
2. Oil and natural gas and other emissions from energy production	2861.43	2861.43	2218.12	2537.01	2696.45	2826.36	2734.00	3110.77	2912.53	3061.31	3666.84	3847.76	3540.65
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	82.01	30.01	5.20	10.11	9.32	4.06
2. Industrial processes	6402.00	6402.00	5847.04	5856.71	6369.87	6761.48	6916.36	6321.06	7186.75	7331.16	7214.92	7488.37	7084.84
A. Mineral industry	727.69	727.69	680.89	739.68	925.03	943.36	989.80	991.17	1049.07	1026.50	992.38	999.34	962.24
B. Chemical industry	1188.51	1188.51	1060.45	1004.90	1059.83	1148.74	1165.03	1166.24	1217.68	1050.82	873.40	1129.54	1089.87
C. Metal industry	4167.07	4167.07	3797.71	3807.23	4073.79	4360.92	4478.86	4468.91	4615.87	4975.50	5073.60	5089.54	4756.85
D. Non-energy products from fuels and solvent use	287.45	287.45	265.05	263.68	268.07	265.66	235.72	247.37	247.80	222.64	218.73	207.19	204.72
E. Electronic industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	31.27	31.27	42.95	41.23	43.14	42.79	46.97	46.77	56.33	55.70	56.80	62.76	71.16
3. Agriculture	231.52	231.52	201.20	166.20	193.82	173.72	193.86	180.46	180.63	160.63	159.06	137.22	139.56
A. Enteric fermentation													
B. Manure management													
C. Rice cultivation													
D. Agricultural soils													
E. Prescribed burning of savannas													
F. Field burning of agricultural residues													
G. Liming	230.97	230.97	200.64	165.65	193.27	173.17	193.31	179.91	180.07	160.07	158.51	137.11	139.48
H. Urea application	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.11	0.07
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry [2]	-10899.60	-10899.60	-13072.46	-13767.35	-12940.80	-14741.10	-14075.98	-16399.42	-16423.05	-19193.93	-21754.20	-23978.78	-25980.62
A. Forest land	-12342.76	-12342.76	-14654.87	-15734.74	-15050.49	-16662.60	-15900.83	-18553.77	-18388.74	-21825.38	-24318.49	-27030.00	-29131.57
B. Cropland	1743.22	1743.22	1748.44	1739.00	1734.41	1733.58	1774.49	1767.48	1861.62	1840.03	1844.26	1832.93	1876.96
C. Grassland	9.86	9.86	14.07	17.19	24.15	27.12	42.98	61.82	89.97	70.58	101.77	101.94	92.77
D. Wetlands	-1.34	-1.34	-2.73	4.42	-5.82	-15.31	6.86	9.26	9.35	5.09	-11.92	-10.83	-12.82
E. Settlements	691.36	691.36	744.49	797.59	850.69	903.79	1008.21	1137.47	1247.83	1425.02	1495.69	1662.53	1725.23
F. Other land	0.07	0.07	0.13	0.19	0.26	0.32	0.32	0.32	0.32	0.32	0.48	0.65	0.81
G. Harvested wood products	-1000.00	-1000.00	-922.00	-591.00	-494.00	-728.00	-1008.00	-822.00	-644.00	-709.00	-866.00	-536.00	-532.00
H. Other													
5. Waste	0.19	0.19	0.19	0.19	0.16	0.18	0.15	0.13	0.14	0.15	0.12	0.07	0.07
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Biological treatment of solid waste													
C. Incineration and open burning of waste	0.19	0.19	0.19	0.19	0.16	0.18	0.15	0.13	0.14	0.15	0.12	0.07	0.07
D. Waste water treatment and discharge													
E. Other													
6. Other *(as specified in summary 1.A)*													
Memo items:													
International bunkers	2097.52	2097.52	1811.80	2169.53	2312.09	2462.27	2841.18	3171.59	3772.86	3687.43	3619.86	3514.91	3428.96
Aviation	619.47	619.47	559.65	602.87	635.14	616.57	585.57	691.44	770.89	821.39	941.67	912.88	835.42
Navigation	1478.05	1478.05	1252.15	1566.66	1676.94	1845.70	2255.62	2480.16	3001.98	2866.04	2678.18	2602.03	2593.53
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	4481.60	4481.60	4381.95	4103.61	4418.07	4735.03	4840.06	4861.48	5065.02	4682.74	4861.71	4720.70	5166.73
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	4929.19	4929.19	5098.50	5260.92	5416.49	5565.21	5707.30	5847.62	5983.66	6117.24	6237.73	6351.58	6452.95
Indirect N_2O													
Indirect CO_2 [3]	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE
Total CO_2 equivalent emissions without land use, land-use change and forestry	35704.39	35704.39	34069.33	34831.89	36531.56	38445.88	38476.69	41593.16	41691.54	41947.95	42699.66	42202.11	43539.74
Total CO_2 equivalent emissions with land use, land-use change and forestry	24804.79	24804.79	20996.87	21064.54	23590.76	23704.78	24400.71	25193.74	25268.49	22754.02	20945.46	18223.33	17559.12
Total CO_2 equivalent emissions, including indirect CO2, without land use, land	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 equivalent emissions, including indirect CO2, with land use, land-us	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table AI-2 (continued). CRF TABLE 10S2: NORWAY'S EMISSIONS OF METHANE (CH_4) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)														%
1. Energy	36001.79	37222.01	37083.83	36738.16	37541.43	39157.63	37953.32	37696.43	39483.46	38581.36	38167.40	37784.64	37329.37	37970.74	30.62
A. Fuel combustion (sectoral approach)	32979.52	34308.39	34335.34	34056.38	34926.93	35286.90	34753.74	35172.60	36720.32	35834.08	35424.09	35081.67	34977.81	35355.62	35.00
1. Energy industries	12330.32	12999.42	13097.24	13369.73	13319.68	13647.30	13678.68	14396.42	14880.79	14564.76	14225.65	14262.20	14954.95	15347.11	112.73
2. Manufacturing industries and construction	4231.94	4565.81	4382.01	4171.68	4486.55	4218.98	4318.49	3923.38	4272.22	4149.67	3921.62	3915.05	3735.74	3748.55	-5.99
3. Transport	11755.61	11997.28	12357.76	12515.37	12950.36	13395.21	13028.34	12906.26	13290.00	13234.19	13169.47	12968.40	12882.14	12945.99	28.15
4. Other sectors	4177.59	4542.72	4137.66	3680.10	3862.61	3786.07	3446.16	3654.11	4007.89	3641.02	3844.71	3667.56	3147.80	3083.23	-30.28
5. Other	484.07	203.15	360.67	319.51	307.73	239.35	282.06	292.42	269.42	244.44	262.64	268.47	257.17	230.74	-50.09
B. Fugitive emissions from fuels	3013.70	2888.70	2726.11	2674.58	2611.03	3792.80	3090.60	2467.41	2666.35	2656.11	2680.41	2669.44	2307.55	2573.15	-10.71
1. Solid fuels	16.90	22.29	16.45	14.86	13.26	17.39	13.76	11.96	11.25	12.50	10.49	13.60	13.30	10.99	-46.21
2. Oil and natural gas and other emissions from energy production	2996.80	2866.41	2709.66	2659.72	2597.77	3775.41	3076.84	2455.46	2655.10	2643.61	2669.92	2655.84	2294.25	2562.16	-10.46
C. CO_2 transport and storage	8.57	24.92	22.38	7.20	3.48	77.92	108.98	56.42	96.79	91.17	62.91	33.53	44.02	41.97	100.00
2. Industrial processes	6523.81	6568.66	7132.04	6706.44	6273.90	6591.84	6849.06	5432.04	6276.69	6266.95	6311.04	6436.19	6547.73	6604.49	3.16
A. Mineral industry	986.76	1038.64	849.04	913.95	953.18	1013.56	1038.39	1022.52	1038.31	1013.81	998.18	1055.06	1068.87	1001.09	37.57
B. Chemical industry	968.35	941.06	1058.23	813.30	908.33	836.28	897.74	785.54	857.49	819.59	811.96	746.71	689.21	804.82	-32.28
C. Metal industry	4291.05	4294.33	4924.67	4682.43	4131.70	4446.31	4617.83	3349.82	4077.86	4114.59	4187.15	4310.87	4481.21	4488.37	7.71
D. Non-energy products from fuels and solvent use	203.76	209.59	211.75	204.23	194.81	206.46	204.75	190.09	208.09	218.43	209.15	222.44	208.54	201.66	-29.85
E. Electronic industry															
F. Product uses as ODS substitutes															
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	73.90	85.03	88.35	92.53	85.88	89.23	90.35	84.08	94.94	100.54	104.61	101.11	99.89	108.55	247.11
3. Agriculture	136.07	123.95	111.46	109.28	103.93	98.65	95.72	88.27	78.33	78.26	80.10	81.83	88.77	88.82	-61.64
A. Enteric fermentation															
B. Manure management															
C. Rice cultivation															
D. Agricultural soils															
E. Prescribed burning of savannas															
F. Field burning of agricultural residues															
G. Liming	135.64	123.87	110.25	109.18	103.80	97.48	94.83	86.92	78.01	77.93	79.87	81.67	88.61	88.61	-61.64
H. Urea application	0.43	0.07	1.22	0.10	0.12	1.17	0.89	1.35	0.32	0.33	0.23	0.16	0.16	0.22	-60.94
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry [2]	-26684.73	-27617.16	-27140.64	-25101.80	-26327.95	-26310.54	-26848.78	-28960.91	-26398.37	-26996.03	-25762.75	-26158.00	-25279.01	-24852.55	128.01
A. Forest land	-30109.61	-31110.87	-30591.47	-28287.87	-29725.92	-29754.58	-30657.59	-33425.32	-31621.61	-31496.84	-30372.63	-30978.80	-30120.62	-29367.28	137.93
B. Cropland	1866.84	1871.26	1841.66	1862.17	1947.79	1919.64	1925.74	1969.52	2076.40	1951.71	1947.91	1943.21	1930.09	1920.00	10.14
C. Grassland	79.74	85.75	53.19	111.44	174.50	205.60	224.71	358.03	297.97	280.45	276.93	279.98	226.54	269.12	2629.53
D. Wetlands	-6.74	-0.06	0.45	11.37	10.73	-10.31	10.40	21.11	16.28	20.99	21.54	54.59	45.37	32.50	-2529.13
E. Settlements	1832.08	1667.63	1751.38	1680.95	1685.81	1689.99	1892.83	2051.62	2157.52	2164.66	2199.57	2135.14	2092.80	2080.30	200.90
F. Other land	0.97	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.07	1.00	0.94	0.87	0.81	0.81	1127.78
G. Harvested wood products	-348.00	-132.00	-197.00	-481.00	-422.00	-362.00	-246.00	63.00	674.00	82.00	163.00	407.00	546.00	212.00	-121.20
H. Other															
5. Waste	0.04	0.04	0.04	0.04	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	IE,NE,NO	NE,NO,IE	NO,NE,IE	
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Biological treatment of solid waste															
C. Incineration and open burning of waste	0.04	0.04	0.04	0.04	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	IE,NE,NO	NE,NO,IE	NO,NE,IE	
D. Waste water treatment and discharge															
E. Other															
6. Other *(as specified in summary 1.A)*															
Memo items:															
International bunkers	2808.04	2803.69	2815.92	3201.39	3389.25	3235.17	3189.73	2850.41	2724.52	2698.74	2848.38	2968.16	2650.67	2321.66	10.69
Aviation	739.74	747.48	846.91	937.74	1125.12	1158.07	1107.82	1089.76	1256.23	1169.26	1378.68	1504.25	1613.39	1521.96	145.69
Navigation	2068.30	2056.22	1969.01	2263.65	2264.13	2077.10	2081.91	1760.65	1468.29	1529.48	1469.70	1463.91	1037.28	799.71	-45.89
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass	5289.81	5413.66	5203.29	5329.59	5409.52	5589.06	5834.94	5395.00	6490.47	6419.56	5777.68	5208.15	4044.62	4389.62	-2.05
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Long-term storage of C in waste disposal sites	6554.54	6652.04	6752.19	6847.05	6945.86	7046.88	7143.13	7207.22	7239.08	7253.22	7253.64	7253.84	7254.04	7254.24	47.17
Indirect N_2O															
Indirect CO_2 [3]	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,NA,IE	NE,IE,NA	0.00
Total CO_2 equivalent emissions without land use, land-use change and forestry	42661.71	43914.65	44327.38	43553.93	43919.25	45848.12	44898.10	43216.75	45838.48	44926.57	44558.54	44302.66	43965.86	44664.05	25.09
Total CO_2 equivalent emissions with land use, land-use change and forestry	15976.98	16297.49	17186.74	18452.13	17591.30	19537.59	18049.32	14255.84	19440.11	17930.54	18795.80	18144.66	18686.85	19811.50	-20.13
Total CO_2 equivalent emissions, including indirect CO2, without land use, land	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Total CO_2 equivalent emissions, including indirect CO2, with land use, land-us	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00

Table AI-3. CRF TABLE 10S3: NORWAY'S EMISSIONS OF NITROUS OXIDE (N_2O) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1. Energy	36.41	36.41	37.45	41.41	46.40	48.01	46.89	48.65	52.00	49.33	47.97	53.22	58.01
A. Fuel combustion (sectoral approach)	12.87	12.87	12.15	12.05	12.90	13.33	13.08	13.63	14.01	13.31	13.21	13.58	14.18
1. Energy industries	2.14	2.14	2.26	2.43	2.53	2.63	2.64	2.83	3.02	2.90	2.69	3.11	3.48
2. Manufacturing industries and construction	0.43	0.43	0.40	0.40	0.42	0.47	0.48	0.52	0.57	0.52	0.54	0.51	0.53
3. Transport	3.25	3.25	3.10	2.99	2.96	2.84	2.72	2.54	2.46	2.30	2.19	2.07	1.91
4. Other sectors	7.03	7.03	6.37	6.20	6.95	7.38	7.21	7.72	7.94	7.59	7.77	7.88	8.25
5. Other	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02
B. Fugitive emissions from fuels	23.53	23.53	25.30	29.37	33.50	34.68	33.81	35.02	37.99	36.02	34.76	39.63	43.82
1. Solid fuels	6.54	6.54	6.38	5.67	5.76	5.62	5.47	5.43	5.02	5.04	5.66	5.89	5.52
2. Oil and natural gas and other emissions from energy production	17.00	17.00	18.92	23.70	27.74	29.06	28.34	29.59	32.97	30.98	29.10	33.74	38.30
C. CO_2 transport and storage													
2. Industrial processes	0.48	0.48	0.41	0.42	0.43	0.46	0.48	0.47	0.71	0.91	0.87	0.84	0.95
A. Mineral industry													
B. Chemical industry	0.43	0.43	0.37	0.38	0.38	0.41	0.43	0.41	0.65	0.85	0.81	0.78	0.90
C. Metal industry	0.05	0.05	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	107.84	107.84	106.52	106.96	106.60	108.13	105.95	109.38	107.53	107.68	109.16	104.52	103.78
A. Enteric fermentation	96.88	96.88	95.85	96.56	95.89	97.58	95.35	98.46	96.96	97.09	98.61	94.58	93.97
B. Manure management	9.88	9.88	9.82	9.93	10.06	10.09	10.02	10.29	10.12	10.12	10.13	9.48	9.45
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1.09	1.09	0.85	0.46	0.64	0.46	0.57	0.62	0.45	0.47	0.42	0.45	0.36
G. Liming													
H. Urea application													
I. Other carbon-containing fertilizers													
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	5.60	5.60	5.67	5.68	5.63	5.65	5.65	5.72	5.75	5.75	5.76	5.80	5.82
A. Forest land	1.98	1.98	2.04	2.05	2.00	2.01	2.01	2.06	2.07	2.04	2.03	2.04	2.04
B. Cropland	3.45	3.45	3.46	3.46	3.47	3.48	3.49	3.51	3.53	3.56	3.58	3.61	3.63
C. Grassland	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08
D. Wetlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products													
H. Other													
5. Waste	87.28	87.28	86.32	85.14	84.42	83.70	82.08	80.07	78.15	72.48	67.26	69.56	66.92
A. Solid waste disposal	82.47	82.47	81.91	80.31	79.80	79.44	77.60	75.92	74.04	68.86	63.32	65.38	62.62
B. Biological treatment of solid waste	0.12	0.12	0.12	0.12	0.17	0.22	0.27	0.31	0.40	0.49	0.76	0.99	1.22
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
D. Waste water treatment and discharge	4.69	4.69	4.29	4.71	4.45	4.04	4.22	3.83	3.71	3.12	3.18	3.20	3.08
E. Other													
6. Other ***(as specified in summary 1.A)***													
Total CH_4 emissions without CH_4 from LULUCF	232.01	232.01	230.70	233.93	237.84	240.31	235.40	238.57	238.39	230.40	225.27	228.14	229.65
Total CH_4 emissions with CH_4 from LULUCF	237.61	237.61	236.36	239.61	243.47	245.96	241.05	244.28	244.13	236.15	231.03	233.94	235.47
Memo items:													
International bunkers	0.11	0.11	0.09	0.11	0.12	0.13	0.16	0.18	0.22	0.21	0.20	0.19	0.19
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Navigation	0.11	0.11	0.09	0.11	0.12	0.13	0.16	0.18	0.22	0.21	0.19	0.19	0.19
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass													
CO_2 captured													
Long-term storage of C in waste disposal sites													
Indirect N_2O													
Indirect CO_2 [3]													

Table AI-3 (continued). CRF TABLE 10S3: NORWAY'S EMISSIONS OF NITROUS OXIDE (N_2O) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)														%
1. Energy	55.86	59.09	60.47	55.55	51.96	58.48	54.96	54.44	56.74	53.60	53.26	54.13	58.89	56.42	54.98
A. Fuel combustion (sectoral approach)	15.30	15.74	15.38	15.33	15.08	16.29	16.71	17.40	19.34	18.28	19.93	19.11	19.26	20.18	56.80
1. Energy industries	3.62	3.90	4.07	4.03	3.87	4.08	4.28	4.59	5.08	4.82	4.76	4.51	4.96	5.25	145.76
2. Manufacturing industries and construction	0.51	0.56	0.53	0.57	0.56	0.58	0.57	0.51	0.70	0.78	0.66	0.70	0.70	0.70	65.43
3. Transport	1.80	1.92	1.98	1.95	1.86	3.01	3.29	3.50	3.74	3.92	5.42	6.37	7.00	7.27	123.68
4. Other sectors	9.35	9.35	8.79	8.77	8.77	8.62	8.55	8.77	9.74	8.68	9.00	7.39	6.43	6.82	-2.97
5. Other	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.03	0.08	0.08	0.09	0.13	0.17	0.13	424.14
B. Fugitive emissions from fuels	40.56	43.35	45.08	40.21	36.88	42.19	38.25	37.04	37.40	35.32	33.32	35.03	39.63	36.24	53.99
1. Solid fuels	5.24	6.71	5.11	4.30	4.21	5.36	4.35	3.84	3.63	3.96	3.40	4.25	4.17	3.51	-46.25
2. Oil and natural gas and other emissions from energy production	35.32	36.64	39.98	35.91	32.66	36.83	33.90	33.20	33.77	31.37	29.92	30.78	35.46	32.73	92.53
C. CO_2 transport and storage															
2. Industrial processes	0.98	0.88	0.80	0.83	0.79	0.65	0.80	0.74	0.80	0.85	0.83	0.77	0.76	0.79	66.34
A. Mineral industry															
B. Chemical industry	0.94	0.83	0.75	0.78	0.76	0.62	0.76	0.70	0.74	0.79	0.77	0.72	0.70	0.74	73.51
C. Metal industry	0.05	0.04	0.05	0.04	0.03	0.03	0.04	0.04	0.06	0.06	0.05	0.05	0.06	0.05	4.64
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
E. Electronic industry															
F. Product uses as ODS substitutes															
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	103.25	104.78	103.63	104.11	101.91	101.15	101.23	102.81	102.19	99.61	100.10	101.63	102.21	103.16	-4.34
A. Enteric fermentation	93.64	95.12	93.94	94.33	92.25	91.47	91.55	92.92	92.25	89.92	90.20	91.06	91.53	92.48	-4.55
B. Manure management	9.34	9.43	9.44	9.57	9.49	9.51	9.51	9.79	9.82	9.60	9.80	10.49	10.57	10.55	6.87
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural soils	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.27	0.22	0.25	0.21	0.18	0.17	0.18	0.11	0.13	0.09	0.10	0.09	0.11	0.13	-88.43
G. Liming															
H. Urea application															
I. Other carbon-containing fertilizers															
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	5.83	5.86	5.86	5.90	6.05	5.89	6.15	5.91	5.93	5.89	5.89	5.92	5.96	5.96	6.44
A. Forest land	2.05	2.07	2.05	2.07	2.24	2.08	2.34	2.12	2.16	2.10	2.10	2.10	2.13	2.11	6.61
B. Cropland	3.63	3.64	3.66	3.68	3.67	3.66	3.65	3.63	3.61	3.63	3.63	3.65	3.66	3.68	6.67
C. Grassland	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.11	0.00
D. Wetlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products															
H. Other															
5. Waste	63.52	63.17	62.52	59.07	59.84	58.99	56.56	57.16	56.20	55.65	54.61	53.22	50.88	47.32	-45.79
A. Solid waste disposal	59.63	58.82	58.33	54.75	55.50	54.34	51.94	52.70	51.65	51.17	49.40	47.95	46.80	43.26	-47.55
B. Biological treatment of solid waste	1.19	1.16	1.44	1.34	1.36	1.73	1.69	1.54	1.56	1.32	2.34	2.45	1.55	1.55	1230.81
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	447.60
D. Waste water treatment and discharge	2.69	3.18	2.75	2.98	2.98	2.92	2.93	2.91	2.99	3.15	2.86	2.82	2.53	2.51	-46.61
E. Other															
6. Other ***(as specified in summary 1.A)***															
Total CH_4 emissions without CH_4 from LULUCF	223.60	227.92	227.42	219.55	214.50	219.27	213.55	215.15	215.94	209.71	208.80	209.76	212.73	207.69	-10.48
Total CH_4 emissions with CH_4 from LULUCF	229.43	233.78	233.28	225.45	220.56	225.16	219.70	221.07	221.87	215.60	214.69	215.67	218.70	213.65	-10.08
Memo items:															
International bunkers	0.15	0.15	0.15	0.17	0.17	0.16	0.16	0.13	0.11	0.12	0.11	0.11	0.09	0.07	-39.16
Aviation	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	609.97
Navigation	0.15	0.15	0.14	0.16	0.16	0.15	0.15	0.13	0.11	0.11	0.11	0.11	0.08	0.06	-45.72
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass															
CO_2 captured															
Long-term storage of C in waste disposal sites															
Indirect N_2O															
Indirect CO_2 [3]															

Table AI-4. CRF TABLE 10S4: NORWAY'S EMISSIONS OF INDUSTRIAL GREENHOUSE GASES (HCFS, PFCS AND SF_6) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year [1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1. Energy	0.61	0.61	0.60	0.61	0.63	0.67	0.69	0.74	0.76	0.75	0.78	0.73	0.76
A. Fuel combustion (sectoral approach)	0.60	0.60	0.59	0.59	0.61	0.66	0.68	0.72	0.75	0.73	0.76	0.72	0.74
1. Energy industries	0.05	0.05	0.05	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06
2. Manufacturing industries and construction	0.10	0.10	0.09	0.09	0.09	0.11	0.11	0.12	0.12	0.11	0.12	0.11	0.11
3. Transport	0.28	0.28	0.28	0.29	0.31	0.32	0.34	0.36	0.38	0.38	0.39	0.38	0.39
4. Other sectors	0.16	0.16	0.15	0.14	0.15	0.16	0.16	0.18	0.18	0.17	0.18	0.17	0.18
5. Other	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
B. Fugitive emissions from fuels	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01
1. Solid fuels	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
2. Oil and natural gas and other emissions from energy production	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01
C. CO_2 transport and storage													
2. Industrial processes	7.02	7.02	6.51	4.73	5.43	5.66	5.66	5.61	5.56	5.83	6.58	5.97	5.81
A. Mineral industry													
B. Chemical industry	6.88	6.88	6.38	4.60	5.29	5.51	5.52	5.46	5.41	5.68	6.43	5.83	5.68
C. Metal industry	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	0.11	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.12	0.11
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	6.36	6.36	6.35	6.34	6.25	6.20	6.26	6.34	6.30	6.33	6.27	6.25	6.12
A. Enteric fermentation													
B. Manure management	0.59	0.59	0.60	0.60	0.58	0.58	0.58	0.60	0.58	0.59	0.60	0.58	0.59
C. Rice cultivation													
D. Agricultural soils	5.74	5.74	5.73	5.73	5.66	5.60	5.67	5.73	5.71	5.73	5.66	5.65	5.52
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.03	0.03	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
G. Liming													
H. Urea application													
I. Other carbon containing fertlizers													
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.04	1.04	1.06	1.08	1.09	1.10	1.12	1.13	1.14	1.15	1.16	1.17	1.18
A. Forest land	1.01	1.01	1.02	1.03	1.04	1.05	1.06	1.06	1.07	1.07	1.07	1.08	1.08
B. Cropland	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
C. Grassland	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	0.00	NE,NO	0.00	0.00	0.00
D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Settlements	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05
F. Other land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Harvested wood products													
H. Other													
5. Waste	0.20	0.20	0.20	0.20	0.21	0.23	0.24	0.24	0.25	0.26	0.28	0.27	0.30
A. Solid waste disposal													
B. Biological treatment of solid waste	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.06	0.07	0.09
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	0.20	0.20	0.19	0.19	0.19	0.21	0.22	0.21	0.22	0.22	0.22	0.20	0.21
E. Other													
6. Other *(as specified in summary 1.A)*													
Total direct N_2O emissions without N_2O from LULUCF	14.20	14.20	13.66	11.87	12.51	12.75	12.85	12.92	12.87	13.16	13.91	13.22	12.99
Total direct N_2O emissions with N_2O from LULUCF	15.24	15.24	14.73	12.96	13.60	13.86	13.97	14.04	14.01	14.31	15.06	14.39	14.17
Memo items:													
International bunkers	0.06	0.06	0.05	0.06	0.06	0.07	0.08	0.08	0.10	0.10	0.10	0.09	0.09
Aviation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Navigation	0.04	0.04	0.03	0.04	0.04	0.05	0.06	0.06	0.08	0.07	0.07	0.07	0.07
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass													
CO_2 captured													
Long-term storage of C in waste disposal sites													
Indirect N_2O	0.35	0.35	0.32	0.31	0.33	0.35	0.37	1.02	1.07	1.07	1.08	1.03	1.02
Indirect CO_2 [3]													

Table AI-4 (continued). CRF TABLE 10S4: NORWAY'S EMISSIONS OF INDUSTRIAL GREENHOUSE GASES (HCFS, PFCS AND SF_6) DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)														%
1. Energy	0.77	0.77	0.75	0.67	0.68	0.71	0.71	0.70	0.76	0.76	0.78	0.76	0.73	0.74	20.67
A. Fuel combustion (sectoral approach)	0.76	0.76	0.74	0.66	0.67	0.69	0.69	0.69	0.74	0.75	0.77	0.75	0.72	0.73	22.36
1. Energy industries	0.06	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.10	0.10	121.35
2. Manufacturing industries and construction	0.11	0.12	0.11	0.12	0.12	0.13	0.13	0.11	0.13	0.14	0.12	0.13	0.12	0.12	18.66
3. Transport	0.38	0.38	0.37	0.30	0.30	0.31	0.31	0.31	0.32	0.33	0.34	0.34	0.34	0.34	21.63
4. Other sectors	0.19	0.20	0.19	0.18	0.19	0.19	0.18	0.19	0.21	0.19	0.20	0.18	0.16	0.17	3.13
5. Other	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-47.11
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-40.05
1. Solid fuels	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-40.05
C. CO_2 transport and storage															
2. Industrial processes	6.64	6.00	6.46	6.79	5.75	5.04	3.61	1.95	1.78	1.62	1.58	1.41	1.33	1.36	-80.61
A. Mineral industry															
B. Chemical industry	6.52	5.89	6.35	6.69	5.64	4.95	3.49	1.83	1.67	1.52	1.48	1.31	1.24	1.27	-81.58
C. Metal industry	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	-12.77
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
E. Electronic industry															
F. Product uses as ODS substitutes															
G. Other product manufacture and use	0.10	0.10	0.10	0.09	0.09	0.08	0.10	0.11	0.09	0.09	0.09	0.09	0.08	0.08	-32.19
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	6.11	6.27	6.30	6.30	6.22	6.28	6.24	6.08	5.91	6.04	6.06	6.08	6.23	6.31	-0.86
A. Enteric fermentation															
B. Manure management	0.59	0.62	0.62	0.63	0.62	0.63	0.63	0.65	0.65	0.64	0.65	0.60	0.60	0.60	2.46
C. Rice cultivation															
D. Agricultural soils	5.51	5.65	5.68	5.67	5.59	5.65	5.60	5.43	5.26	5.40	5.41	5.48	5.62	5.70	-0.77
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-88.43
G. Liming															
H. Urea application															
I. Other carbon containing fertlizers															
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	1.19	1.20	1.20	1.22	1.22	1.23	1.24	1.26	1.27	1.27	1.28	1.28	1.28	1.29	23.78
A. Forest land	1.09	1.09	1.09	1.10	1.10	1.10	1.11	1.12	1.12	1.13	1.13	1.13	1.13	1.14	13.10
B. Cropland	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C. Grassland	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	100.00
D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Settlements	0.06	0.07	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.08	0.09	655.88
F. Other land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1050.00
G. Harvested wood products															
H. Other															
5. Waste	0.30	0.30	0.33	0.32	0.32	0.36	0.36	0.35	0.35	0.33	0.42	0.42	0.36	0.37	82.12
A. Solid waste disposal															
B. Biological treatment of solid waste	0.09	0.09	0.11	0.10	0.10	0.13	0.12	0.11	0.11	0.09	0.17	0.18	0.11	0.11	1175.33
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-55.39
D. Waste water treatment and discharge	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.25	0.26	33.14
E. Other															
6. Other ***(as specified in summary 1.A)***															
Total direct N_2O emissions without N_2O from LULUCF	13.82	13.34	13.85	14.08	12.96	12.39	10.91	9.08	8.80	8.75	8.84	8.67	8.65	8.78	-38.14
Total direct N_2O emissions with N_2O from LULUCF	15.01	14.54	15.05	15.30	14.19	13.62	12.15	10.34	10.07	10.03	10.11	9.95	9.93	10.07	-33.91
Memo items:															
International bunkers	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.07	20.56
Aviation	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.05	0.05	145.69
Navigation	0.05	0.05	0.05	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.02	-45.72
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass															
CO_2 captured															
Long-term storage of C in waste disposal sites															
Indirect N_2O	0.99	0.99	1.00	1.00	0.99	1.00	0.95	0.90	0.93	0.90	0.87	0.82	0.77	0.74	-21.91
Indirect CO_2 [3]															

Table AI-5. CRF TABLE 10S5: NORWAY’S TOTAL EMISSIONS AND REMOVALS OF GREENHOUSE GASES DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Emissions of HFCs and PFCs - (kt CO_2 equivalent)	3894.84	3894.84	3466.61	2657.17	2679.91	2392.41	2406.05	2237.10	2074.21	1956.04	1915.98	1901.72	2004.57
Emissions of HFCs - (kt CO_2 equivalent)	0.04	0.04	9.91	19.95	31.64	49.88	92.00	129.48	191.50	244.07	316.02	383.27	473.31
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-41	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-43-10mee	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-125	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
HFC-134	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-134a	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09
HFC-143	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-143a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04
HFC-152	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-152a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-161	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-227ea	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
HFC-236cb	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-236ea	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-236fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-245ca	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-245fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-365mfc	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	0.00	0.00	0.00	0.00	0.29	0.52	2.58	3.99	9.04	13.82	19.17	21.54	24.05
Emissions of PFCs - (kt CO_2 equivalent)	3894.80	3894.80	3456.70	2637.22	2648.27	2342.53	2314.05	2107.62	1882.70	1711.98	1599.97	1518.45	1531.26
CF_4	0.47	0.47	0.42	0.32	0.32	0.29	0.28	0.26	0.23	0.21	0.20	0.19	0.19
C_2F_6	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
C_3F_8	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C_4F_{10}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
$c\text{-}C_4F_8$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C_5F_{12}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C_6F_{14}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
$C_{10}F_{18}$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
$c\text{-}C_3F_6$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of PFCs[4] - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of SF_6 - (kt CO_2 equivalent)	2098.54	2098.54	1983.46	672.58	703.76	837.57	579.82	547.68	553.17	693.29	833.74	891.41	754.79
SF_6	0.09	0.09	0.09	0.03	0.03	0.04	0.03	0.02	0.02	0.03	0.04	0.04	0.03
Emissions of NF_3 - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

Table AI-5 (continued). CRF TABLE 10S5: NORWAY'S TOTAL EMISSIONS AND REMOVALS OF GREENHOUSE GASES DURING THE PERIOD 1990-2015.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)														%
Emissions of HFCs and PFCs - (kt CO_2 equivalent)	2237.00	1608.71	1613.84	1569.58	1537.11	1666.49	1702.07	1294.49	1302.93	1368.39	1341.32	1336.19	1414.50	1379.29	-64.59
Emissions of HFCs - (kt CO_2 equivalent)	578.22	557.60	597.10	614.26	678.03	715.30	806.08	856.15	1064.54	1105.75	1140.81	1155.15	1235.58	1232.90	2808441.08
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	778966700.00
HFC-32	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.04	112946722564.00
HFC-41	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-43-10mee	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-125	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.09	0.10	0.10	0.10	0.10	0.11	315998529877.43
HFC-134	NA,NO	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-134a	0.10	0.11	0.11	0.12	0.14	0.17	0.20	0.23	0.26	0.28	0.30	0.33	0.34	0.32	811436110458.25
HFC-143	NA,NO	NA,NO	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-143a	0.05	0.04	0.05	0.04	0.05	0.05	0.05	0.05	0.07	0.06	0.06	0.06	0.07	0.07	1337721872918.00
HFC-152	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-152a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.44
HFC-161	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-227ea	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00	0.00	0.00	0.00	100.00
HFC-236cb	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-236ea	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-236fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-245ca	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-245fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
HFC-365mfc	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	28.45	27.86	30.18	33.53	32.19	32.82	31.77	31.94	33.59	53.11	66.39	65.09	63.93	49.55	3320820877.47
Emissions of PFCs - (kt CO_2 equivalent)	1658.79	1051.11	1016.75	955.32	859.08	951.19	895.99	438.35	238.39	262.64	200.51	181.04	178.92	146.39	-96.24
CF_4	0.20	0.13	0.12	0.12	0.10	0.11	0.10	0.05	0.03	0.03	0.02	0.02	0.02	0.02	-96.43
C_2F_6	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-94.74
C_3F_8	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.00	0.00	0.00	0.00	0.00	NO,NA	0.00
C_4F_{10}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
$c\text{-}C_4F_8$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
C_5F_{12}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
C_6F_{14}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
$C_{10}F_{18}$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
$c\text{-}C_3F_6$	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
Unspecified mix of PFCs[4] - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
Emissions of SF_6 - (kt CO_2 equivalent)	227.34	217.37	263.34	297.67	202.33	72.73	62.39	58.63	71.91	57.92	57.55	60.62	54.74	55.25	-97.37
SF_6	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-97.37
Emissions of NF_3 - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00

10.2 Annex II. Summary of reporting of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol, in the NC.

The table below allows identifying the Kyoto Protocol elements that are allocated in different sections of the report.

Table A2-1: Summary of reporting of the Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in the NC6.

Information reported under Article 7, paragraph 2	**NC7 chapter**
National systems in accordance with Article 5, paragraph 1	3.2
National registries	3.3
Information on base year, assigned amount and total greenhouse gas emission trend under the Kyoto Protocol	5.4
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	5.5
Policies and measures in accordance with Article 2	4.3
Legislative arrangements and enforcement and administrative procedures	4.2
Information under Article 10: - Art 10a (programmes to improve the quality of local emission factors, activity data and/or models which reflect the socio-economic conditions of each Party for the preparation and periodic updating of national inventories) - Art 10b (measures to mitigate climate change and measures to facilitate adequate adaptation to climate change) - Art 10c (transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries) - Art 10d (maintenance and the development of systematic observation systems and development of data archives to reduce uncertainties related to the climate system etc.) - Art 10e (the development and implementation of education and training programmes)	Art. 10a: 3.2 Art. 10b: 6.4 Art. 10c: 7.5 Art. 10d: 8 Art. 10e: 9
Financial resources	7

10.3 Annex III Methodology and key macroeconomic assumptions

10.3.1 Methodology

Since the NC6 was reported, the Norwegian inventory has been prepared in accordance with the revised UNFCCC reporting ruidelines on annual inventories (decision 24/CP.19). This includes using the Global Warming Potential (GWP) for greenhouse gas emissions from the IPCC's fourth assessment report, new emissions sources and new methods/emission factors for calculating some emission sources. The most important change is due to the new GWP values. The projections are consistent with historical data. The update makes it difficult to compare the projections with what was reported in NC6 and we have therefore choosen to compare with BR2.

The emission projections for Norway are based on various sources and methodologies. The projections for energy-related emissions are largely based on macroeconomic model simulations supplemented by available micro studies. Projections of CO_2 emissions from the petroleum sector are based on information collected by the Norwegian Petroleum Directorate. Projections of emissions of greenhouse gases than CO_2 are mainly based on sector- and plant-specific information, collected by the Norwegian Environmental Agency from the industries concerned.

Since BR2 and NC6, a new macroeconomic model, SNOW, to project emissions has been taken into use. As the previous MSG-model, the SNOW-model is a computable general equilibrium (CGE) model.

The SNOW-model
The model gives a detailed description of the structures of economic policy, production and consumption in the Norwegian economy. Agents are represented as optimising individuals who interact with each other in national and international markets. Factor prices and prices of deliveries to the domestic markets are all determined by market equilibria. Consumption and savings result from the decisions of the representative household, which maximizes welfare, given income from labour, capital and natural resources.

The model is a recursive dynamic, integrated economy and emissions model that can project energy-related and process emissions based on macroeconomic assumptions. The model gives a detailed description of the production and consumption structures in the Norwegian economy. The model specifies 46 industries (42 private production sectors and 4 government sectors), classified to capture important substitution possibilities with environmental implications. The model includes 20 consumption goods with detailed description of use of energy and transport. Moreover, detailed description of governmental taxes and transfers such as environmental policy, trade policy, subsidies, tax rates, and real government spending is also included.

Producer behaviour is characterised by perfect competition. The main production factors are material inputs, labour, three types of real capital, five types of energy goods (incl. biomass) and various types of polluting and non-polluting transport services. For most commodities, a certain degree of substitution between production factors is assumed, depending on their relative prices and the exogenous assumptions about factor productivity developments. Labour and capital are perfectly mobile between sectors, implying that investments can take place gradually. In each sector, real capital formation is determined so that expected return on capital equals an exogenously given return on capital.

We model a small, open economy, which considers the world market prices and interest rate as exogenous. Domestic and foreign goods are assumed to be imperfect substitutes (Armington assumption). Together with a given balance of payments, the real exchange rate will be determined consistent with domestic consumption.

The model provides a relatively detailed description of the markets for energy and transport. A detailed emission module is incorporated into the SNOW model, turning it into an effective tool for assessing environmental consequences of changes in economic activity. Both emissions related to energy use and emissions from industrial processes are modelled. Energy-related emissions are linked in fixed proportions to the use of fossil fuels, with emission coefficients differentiated by the specific carbon content of the fuels. Various environmental and climate policy instruments are included, e.g., emission quotas, taxes and subsidies.

For reference scenario a dynamic recursive variation of the model is applied with exogenous paths for government spending and labour supply.

The intended field of application of the model is climate policy, tax reforms, sustainable public finance. The main input data categories and data sources are National accounts and official statistics on emissions. Output of the model is prices and quantities for all goods (monetary values, based on national accounts), GHG emissions, emissions of other pollutants, energy consumption, tax revenues and goverment spending. Gases covered by the modell is domestic emissions of twelve pollutants (six GHG and six air pollutants) disaggregated by source and sector. The base year is 2013 and the model can be run to 2100. Population projections are from Statistics Norway. The model structure is top-down with bottom-up features. There are nested CES functions in production and consumption.

Projections of emissions of greenhouse gases other than CO_2 are mainly based on sector- and plant-specific information, collected by the Norwegian Environment Agency.

GHG emissions from the petroleum sector

The projections of emissions from oil and gas production have been prepared by the Norwegian Petroleum Directorate and are based on reporting from oil companies. Emissions from the petroleum sector in Norway are well documented. The industry's own organisation, the Norwegian Oil and Gas Association, has established a national database for reporting all releases from the industry, called EPIM Environment Hub (EEH). All operators on the Norwegian continental shelf report data on emissions to air and discharges to the sea directly in EEH. Oil companies operating on the Norwegian shelf must annually submit data and forecasts for their respective operated fields, discoveries, transport- and land facilities. The reporting includes corporate financial data, projects, resource volumes and forecasts for production, costs and environmental discharges/emissions. The Norwegian Petroleum Directorate (NPD) quality-assures and organises the data reported by the companies. The NPD also prepares its own estimates and classifies the resources based on its own assumptions. Based on the information from the companies and NDP's own assumption, the NPD updates the resource accounts for the Norwegian shelf and prepares forecasts for production, costs and emissions.

Emissions of CO_2 mainly derive from offshore generation of electricity and from flaring for safety reasons. In addition mobile facilities linked to a permanent facility in production generate some emissions.

Once in production the power demand at an installation is almost constant, and so are the CO2 emissions. The emission projections thus take into account that emissions are a consequence of the time the installation is producing and to a much lesser extent the production on the installation. Only new installations with new gas-fired power generation will result in higher emissions and thus lower emissions when an installation is closed down.

GHG emissions from road traffic
Emissions of CH_4, N_2O, CO_2 from road traffic is projected in an excel spreadsheet model. The model is based on historical data from the Handbook of Emissions Factors (HBEFA)[i] model for 1990-2014. This is the same model as Norway use to estimate historical emissions from road traffic. Emissions are projected using time series estimates for the following parameters: Population growth, km driven per person for different vehicle classes, emission factors, biofuel blending, and a factor that adjust for the discrepancy between fuel sales and bottom-up estimates of fuel consumption.

For heavy vehicles (buses and HGV), the trend in the emission factor is specified directly at an aggregated level. For light duty vehicles, the trend in the emission factor is specified by technology (gasoline, diesel, plug-in hybrids, and zero emission vehicles such as electric cars). The fraction in the vehicle stock of different technologies is estimated using simple stock models for passenger cars and other light duty vehicles.

Projection data:

- Activity, population - Statistics Norway.
- Activity, km driven per person for different vehicle classes - expert estimates based on historical trends and background data in the National Transport Plan
- Emission factors: Trend by vehicle class (or by technology for light duty vehicles) - expert estimates
- Biofuels: Adopted blending obligations
- Adjustment for the discrepancy between fuel sales and bottom-up estimates of fuel consumption - expert estimates

Agriculture sector
We have used the same estimation methodologies for projections of CH_4, N_2O and NH_3 from agriculture as for calculation historical emissions. Model descriptions of the side models used to project emissions for enteric CH_4 from cattle and sheep, CH_4 and N_2O from manure management and the NH_3 model are given in chapter five of the Norwegian National Inventory Report 2016 (NIR 2016) and Annex IX to the NIR 2016.[78] Calculations are in Excel.

[78] http://www.miljodirektoratet.no/no/Publikasjoner/2016/April-2016/Greenhouse-Gas-Emissions-1990-2014-National-Inventory-Report/ and

The projection of CH_4, N_2O and NH_3 emissions from agriculture are based on projected development in animal stock, share of concentrate in fodder, milk yield, mineral fertiliser use and assumption about the development in cultivation of peat land. The emission trends are dependent on the expected development in number of inhabitants and expected food consumption trend, and scenarios for agriculture polices nationally.

Activity assumptions are given by the Ministry of Agriculture and Food for animal population development and increase in animal manure substitutes for synthetic fertiliser (1 kg manure-N: 0.45 kg fertilizer-N).

In addition, expert estimates are used for area cultivated organic soils, development depending on cultivation of new areas, share of concentrates and milk yield (trend from Norwegian Institute of Bioeconomy Research).

Solid waste disposal
The emissions model for estimating methane from Solid Waste Disposal Sites (SWDS) complies with the Revised IPCC 1996 Guidelines for National Greenhouse Gas Inventories and the IPCC Report on Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories as approved by the UNFCCC. From 2009 deposition of wet organic waste on landfills is prohibited. The effect of this measure and all other policy measures concerning the waste sector are taken into account in the baseline scenario. The effect of licensing requirements for collection and combustion of methane from landfills is also taken into account in the projections. This implies that in the projection, only minor amounts of paper and sewage sludge are deposited, and this corresponds with Statistics Norway's waste account. In the projection, about 16 per cent of produced methane is recovered. This equal to the actual recovery in 2015.

Descriptions of the model for calculating CH_4 from landfills are given in chapter 7 of the Norwegian NIR 2016.

N_2O, PFCs and SF_6 emissions

- Projections of N_2O emissions from nitric acid production are based on information about the N_2O reducing technology as of 2015 and expanded production in a new production line from 2017. In the projections, the emissions from the existing production lines are assumed to have an efficiency rate of 0.5 percent per annum from 2015 as is lower than in the years 2010-2015. The emissions of N_2O per tonne nitric acid produced in the newest production line is less than 50 per cent of today's production. Included in the projections is also N_2O emissions from production of mineral fertilizers. The emissions derive from phosphate used in production of mineral fertilizers.

- Emission projections of perfluorocarbons (CF_4 and C_2F_6) from aluminium production are based on the assumption that all production in 2020 uses pre-baked technology and that total electricity consumption remains at approximately the same level as in 2015.

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http://www.miljodirektoratet.no/no/Publikasjoner/2016/April-2016/Greenhouse-Gas-Emissions-1990-2014-Annexes-to-NIR-2016/.

Production of aluminium is assumed to increase somewhat going forward, mainly due to startup of a new production line with more efficient electricity use per tonne aluminium.

- In the emissions projections of SF_6 from electrical equipment an increase by 1 per cent per annum is assumed.

- HFC emissions: Emission projections of HFCs are based on the HFC emission inventory, historical import statistics for chemicals and current regulations.

Forest carbon sinks
In 2015, the carbon stock changes on forest land amounted to a net removals of 29.4 million tonnes of CO_2. Net emissions from other LULUCF-sources were estimated at close to 5 million tonnes of CO_2 equivalents (i.e. including CH_4 and N_2O emissions). Settlements and cropland contributed the most to these emissions. The total net removal for the LULUCF sector for 2015 was 24.3 million tons CO_2 equivalents.

The projections were calculated by the Norwegian Institute of Bioeconomy Research (NIBIO) in 2014 http://www.skogoglandskap.no/filearchive/rapport-14-2015.pdf. The method used for projections of thinning and final felling (the harvest model) is described in Antón-Fernández and Astrup (2012). In combination with a growth model for living biomass, this harvest model is used to develop a national business-as-usual scenario for forest carbon. The soil model Yasso has been used for projections of carbon in mineral soil and dead organic materials. Both short and long-term projections are sensitive to fluctuations in the harvest level. In the longer perspective, the projections are also sensitive to the level of afforestation, silvicultural activities and climatic effects on forest health and growth.

It is expected that the annual harvest rate will increase owing to age class effects and maturity of forest types on accessible forest land with high economic value. It is projected that the annual harvest rate will increase from approximately 10 million m3 today, to around 12 million m3 by 2020 and nearly 13 million m3 in 2030. It is assumed a further increase in the mean harvest to somewhere around 16 – 17 million m3 by 2100, based on today's climate conditions. Given these assumptions, the annual net CO_2 sequestration on forest land is expected to decrease to respective 27.4 million tonnes of CO_2 by 2020. In the longer run, CO_2 sequestration is projected to decrease to 25.1 million tonnes of CO_2 in 2030 and further to approximately 13 million tonnes by the end of the century (based on today's climate conditions).

Forest is the land use category that is most significant for emissions and removals of greenhouse gases form the LULUCF sector in Norway. However, emissions from the other land use categories were also projected. The projections show that forests will continue to be the most important land use category for emissions and removals of greenhouse gases in the future, but the removals are expected to decrease significantly over the next 100 years. Wetlands are projected to act as a small sink, while cropland, grassland, settlements and other land all contribute to net emissions. The projections are based on a continuation of the trend in land use changes as seen in the period 2006-2010. The area for settlements and grassland are expected to increase, whilst the areas for forest, cropland, wetlands and other land are expected to decrease. The projections did not include estimates for harvested wood products. All in all, the net removal of CO_2 from LULUCF is estimated to 23.5 million tonnes in 2020 and 21.3 million tonnes in 2030.

10.3.2 Main differences in projections between current and previous communication

In 2015, Norway applied new GWP-values. To isolate the effect of new assumptions we compare with BR2 projections. Since BR2, new emission factors in agriculture has been applied and hence emissions in 1990 have been revised down by 0.3 million tonnes of CO_2 equivalents. The revision is strongest for historic emissions of methane due to among others a revision in the number of sheeps and their slaughter weight. In 2010, the revision in emission from agriculture is small, and in the projections agricultural emissions is forecasted at about the same level as in the previous projections.

Table A3-1. *Changes in GHG emissions compared with BR2 by sector. Millions tonnes of CO_2 equivalents*

	1990	2000	2010	2020	2030
Energy	0.1	0.2	0.0	-2.2	-1.7
Transport	-0.0	-0.0	0.0	-0.6	-2.0
Industry/industrial processes	0.0	0.0	0.0	-0.3	-0.5
Agriculture	-0.3	-0.4	-0.1	-0.1	-0.0
Forestry/LULUCF	0.1	0.1	-0.4	-0.0	-0.0
Waste management/waste	-0.1	-0.1	-0.1	0.0	0.0
Total with LULUCF	-0.2	-0.2	-0.5	-3.1	-4.2
Total without LULUCF	-0.3	-0.3	-0.1	-3.1	-4.2

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

All, inn all, projected emissions in this report are 3 million tonnes of CO_2 equivalents lower in 2020 and in excess of 4 million tonnes lower in 2030 compared to the previous projection (BR2). Both CO_2 emissions and f-gas emissions, primarily HFC, contribute to this reduction. A small increase in estimated agricultural nitrous oxide emissions have an opposite effect.

Table A3-2. *Changes in GHG emissions compared with BR2 by gas. Millions tonnes of CO_2 equivalents*

	1990	2000	2010	2020	2030
Total emissions excluding LULUCF	-0-3	-0.3	-0.1	-3.1	-4.2
CO_2	0-1	0.2	0.0	-2.4	-3.5
Other greenhouse gases	-0-4	-0.5	-0.1	-0.7	-0.7
CH_4	-0-5	-0.5	-0.2	-0.4	-0.5
N_2O	0-1	0.1	0.1	0.1	0.1
HFC	0.0	0.0	0.0	-0.2	-0.2
PFC	0.0	0.0	0.0	-0.1	-0.1
SF_6	0.0	0.0	0.0	0.0	0.0

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

As has been discussed in chapter 5 the main revisions in 2020 stem from:

- The estimate for non-EU ETS emissions has been reduced by 3 million tonnes of CO2 equivalents in 2030, compared to the previous projection primarily due to updated assumptions on transport emissions. Road transport emissions are now estimated to decline from 10.3 million tonnes in 2015 to 9.7 million tonnes in 2020, and down to 8.4 million tonnes in 2030, compared a stable development in emissions at today's level in the previous projection. The primary cause of the reduction is that the observed take up of electric vehicles (EV) and other low emissions cars in recent that is assumed to continue in the coming years.

- Domestic shipping and fisheries emissions have declined significantly in recent years. The projections assume that this decline is permanent and that further technological development and the enhancement of policy measures over the last few years will cause emissions to keep declining on after 2020.

- Emissions from heating of buildings have been revised downwards by ¾ million tonnes in both 2020 and 2030, compared to previous projections, due to the ban on use of heating oil from 2020.

- Energy supply emissions are in the projections estimated to be reduced by about ½ million tonnes of CO_2 from the current level in 2020 and 2030. The reduction follows the announced closure of the power plant at Mongstad. Emissions have thereby also been reduced correspondingly from the previous projection.

- Manufacturing emissions are estimated to remain fairly stable in the years ahead, and at about the same level as in the previous emissions projection.

- The estimate for emissions from oil and gas production in 2020 are somewhat reduced from those in the previous projection. The emissions estimate for 2030 has not been changed.

10.3.3 Key macroeconomic assumptions

Long-term projections of emissions are being developed using Statistics Norway's general equilibrium models SNOW and DEMEC.

The long-term macroeconomic projections in this report were presented in *Long-term Perspectives on the Norwegian Economy 2017* (Meld. St. 29 (2016–2017) Report to the Storting (white paper)). A summary in English can be found here:

https://www.regjeringen.no/contentassets/aefd9d12738d43078cbc647448bbeca1/en-gb/pdfs/stm201620170029000engpdfs.pdf

Assumptions central to projections are:

International economy and petroleum activity

- The prices of traditional export and import goods will increase by 1.9 per cent measured as an annual average.

- 3 per cent expected annual real return on the capital in the Government Pension Fund Global.

- Oil and gas prices are assumed to be NOK 510 per barrel and NOK 1.85 per Sm3, respectively, measured in fixed 2017 NOK for the projection period.

- In 2030, oil (including LNG) and gas production will total 86 per cent and 80 per cent, respectively, of the level in 2015.
- Following a very short-term increase, the investment demand of the petroleum sector will fall to close to ½ per cent of mainland Norway GDP by 2060. In 2015, the level was about 7 per cent.

Population, access to labour and productivity

- The population will grow in line with the middle alternative in Statistics Norway's population projection from June 2016.

- The labour force participation rates of different demographic sub-groups (sex, age and immigrant background), remain unchanged from 2020-levels following a projected medium term modest increase towards 2020.

- The unemployment rate and average working hours per employed person will remain unchanged from 2020, after a projected medium term modest decrease towards 2020.

- 1.2 per cent annual growth in total factor productivity among businesses in the mainland economy.

Economic policy

- Budget policy will comply with the spending rule for the use of oil revenue, with structural non-oil deficit limited to the expected 3 per cent annual return on the capital in the Government Pension Fund Global.

- Norway's total net financial investments (the current account surplus), tracks net financial investments in the Government Pension Fund Global. Together with the domestic production trend, the assumptions regarding the development of the current account determine the trend of total domestic consumption of goods and services.

Emissions to air

- The current orientation of climate policy is maintained, including the scope and rates of the CO_2 tax.

- The price of future delivery of emission allowances under the EU ETS is assumed to increase to NOK 60 per tonne of CO_2 in 2020, in line with prices quoted in the futures market for such emission allowances. After 2020, it is assumed that the price of emission allowances in the EU ETS will increase by 4 per cent per year in real terms.

- In certain areas, the technology parameters of the model have been adjusted to reflect, for example, technology changes. Stronger than average growth in the development and uptake of cleaner technologies is assumed among others in road traffic.

- Road traffic emissions are based on Statistics Norway's model to calculate national road traffic emissions to air. It is assumed that the share of electric cars will increase to 50 per cent of new car sales in 2030. Sales of plug-in hybrid cars are estimated at about 20 per cent of new car sales. These assumptions imply that the share of new diesel and petrol cars (including non-plug-in hybrid cars) will decrease from about 70 per cent in 2016 to 30 per cent of new car sales in 2030. Traffic activity is assumed to trace population developments. Emissions from new cars per kilometre driven on the basis of fossil energy carriers are assumed to decline by about 1 per cent per year. Biofuel blending is maintained at the current level of 6.25 per cent in real terms.

- Electricity consumption by energy-intensive industries will remain approximately unchanged up to 2030.

Table A.3-3 lists key macroeconomic projections underpinning the Norwegian emission projections. In the baseline scenario average annual GDP growth is estimated at 1.5 per cent in 2015-2020 and at 1.7 per cent in 2020-2030. Growth in the mainland economy, i.e. total GDP excluding petroleum activities and ocean transport, is estimated at 2.0 per cent in 2015-2020 and 2.2 per cent in 2020-2030.

Table A3-3 *Key macroeconomic assumptions*

	2013	2015	2020	2030
	Billion 2013 NOK		Annual average growth rate	
Gross domestic product	3 071	3 180	1.5	1.7
- Petroleum activities and ocean transport	652	683	-0.9	-1.1
- Mainland Norway	2 419	2 499	2.0	2.2
Goods	408	425	2.2	2.5
Services	1 075	1 094	1.7	2.2
Consumption	1 233	1 283	2.3	2.8
Gross fixed capital formation	717	685	2.1	2.1
- Petroleum activities and ocean transport	214	178	-5.3	1.9
- Mainland Norway	503	508	4.2	2.2
Population in 1000	5 109	5 214	1.0	0.8
Number of persons employed in 1000	2 713	2 753	1.0	0.5
	Level			
Oil price (2013-NOK)	639	423	416	483
Gas price (2013-NOK)	2.31	1.89	1.75	1.75
EU-ETS price (2013-NOK)	35	67	57	85
Electricity price (NOK/KWh 2013-NOK)	0.35	0.28	0.30	0.33

Sources: Statistics Norway and Ministry of Finance.

The high population growth rate since 2005, of about 1.2 per cent annually, is projected to come somewhat down. From 2015 to 2020 the population is estimated to increase by 1.0 per cent annually. Up to 2030 the growth rate is 0.8 per cent. All in all the population is estimated to increase by around 14 per cent during the projection period.

The wholesale price of electricity is assumed to increase from NOK 0.28 per KWh in 2015 to NOK 0.33 per KWh in 2030 measured in 2013 prices. It is projected[79] that the surplus of supply of electricity will increase from 4 TWh in 2016 to 7 TWh in 2030, as production will outpace demand. In the forecast, electricity consumption is projected to grow by 10 TWh from 2016 to 2030. The forecast is based on continued improvements in average energy efficiency, but i.e. population growth and increasing electrification of the car fleet and the petroleum sector will increase the use of electricity. The production of electricity is projected to increase from 137 TWh in 2016 to 147 TWh in 2020 and 151 TWh in 2030. Investment in new renewable production is up to 2020 subsidised by the electricity certificate market and most of the production is assumed to be wind or unregulated water.

In the baseline scenario, the EU ETS price is assumed to increase to NOK 58 by 2020, measured in 2013-prices. In 2030 the price will increase to NOK 85 measured in 2013-prices.

[79] NVE «Kraftmarkedsanalyse 2016-2030».

10.4 Annex IX Norway's Biennial Report under the Framework Convention on Climate Change

1 Introduction

Norway's third Biennial Report (BR3) uses the "UNFCCC biennial reporting guidelines for developed country Parties" as contained in annex 1 to decision 2/CP.17 for the preparation of this report. The common tabular format (CTF) tables have been prepared to be in accordance with the common tabular format for "UNFCCC biennial reporting guidelines for developed country Parties" as specified in decision 19/CP.18.

This BR3 is submitted in conjunction with Norway's seventh National Communication (NC7) and will in some cases refer to information reported in the NC7. The BR3 focuses on progress towards Norway's 2020 target, as operationalised through the Kyoto Protocol's second commitment period, and provision of support since what was reported in BR2.

The expert review team (ERT) of Norway's BR2 found that the reporting was mostly in adherence with the UNFCCC reporting guidelines on BRs as per decision 2/CP.17. In the review report[80], the ERT had eight recommendations for improving the completeness and transparency of the reporting. In the report, it is sought to follow-up the various recommendations to the extent it has been practically possible. The preparation of the BR3 also draws on the questions formulated and answers provided prior to the multilateral assessment and the multilateral assessment itself.[81]

2 Information on greenhouse gas emissions and trends

2.1 Emission trends for aggregated greenhouse gas emissions

The Norwegian National Inventory Report (NIR) has been prepared in accordance with the UNFCCC Reporting Guidelines on Annual Inventories, and the estimation methods generally follow the Guidelines for National Greenhouse Gas Inventories published by the Intergovernmental Panel on Climate Change (IPCC). The latest inventory with the National Inventory Report (NIR) and Common Reporting Format (CRF) covering the years 1990-2015 was submitted to the UNFCCC Secretariat 07 April 2017.

Chapter 2 of Norway's 2017 NIR provides detailed information on the greenhouse gas emissions and removals trends for gases and sectors. Therefore, only a short summary of the GHG emissions and removals trends for the years 1990-2015 is included here in BR3.

As required by the revised reporting guidelines, Norway's greenhouse gas inventory includes four different national totals. This includes total GHG emissions expressed in CO_2 equivalent

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[80] http://unfccc.int/resource/docs/2016/trr/nor.pdf

[81] http://unfccc.int/focus/mitigation/the_multilateral_assessment_process_under_the_iar/items/9717.php

with and without LULUCF. Both with and without indirect CO_2. In the following chapters, if not specified otherwise, emission figures include indirect CO_2 emissions, but not LULUCF.

In 2015, total greenhouse gas (GHG) emissions in Norway were 53.9 million tonnes of carbon dioxide equivalents, which is an increase of 0.6 million tonnes compared to 2014. Preliminary figures for 2016 show 53.3 Mt. Over the last two decades total emissions have been relatively stable. Total greenhouse gas emissions were approximately 2.2 million tonnes CO_2-equivalent, or 4.2 per cent, higher in 2015 than in 1990. Emissions have decreased by 5-6 per cent since they peaked at 56.8 million tonnes in 2007. The net greenhouse gas emissions, including all sources and sinks, were 29.2 million tonnes of CO_2 equivalents in 2015 as compared to 40.7 Mt in 1990. The total emissions distribution among the main CRF categories from 1990 to 2015 is illustrated in Figure 2.1

Figure 2.1 *Total emissions of greenhouse gases by sources and removals from LULUCF in Norway 1990-2015 (Million tonnes CO_2 equivalents). 2016 estimate is preliminary. Source: Statistics Norway/Norwegian Environment Agency/ Norwegian Institute of Bioeconomy Research*

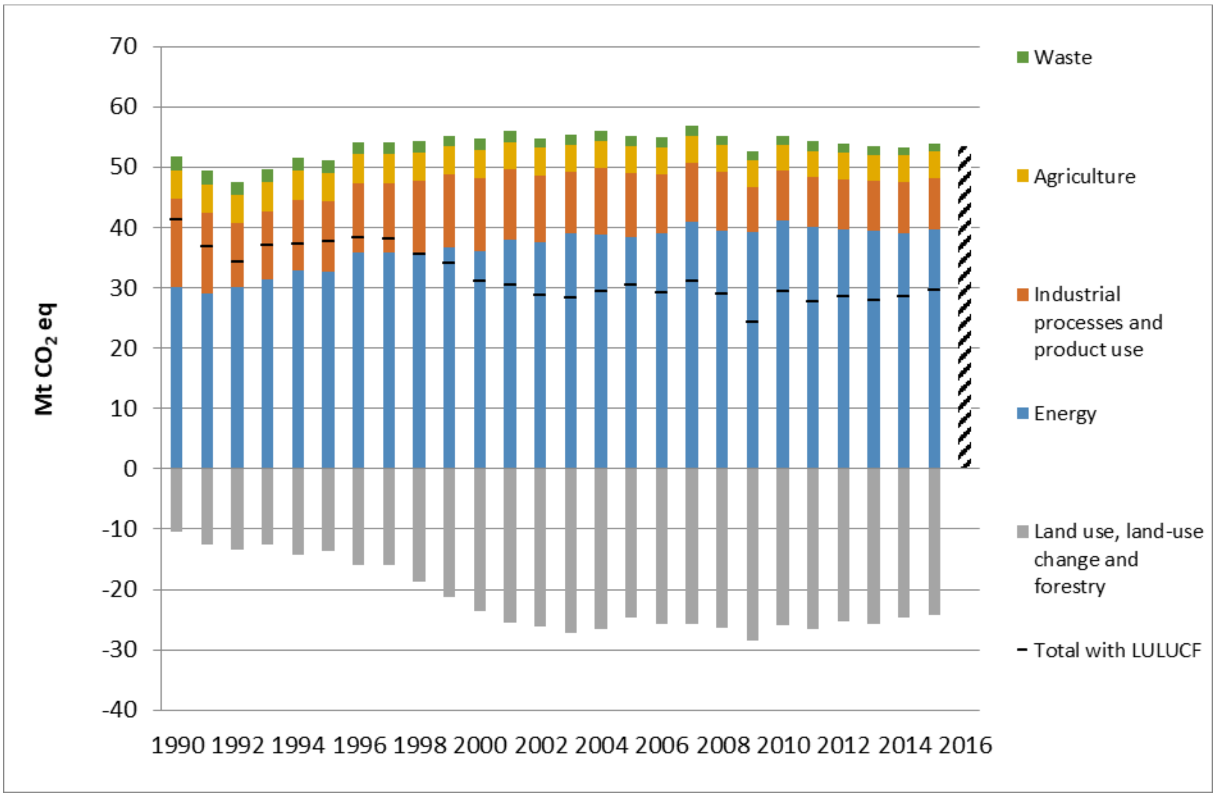

Table 2.1 presents the total emissions including indirect CO_2 emissions and its distribution among the main CRF categories from 1990 to 2015, and a preliminary estimate of the total for 2016. The total indirect CO_2 emissions are also presented in this table.

Table 2.1 *Total emissions of greenhouse gases by sources and removals from LULUCF in Norway 1990-2016. Emissions are given in million tonnes CO_2 equivalents*

Year	**Energy**	**Industrial processes and product use**	**Agriculture**	**LULUCF**	**Waste**	**Total with indirect CO_2 and without LULUCF**	**Total with indirect CO_2 and with LULUCF**	**Indirect CO_2 emissions**
1990	30.2	14.5	4.8	-10.4	2.2	51.7	41.3	0.6
1995	32.7	11.6	4.7	-13.6	2.1	51.2	37.6	0.9
2000	36.1	12.1	4.6	-23.5	1.8	54.6	31.2	1.0
2005	38.3	10.6	4.6	-24.6	1.6	55.1	30.5	0.5
2006	39.0	9.7	4.5	-25.8	1.6	54.9	29.1	0.5
2007	40.8	9.9	4.5	-25.8	1.6	56.8	31.0	0.5
2008	39.5	9.7	4.5	-26.3	1.5	55.3	28.9	0.4
2009	39.3	7.4	4.5	-28.4	1.5	52.7	24.2	0.3
2010	41.1	8.2	4.4	-25.9	1.5	55.2	29.4	0.3
2011	40.1	8.2	4.4	-26.5	1.5	54.2	27.7	0.3
2012	39.7	8.2	4.4	-25.2	1.5	53.8	28.6	0.3
2013	39.4	8.3	4.4	-25.6	1.5	53.5	27.9	0.3
2014	39.0	8.4	4.5	-24.7	1.4	53.3	28.6	0.4
2015	39.6	8.5	4.5	-24.3	1.3	53.9	29.6	0.4
2016*						53.3		

Source: Statistics Norway/ Norwegian Environment Agency/ Norwegian Institute of Bioeconomy Research.¤ 2016 estimate is preliminary.

Since 1990 Norway has experienced strong economic and population growth as well as expansion of petroleum extration. These factors have led to increased use of fossil fuels, and consequently higher CO2 emissions. However, the growth in CO_2 has been almost fully offset by reductions in other gases and sectors.

In 2015 the net greenhouse gas removals in the LULUCF sector was 24.3 million CO2 equivalents, which would offset almost half of the total greenhouse gas emissions in Norway that year. The average annual net removals from the LULUCF sector was about 21.6 million tonnes of CO_2 equivalents for the period 1990-2015. It should be noted, however, that the accounting rules under the Kyoto Protocol, which would be relevant for the targets through 2020, will probably result in a minor negative contribution from LULUCF (see table 4.2). The calculated changes in carbon stocks depend upon several factors such as growing conditions, harvest levels, age-class effects and land use changes. In particular, variations in annual harvest will in the short term directly influence the variations in changes in carbon stocks and dead organic matter.

CTF table 1 with the trends for the gases is reported through the CTF application and are also found as Annex I to the NC7 report.

2.2 National inventory arrangements and changes

2.2.1 Current national inventory arrangements

Chapter 3.2 in NC7 describes the Norwegian national system for greenhouse gas inventory and only a brief summary is provided in here in BR3. The national system is based on close cooperation between the Norwegian Environment Agency, Statistics Norway and the Norwegian Institute of Bioeconomy Research (NIBIO). Statistics Norway is responsible for the official statistics on emissions to air. NIBIO is responsible for the calculations of emission and removals from Land Use and Land Use Change and Forestry (LULUCF). An overview of institutional responsibilities and cooperation is shown in Figure 2.2.

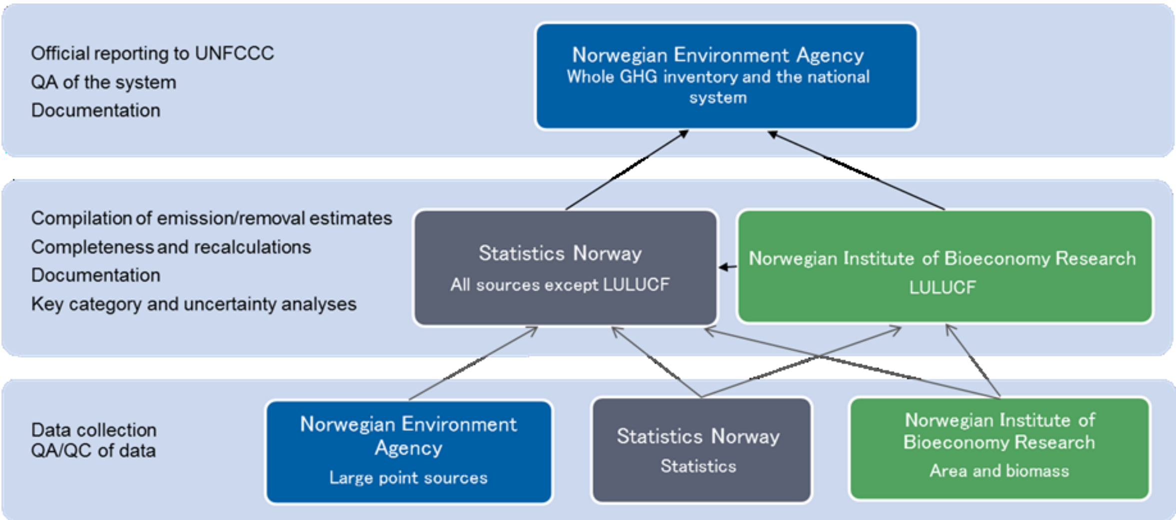

Figure 2.2: Overview institutional responsibilities for GHG inventories, Norway.

The Norwegian Environment Agency was appointed by the Ministry of Climate and Environment as the national entity pursuant to the Norwegian government`s Parliament budget proposition for 2006. As the national entity, the Norwegian Environment Agency is in charge of approving the inventory before official submission to the UNFCCC.

To ensure that the institutions comply with their responsibilities, Statistics Norway and NIBIO have signed agreements with the Norwegian Environment Agency as the national entity. Through these agreements, the institutions are committed to implementing Quality Assurance/Quality Control (QA/QC) and archiving procedures, providing documentation, making information available for review, and delivering data and information in a timely manner to meet the deadline for reporting to the UNFCCC. The most updated information about the methods and framework for the production of the emission inventory, as well as changes performed since the previous emission inventory, are given in the Norwegian Inventory Report "Greenhouse Gas Emissions 1990-2017, National Inventory Report" (Norwegian Environment Agency Report M-724).

The UNFCCC biennial reporting guidelines calls for Parties to provide summary information on the changes to the national inventory arrangements since their last national communication or biennial report. Each year, Norway reports the changes in the national system in chapter 13 of the NIR. For BR3, Norway therefore includes the changes reported in the NIRs reported in

2017 and 2016. Comprehensive information regarding the national system is reported annually in Annex V of the NIR.

2.2.2 Changes in the national inventory arrangements reported in the 2017 NIR

There have been no major changes to the national inventory arrangements since the 2016 annual submission. The change in routines that arose from the implementation of the new online CRF Reporter software has been further refined to streamline cooperation between institutions, and an ongoing project to improve the QC routines of the inventory production have led to some minor changes in the communication between the institutions in the national system.

2.2.3 Changes in the national inventory arrangements reported in the 2016 NIR

The new CRF reporting tool has introduced a need for revision of the production plan of the Norwegian emission inventory, and of the timeline for cooperation between the institutions of the national system. The 2016 reporting cycle is the first reporting according to 2006 IPCC Guidelines within a regular reporting timeline. New routines for data inputs and collaboration between institutions have been implemented. More specifically, NIBIO and Statistics Norway now independently enter data into the CRF system, and the respective institutions and the Norwegian Environment Agency then perform QA/QC of the CRF tables. Previously, Statistics Norway merged the reporting from NIBIO and Statistics Norway before the CRF tables were sent to the Norwegian Environment Agency for further QA/QC.

3 Quantified economy-wide emission reduction target

Norway's climate policy is founded on the objective of the Convention on Climate Change, the Kyoto Protocol and the Paris Agreement. The scientific understanding of the greenhouse effect set out in the reports from IPCC is an important factor in developing climate policy. Thus, the policies and measures reported are seen as modifying long-term trends in anthropogenic greenhouse gas emissions and removals. Section 4.1 of Norway's seventh National Communication describes inter alia the Norwegian policy-making process, Norway's climate targets and the policy instruments.

Norway has ambitious climate targets that are set out in various policy documents: the updated cross-party agreement on climate policy from 2012 (published as a recommendation to the Storting (Innst. 390 S (2011–2012)) in response to the white paper on Norwegian climate policy from the same year (Meld. St. 21 (2011–2012)); the white paper *New emission commitment for Norway for 2030 – towards joint fulfilment with the EU* (Meld. St. 13 (2014–2015)) and a subsequent recommendation to the Storting (Innst. 211 S (2014–2015)); the documents relating to the Norwegian Parliaments consent to ratification of the Paris Agreement (Innst. 407 S (2015–2016) and Prop. 115 S (2015–2016)); and the Climate Change Act that the Norwegian Parliament adopted in June 2017. Most recently the targets were reiterated in the White Paper on the Solberg Government's strategy for fulfilling the 2030 climate target (Meld St. 41 (2016-2017) issued in June 2017.

BOX 1: Norway's climate targets:

1. Reduce emissions by 30 % by 2020
2. Reduce emissions by at least 40 % by 2030
3. Climate neutrality by 2030
4. Low-emission society by 2050

These targets are described in detail in Norway's seventh national communication, chapter 4.

In this BR3, Norway reports on the target for the period through 2020. By 2020, Norway is committed to reduce global emissions of greenhouse gases equivalent by 30% relative to Norway's emission level in 1990. The target was set by the Government in 2007, agreed by the Norwegian Parliament and sets the overall ambition level. It was reported pursuant to the Copenhagen Accords. In 2012, this target was made operational through the legally binding commitment for 2013-2020 under the Kyoto Protocol where average emissions in 2013-2020 shall not exceed 84 % of the 1990 level. Norway ratified the Doha amendments 12 June 2014. Thus, compliance with the commitment under KP will also imply that the 30% target for 2020 is achieved. Norway explained the relation between the target and a quantified emissions reduction commitment for an 8 years period in its submission under the KP the 8th of May 2012[82] and in the subsequent presentation to the AWG KP on the 16th of May[83].

In April 2016, Norway submitted its report to facilitate the calculation of its assigned amount pursuant to Article 3, paragraphs 7bis, 8 and 8bis, of the Kyoto Protocol for the second commitment period and to demonstrate its capacity to account for its emissions and assigned amount (hereinafter referred to as the initial report) to facilitate the calculation of the assigned amount. The report has been reviewed and Norway is thus ready to issue its assigned amount.

Through the initial report Norway made a number of choices with regards to the implementation of the Kyoto Protocol's second commitment period. CTF table 2 describes relevant information for Norway's implementation of the second commitment period under the Kyoto Protocol and the most important aspects are summarized here in textual form.

Norway reports and will account for all the seven mandatory gases or groups of gases. 1990 will be used as the base year, with the exception of NF_3 which has 2000 as the base year. All mandatory sectors are included and the global warming potential values from the Fourth Assessment Report of the IPCC (IPCC 2006) are used.

Pursuant to the accounting rules under the Kyoto Protocol, Norway uses an activity-based approach for the LULUCF sector through 2020. For the Kyoto Protocol's second commitment period Norway will continue to report emissions and removals from Deforestation and

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[82] FCCC/KP/AWG/2012/MISC.1 at http://unfccc.int/resource/docs/2012/awg17/eng/misc01.pdf

[83] http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_norway_ppt.pdf

Afforestation/Reforestation under Article 3.3 and Forest Management under Article 3.4 in accordance with paragraph 7 in Annex I to decision 2/CMP.7. In addition, Norway has elected to include emissions and removals from the voluntary activities Cropland Management and Grazing land Management under Article 3.4 for the current period. Norway will account for all the activities under Articles 3.3 and 3.4 at the end of the commitment period.

As a supplement to domestic action to reduce emissions and enhance removals, Norway will use CERs acquired through its procurement program and AAUs reflecting net transfers under the European ETS from the EU to Norway. Norway will also use about 9 million Kyoto units that are carried over from the first commitment period (see CTF table 2(e)I). 3 million units were acquired by the procurement program, and the 6 million AAUs refer to a swap where the CERs and ERUs used by the ETS installations to offset their emissions in 2013 and 2014 were retired pursuant to the KP 1, and a similar amount of AAUs are carried over.

The information provided in CTF table 2 does not prejudge Norway's post-2020 approach.

CTF table 2a. *Description of quantified economy-wide emission reduction target: base year*

NORWAY		
Base year/base period	1990	
Emission reduction target	% of base year: 30%	% of 1990: 30%
Period for reaching target	2020	2020

CTF table 2b. *Description of quantified economy-wide emission reduction target: gases and sectors covered*

Gases covered	**Base year for each gas (year):**
CO_2	1990
CH_4	1990
N_2O	1990
HFCs	1990
PFCs	1990
SF_6	1990
NF_3	2000
Other gases	NA
Sectors covered	**Covered**
Energy	Yes

Transport	Yes
Industrial processes	Yes
Agriculture	Yes
LULUCF	Yes
Waste	Yes
Other (specify)	NA

Abbreviations: LULUCF = land use, land-use change and forestry.

CTF table 2c. *Description of quantified economy-wide emission reduction target: global warming potential values (GWP)*

Gases	**GWP values**
CO_2	Fourth Assessment Report of the IPCC
CH_4	Fourth Assessment Report of the IPCC
N_2O	Fourth Assessment Report of the IPCC
HFCs	Fourth Assessment Report of the IPCC
PFCs	Fourth Assessment Report of the IPCC
SF_6	Fourth Assessment Report of the IPCC
NF_3	Fourth Assessment Report of the IPCC
Other gases	NA

Abbreviation: GWP = global warming potential

CTF table 2d. *Description of quantified economy-wide emission reduction target: approach to counting emissions and removals from the LULUCF sector*

Role of LULUCF	LULUCF in base year level and target	Included in target year
	Contribution of LULUCF only in target year	Activity-based approach with accounting rules as applied under the Kyoto Protocol

Abbreviation: LULUCF = land use, land-use change and forestry.

CTF table 2(e)I. *Description of quantified economy-wide emission reduction target: market-based mechanisms under the Convention* [a]

	Possible scale of contributions
CERs	Mechanisms under the Kyoto Protocol will be used to meet the target. The net contribution of units acquired through the mechanisms could be about 75 million tonnes for the whole 2013-2020 period excluding possible contributions from LULUCF. This includes actual carry-over of 2.25 million CERs and 0.74 million ERUs to Norway's party holding account and planned carry-over of 5.98 million AAUs.
ERUs	
AAUs [b]	
Carry-over units [c]	
Other mechanism units under the Convention (specify) [d]	

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] AAUs issued to or purchased by a Party.

[c] Units carried over from the first to the second commitment periods of the Kyoto Protocol, as described in decision 13/CMP.1 and consistent with decision XX /CMP.8.

[d] As indicated in paragraph 5(e) of the guidelines contained in annex I of decision 2/CP.17.

CTF table 2(e)II. *Description of quantified economy-wide emission reduction target: other market-based mechanisms*

	Possible scale of contributions
NA	Norway will not use other market mechanisms than those eligible for meeting Norway’s commitment under the Kyoto Protocol. For practical purposes this means planned acquisitions of AAUs through international emissions trading and CERs through the Clean Development Mechanism.

4 Progress in achievement of quantified economy-wide emission reduction targets and relevant information

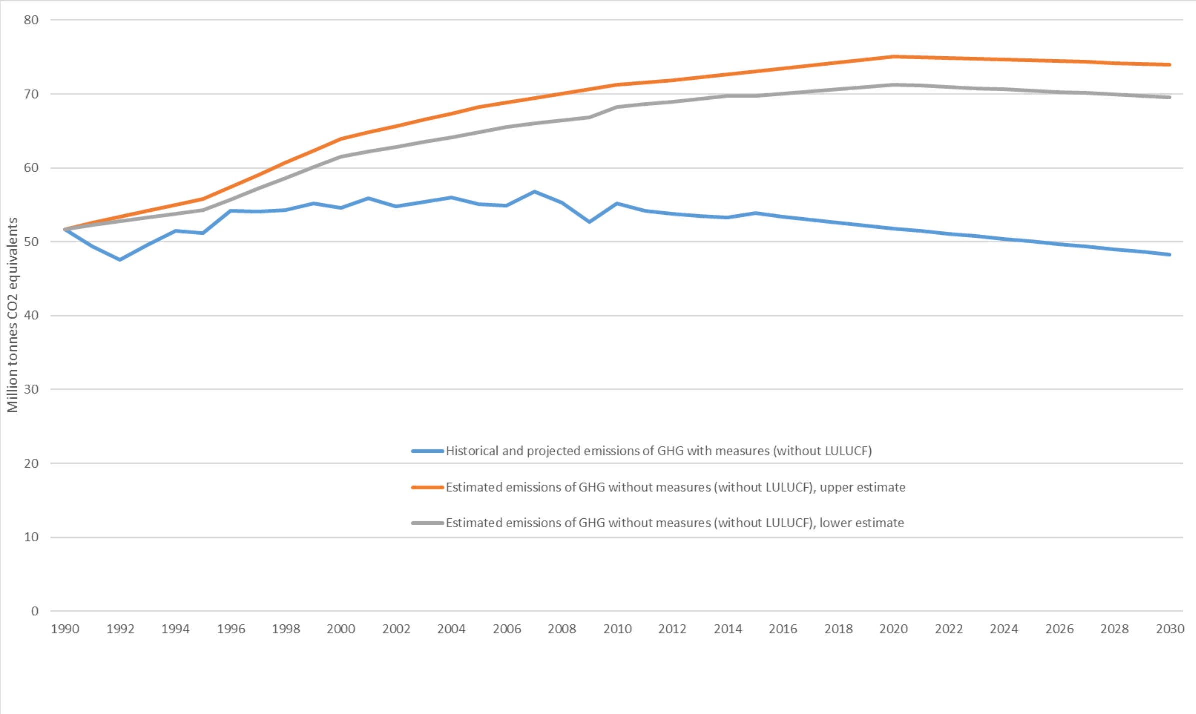
4.1 Mitigation actions and their effects

Norway has over the years introduced several policies and measures that have reduced the GHG emissions. Chapter 4 and section 5.3 of Norway's seventh National Communication (NC7), to which this BR3 is annexed, describe these policies and measures and estimate the effect these have had on the historical and projected emissions. The descriptions of individual policies and measures are not repeated in this BR3.

According to the estimates, the GHG emissions in 2010 would have been 13-16 million tonnes of CO_2 equivalents higher than observed, if these policies and measures had not been implemented. Thus, emissions in 2010 would have been 24-29 per cent higher than without the measures. GHG emissions would be 19.5-23.3 million tonnes higher in 2020 and 21.3-25.7 million tonnes higher in 2030. That would be 38-45 per cent higher than projected emissions in 2020 and 40-53 per cent higher than projected emissions in 2030. The total estimates prepared for the NC7 are illustrated in Figure 4.1 and the effects of policy and measures sectors are shown in Table 4.1 (see also Figure 5.3 and Table 5.5).

To arrive at a total, the estimated effects of each significant policy and measure are aggregated. The estimated and expected effects of the individual policies and measures which are addressed in chapter 4 of the NC7 are mainly based on studies carried out by the Norwegian Environment Agency, the Norwegian Petroleum Directorate, Statistics Norway and various ministries.

Figure 4.1. *Emissions with and without measures (million tonnes CO_2 equivalents).*



Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

Table 4.1. *Effects of policies and measures that have been implemented. Total in million tonnes of CO_2 equivalents*

	1995	2000	2005	2010	2015	2020	2030
Cross sectoral	-	0.8	0.8	1.5-1.8	2.2-2.5	2.9-3.2	2.9-3.2
Petroleum activity	0.6	3.01	3.24	5.3	6.2	7.2	7.1
Energy	-	-	-	-	0.066	0.4	0.2-0.3
Transport	-	-	0.01	0.5	0.8-1.0	1.4-1.7	2.4-2.9
Industry	2.3-3.8	2.5-5.0	5.0-8.4	5.2-7.8	6.1-9.0	7.0-10.3	7.5-11.0
Agriculture	-	-	-	-	-	-	-
LULUCF	-	-	-	-	-	-	0.3
Waste	0.2	0.5	0.6	0.5	0.4	0.6	0.8
Total	3.1-4.6	6.9-9.3	9.7-13.1	13.0-16.0	15.8-19.2	19.5-23.3	21.3-25.7

The UNFCCC biennial reporting guidelines call for information on mitigation actions, including the policies and measures that have been implemented or are planned to be implemented since the last national communication or biennial report. In CTF table 3, Norway therefore includes the policies and measures reported in the sectoral tables in chapter 4 of the NC7 and their effects in 2020 and 2030. The policies and measures are organized by sector and by gas both in CTF table 3 and in the NC7. In order to avoid duplication, reference is made to the description of the mitigation actions in chapter 4 of the NC7.

For some of the policies and measures in CTF table 3 the impact in terms of GHG reductions are not estimated (NE). In chapter 4 of the NC7 the reasons are explained to the extent possible. Thus, although no numerical effect has been estimated, the various policies and measures are likely to have an impact in terms of GHG reductions. It should also be noted that as most of the stationary energy consumption in Norway is based on electricity and the electricity supply in Norway is almost entirely based on renewable energy, enhancing energy efficiency and encouraging the use of new renewable energy sources do not necessarily have an impact on domestic emissions.

CTF table 3. *Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects*

Name of mitigation action[a]	*Sector(s) affected[b]*	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument[c]*	*Status of implementation[d]*	*Brief description[e]*	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)[f]*	
									2020	*2030[f]*
CO2 tax (except CO2 tax off shore)*	Cross-cutting	CO2	Cost-effective reductions of emissions	Economic	Implemented	Coverage and rates changed since 1991.	1991	Ministry of Finance	1,100.00	1,100.00
Emissions trading (2008-2012) onshore (1)*	Industry/industrial processes, Energy	CO2, N2O	Reduce emissions	Economic	Implemented	Part of the EU Emissions Trading Scheme, see text in NC for further details.	2008	Norwegian Environment Agency	0-300	0-300
Emissions trading (2013-2020) onshore (2) (3)*	Industry/industrial processes, Energy	CO2, N2O, PFCs	Reduce emissions	Economic	Implemented	Part of the EU Emissions Trading Scheme, see text in NC for further details.	2013	Norwegian Environment Agency	IE	IE
Regulation by the Pollution Control Act	Industry/industrial processes, Energy	CO2, CH4, N2O, SF6, PFCs, HFCs	Reduce emissions	Regulatory	Implemented	The Act lays down a general prohibition against pollution. Pollution is prohibited unless one has a specific permission. See text in NC for further details.	1983	Norwegian Environment Agency	NE	NE
The Norwegian energy fund, Enova (9)*	Cross-cutting	CO2	Contribution to an environmental friendly change in the consumption and production of energy and development of energy and climate technologies	Economic	Implemented	Enova provides investment support for climate measures in all sectors	2002	Enova, Ministry of Petroleum and Energy	1,800.00	1,800.00
Klimasats	Cross-cutting	CO2, CH4, N2O, SF6, PFCs, HFCs	Reduce emissions	Economic	Implemented	Reduce emisisons at local level and contribute to the transition to a low carbon society.	2016	Norwegian Environment Agency	NE	NE
CO2 tax offshore, EU ETS and regulations (4)*	Energy	CO2	Reduce emissions	Other (Regulatory)	Implemented	Coverage and rates changed since 1991, see text in NC for further details.	1991	Ministry of Finance	7,000.00	7,000.00

NMVOC regulation offshore *	Energy	NMVOC and CH4, i.e. indirect CO2 emissions	Reduce emissions	Regulatory	Implemented	Phase in of vapour recovery units technology, see text in NC for further details.	2002	Norwegian Environment Agency	130.00	110.00
NMVOC regulation land terminals *	Energy	NMVOC and CH4, i.e. indirect CO2 emissions	Reduce emissions	Regulatory	Implemented	Installation of vapour recovery units.	1996	Norwegian Environment Agency	20.00	20.00
Carbon capture and storage (CCS) (5) (6) (7) (8)	Cross-cutting, industry/industrial processes, waste management/waste, energy	CO2	Reduce emissions	Research	Planned	CCS is a key tool for reducing global greenhouse gas emissions. CCS is still a relatively immature technology. Hence, work in this field is focusing on the development of technology and ways of reducing costs (g)	2005	Ministry of Petroleum and Energy	NE	NE
Electricity certificates*	Cross-cutting	No direct effect	New renewable energy	Economic	Implemented	Norway and Sweden will increase their renewable electricity generation by 28.4 TWh from 2012 to the end of 2020 (an average of 3.2 TWh yr).	2012	Ministry of Petroleum and Energy	NE	NE
Electricity tax *	Cross-cutting	No direct effect	Reduce electricity consumption	Economic	Implemented	Tax on electricity consumption	1951	Ministry of Finance	NE	NE
Base tax on mineral oils (10)*	Cross-cutting	CO2	Avoid substitution	Economic	Implemented	Excise duty on mineral oils	2000	Ministry of Finance	IE	IE
Energy requirement in the building code*	Energy	CO2	Reduce use of fossil fuels and energy demand in new buildings	Regulatory	Implemented	Energy requirments in buildings to ensure more energy efficient buildings.	2007	Ministry of Local Government and Modernisation	NE	NE
Ban use of mineral oil for heating in households and for base load in other buildings*	Energy	CO2	Reduce emissions from heating of buildings	Regulatory	Planned	The ban covers the use of mineral oil for both main heating (base load) and additional heating (peak load), in residential buildings, public buildings and commercial buildings.	2020	Ministry of Climate and Environment/ Ministry of Petroleum and Energy	400.00	200 - 300
Bioenergy Scheme	Energy	CO2	Replace fossil energy with bioenergy	Economic	Implemented	Monetary support scheemes for converting to bioenery	2003	Ministry of Agriculture and Food	>0	>0

CO2-dependent registration tax for new passenger cars including special rules for plug-in hybrid cars*	Transport	CO2	Reduce emissions from new cars	Economic	Implemented	Registration tax is based on CO2 emissions, NOx emissions and weight. CO2 emissions included in 2007 - increasingly emphasised. Additional weight rebates for plug-in hybrids in the registration tax.	2007	Ministry of Finance	300-550	350-650
Tax exemptions and other advantages for electric vehicles*	Transport	CO2	Reduce emissions from new cars	Economic and regulatory	Implemented	Exemption from registration tax and VAT for EVs. Reduced rate in annual motor vehicle tax. Other user advantage as free or low charges for toll roads, ferries and public parking.	2001	Ministry of Finance	400.00	1,200.00
Requirement of 6.25 % bio fuels of fuel consumption in road transport *	Transport	CO2	Reduce emissions	Regulatory	Implemented	The requirement is that 6.25% of total fuel consumption in road traffic is bio fuel and 4% of petrol is bioethanol	2017	Ministry of Climate and Environment	570.00	490.00
Zero traffic growth for passenger cars (11)	Transport	CO2	Reduce emissions from passenger cars	Economic and regulatory	Implemented	The 9 largest urban areas either have urban environment agreements, urban growth agreements or a reward scheme for public transport, which all share the same common goal of zero growth in passenger traffic by car.	2012	Ministry of transport and communication	>0	0 - 200
Use low or zero emission car ferries	Transport	CO2	Reduce emissions from ferries	Economic/regulatory	Planned/ Implemented	Requirements for zero and low emission technology on ferries	2015	Ministry of transport and communication	90.00	90.00
Reduced pilotage fees	Transport	CO2	Reduce emissions from freight transport	Economic	Implemented	In order to encourage a modal shift of freight from road to sea, vessels up to 8.000 gross tonnes are exempted from the pilotage readiness fee.	2016	Ministry of transport and communication	NE	NE
Aid Scheme for Short Sea Shipping	Transport	CO2	Reduce emission from freight transport	Economic	Implemented	Shipowners may receive financial aid for operational costs or for investments costs over a three-year period in order to establish a sustainable maritime transport route.	2017	Ministry of transport and communication	83.00	97.00

Discount in the Pilotage Readiness Fee	Transport	CO_2	Reduce emission from freight transport	Economic	Implemented	Vessels scoring 50 or more on the Environmental Ship Index (ESI) are eligible for a 100 per cent discount on the Pilotage Readiness Fee.	2015	Ministry of transport and communication	NE	NE
Investments in railways	Transport	CO_2	Reduce emissions from transport	Economic	Implemented, Planned	1) Investment in railway infrastructure in the larger capital area, the so called InterCity-project. 2) Investment in specific infrastructure measures for freight transport.	2011, 2018	Ministry of transport and communication	>0	174.00
Consensus with the process industry, 2004 (12)*	Industry	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	Reduce emissions	Voluntary agreement	Implemented	The Ministry of Climate and Environment entered into an arrangement with the processing industry. See text in NC for further details.	2004	Ministry of Climate and Environment	IE	IE
Consensus with the process industry, 2009*	Industry	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	Reduce emissions	Voluntary agreement	Implemented	The Ministry of Climate and Environment entered into an agreement with the processing industry that was not covered by the EU ETS. See text in NC for further details.	2009	Ministry of Climate and Environment	200.00	200.00
CO_2 compensation scheme*	Industry	CO_2, N_2O, PFC	Prevent carbon leakage	Economic	Implemented	CO_2 compensation scheme to prevent carbon leakage resulting from increased electricity prices due to the EU ETS. See text in NC for further details.	2013	Ministry of Climate and Environment, Norwegian Environment Agency	NA	NA
Use of bio carbon in the production of cement and ferroalloys (13) (14)*	Industry	CO_2	Reduce CO_2 emissions	Voluntary	Implemented	The producers have voluntarily replaced some of the coal consumption with bio carbon.	1990s (cememt), 2000 (ferroalloys)	NA	460.00	460.00
N_2O reduction, production of nitric acid *	Industry	N_2O	Reduce N_2O emissions	Voluntary/ Voluntary agreement/ EU ETS	Implemented	Mainly because the production lines have been equipped with a new technology – N_2O decomposition by extension of the reactor chamber.	since 1991	NA	2,800.00	2,800.00

Agreement with aluminium industry*	Industry	PFC	Reduce PFC emissions	Voluntary agreement	Implemented	The major aluminium producers signed an agreement with the Ministry of Climate and Environment to reduce emissions. See text in NC for further details.	1997	Ministry of Climate and Environment	2600-5800	2900-6400
Agreement on SF6 reductions from use and production of GIS *	Industry	SF6	Reduce SF6 emissions	Voluntary agreement	Implemented	Agreement between the Ministry of Climate and Environment and the business organisations representing most users of gas-insulated switchgear (GIS) and the single producer. See text in NC for further details.	2002	Ministry of Climate and Environment	59.00	58.00
SF6 reduction, production of magnesium (15)	Industry	SF6	Reduce consumption of SF6	Voluntary	Implemented	Voluntarily reductions in the consumption of SF6 used as a blanket gas in the production of magnesium. See text in NC for further details.	1985	NA	NA	NA
Tax and recycling schemes on HFCs *	Industrial processes	HFCs	Reduce HFCs emissions	Economic	Implemented	Has resulted in better maintenance and improved routines during discharge of old equipment. See text in NC for further details.	2003, 2004	Directorate of Customs and Excise, Norwegian Environment Agency	700.00	500.00
Revised F-gas regulation *	Industrial processes	HFCs	Reduce HFCs emissions	Regulatory	Planned	Planned implementation of the revised EU regulation No. 517/2014. See text in NC for further details.		Norwegian Environment Agency	250.00	600.00
The Environmental Technology Scheme	Cross-cutting	No direct effect	Contribute to sustainable business development in Norway and realize Norway's environmental goals.	Other (research)	Implemented	The Environmental Technology Scheme offers grants and other support for development and investments in pilot and demonstration projects for new Norwegian environmental technology.	2010	The Norwegian Ministry of Trade, Industry and Fisheries	NE	NE
Regional agri-environmental programme	Agriculture	CO2, N2O	Reduce emissions by no-autumn tillage and environmentally friendly spreading of manure	Regulatory and Economic	Implemented	Several support schemes. Differs between regions.	2003 (No-autumn tillage) and 2012 (environmentally friendly	Ministry of Agriculture and Food	NE	NE

							spreading of manure)			
Support Scheme Special Environmental Measures in Agriculture	Agriculture	CH_4, N_2O	Reduce emissions by better storage of manure	Economic	Implemented	Several support schemes, of which storage of manure is mostly related to climate mitigation	2004	Ministry of Agriculture and Food	NE	NE
Drainage of agricultural soils	Agriculture	N_2O	Reduced emissions of N_2O, caused by better drained soils	Economic	Implemented	National support scheme	2013	Ministry of Agriculture and Food	NE	NE
Project Climate Smart Agriculture	Agriculture	CH_4, N_2O, CO_2	Data collection, councelling, sharing knowledge	Information	Implemented	The project will last for three years.	2017	Ministry of Agriculture and Food	NE	NE
Climate and environment programme	Agriculture	CH_4, N_2O, CO_2	Develop knowledge	Economic/information	Implemented	Develop knowledge which, among others, will contribute to reduced emissions on farm level	2011	Ministry of Agriculture and Food	NE	NE
Delivery of manure for production of biogas	Agriculture	CH_4	Reduce emissions from manure	Economic	Implemented	Support scheme for delivery of manure. The goal is to increase the utilization of livestock manure to biogas production.	2016	Ministry of Agriculture and Food	NE	NE
Grant for biogas projects	Agriculture and transport	CH_4, N_2O, CO_2	Reduce emissions	Economic	Implemented	Grants given to pilot projects to increase production and use of biogas	2015	Ministry of Climate and Environment	NE	NE
Forestry, climate and energy funding programme The Forest trust fund	LULUCF	CO_2	Increase sequestration and forest carbon stocks and displace fossile recources	Economic	Implemented	Enhance or increase carbon stocksby silviculture and reduce emissions in other sectors by displacing fossile resources with bio energy or wood materials	2009/1983	Ministry of Agriculture and Food	NE	>0
Genetical improvement, plant breeding	LULUCF	CO_2	Enhanced carbon sink compared to baseline	Economic	Implemented	Genetically improvement means to single out robust plants which can improve the forest stand increment and quality. Enhanced action from 2016.	2016	Ministry of Agriculture and Food	NE	NE

Wood building programme	LULUCF	CO2	Use wood in buildings as a replacement for less climate friendly building materials, LULUCF (HWP)	Economic	Implemented	The Wood-based Innovation Scheme aims to increase the awareness and use of wood by stimulating innovation and market orientation in the wood industries.	2000	Ministry of Agriculture and Food	NE	>0
Denser spacing between forest seedlings in regular forest plantations	LULUCF	CO2	Enhanced carbon sink compared to baseline	Economic	Implemented	Increase the number of plants to an optimum level from a climate perspective in order to enhance net carbon sequestration	2016	Ministry of Agriculture and Food	NE	>0
Increased afforestation to enhance carbon stock and sequestration	LULUCF	CO2	Increase forest carbon stock and net CO2 sequestration	Economic	Under consideration	Planting trees on areas in early seccessional stages and/or areas without existing forests will expand forested areas and increase carbon sequestration. Pilot study to be completed in 2018.	2015	Ministry of Climate and Environment, Ministry of Agriculture and Food	NE	>0
Restoration of organic soils	LULUCF	CO2, CH4, N2O	Reduce soil carbon emissions from peatlands, increase net sequestration	Economic	Implemented	Emissions from drained organic soils can be reduced by restoring trenches made for drainage of peatlands	2015	Ministry of Climate and Environment, Ministry of Agriculture and Food	NE	>0
Fertilization of forests	LULUCF Agriculture	CO2, CH4, N2O	Enhanced carbon sink compared to baseline	Economic	Implemented	Fertilization can sustain or improve sequestration of carbon where scarcity of nitrogen on existing forest areas limits plant growth	2016	Ministry of Climate and Environment, Ministry of Agriculture and Food	>0	270.00
Requirement to collect landfill gas *	Waste management/waste	CH4	Collection of methane from landfills	Regulatory	Implemented	Landfill Directive incorporated into national law requires all landfills with biodegradable waste to have a system for extracting landfill gas	2002	Ministry of Climate and Environment	176.00	109.00
Prohibition of depositing biodegradable waste (16)*	Waste management/waste	CH4	Prohibition of wet organic waste and biodegradable waste	Regulatory	Implemented	Landfilling of wet-organic waste was prohibited in 2002 and was replaced by the wider prohibition of depositing from 2009 that applies to all biodegradable waste.	2002: wet organic waste 2009: biodegradable waste	Ministry of Climate and Environment	395.00	677.00

Agreement with industry to minimise waste	Waste management/waste, Energy	CO2, CH4, N2O	Increase waste recycling	voluntary agreement	Implemented	Agreements primarily to ensure that waste is collected and sent to approved treatment.	1995	Ministry of Climate and Environment	NE	NE
Measures to increase waste recycling	Waste management/waste, Energy	CO2, CH4, N2O	Increase waste recycling	Regulatory	Implemented	Waste regulations for a number of waste fractions and a tax on beverage packaging.	2009	Ministry of Climate and Environment	NE	NE
Tax on final disposal of waste	Waste management/waste, Energy	CO2, CH4, N2O	Reduce emissions, increase recycling and reduce the quantities of waste	Fiscal	Implemented	Tax on incineration up to 2010 and for landfills up to 2015.	1999	Ministry of Finance	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the ‘with measures’ projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Custom footnotes

(1) Effects of ETS in the petroleum sector are included in the estimates for petroleum and not here.

(2) Effects of ETS in the petroleum sector are included in the estimates for petroleum and not here.

(3) ETS 2013-2020: The ETS may have contributed to some of the estimated effects for industry.

(4) CCS projects implemented since 1996 at the Sleipner field and later also on Snøhvit are included. The estimate also includes effects of utilising electricty from the onshore grid.

(5) The most important goal of a full-scale project in Norway is to contribute with knowledge and learning so CCS can be deployed in industry across the world.

(6) It is not possible to quantify the emission reductions that might be realized through this policy

(7) Exisiting CCS-projects in the petroleum sector is included in the table for petroleum

(8) 2005 is the start of the CLIMIT research programme

(9) Actions may build on and enhance previous initiatives incentivising renewables, efficiency and emissions reductions.

(10) Estimated effect included in Enova in other cross-sectoral measures

(11) This includes reward scheme for public transport, stimulate walking and the use of bicycle and urban growth agreements. It is very difficult to single out the effect of each measure. The estimated effect is therefore aggregated for the zero traffic growth goal

(12) The effect is included under N2O reduction, production of nitric acid.

(13) The effects for cement were estimated by the producers and reported in Norway's fifth National Communication. Effects for 2030 assumed equal to 2020.

(14) The effects for ferroalloys are based on the plants' annual reporting to the Norwegian Environmental Agency. For 2020 and 2030, the effect has been assumed equal to the effect for 2015.

(15) The plant producing magnesium was closed down in 2006, and emisison reductions are not included in the estimated effects of policies and measures after this.

(16) For mitigation actions within the waste sector, actions may build on or replace previously established activities to incentivise recycling, reduced disposal and emissions from waste

4.2 Changes in domestic institutional arrangements

The UNFCCC biennial reporting guidelines encourage Parties to provide information on changes in its domestic institutional arrangements, including institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress towards its economy-wide emission reduction target. Chapters 4.2 and 4.3 of Norway's seventh National Communication describes the current domestic institutional arrangements. Norway has several legislative arrangements in place in order to help reduce emissions of greenhouse gases, such as the Pollution Control Act, the Greenhouse Gas Emissions Trading Act, the CO_2 Tax Act, and the Petroleum Act, as well as requirements under the Planning and Building Act. There have not been any significant changes to these arrangements since Norway reported its sixth National Communication. In addition Norway adopted a new Climate Change Act in June 2017 that entered into force as of January 2018. The act will have an overarching function in addition to existing environmental legislation. The purpose of the act is to promote the long-term transformation of Norway in a climate-friendly direction.

4.3 Assessment of economic and social consequences of response measures

The UNFCCC biennial reporting guidelines encourage Parties to provide, to the extent possible, detailed information on the assessment of the economic and social consequences of response measures. On Norway's approach to minimize adverse impacts of mitigation actions in accordance with Articles 2.3 and 3.14 of the Kyoto Protocol see also chapter 4.1.5 in the NC7.

Norway has strived to follow a comprehensive approach to climate change mitigation from policy development started around 1990, addressing all sources as well as sinks, in order to minimize adverse effects of climate policies and measures on the economy.

In developing environmental, as well as the economic and energy policy, Norway strives to formulate the policy on the polluter pays principle and to have a market-based approach where prices reflect costs including externalities. As regards emissions of greenhouse gases, costs of externalities are reflected by levies and by participation in the European Emissions Trading Scheme (EU ETS). These instruments place a charge on emissions of greenhouse gases. The Norwegian Government contends that the best way to reduce emissions on a global scale, in line with the two degree target and striving for 1.5 degree limit, would ideally be to establish a global price on carbon. Pursuing a global price on carbon would be the most efficient way to ensure cost-effectiveness of mitigation actions between different countries and regions, and secure equal treatment of all emitters and all countries. This will help minimize adverse impacts of mitigation. For more information about levies on energy commodities and the design of the EU ETS, see Chapter 4.3.2 in the NC7.

The government presented a national strategy for green competitiveness in October 2017. The aim of the strategy is to provide more predictable framework conditions for a green transition in Norway, while maintaining economic growth and creating new jobs. In conjunction with the strategy for green competitiveness, the government in October 2017 also appointed an expert commission to analyze Norway's exposure to climate risk.

Carbon capture and storage (CCS) is one of five priority areas for enhanced national climate action. Norway strives to disseminate information and lessons learned from projects in operation in the petroleum sector, new large scale projects under planning and from research, development and demonstration projects. The information and lessons learned are shared both through international fora, and through bilateral cooperation with developing and developed countries. See chapter 7 for further information about this.

Norway has also initiated cooperation with developing countries related to fossil fuels: Oil for Development (OfD). This initiative is aimed at responding to requests for assistance from developing countries, in their efforts to manage petroleum resources in a way that generates economic growth and promotes the welfare of the whole population in an environmentally sound way. The rationale behind the OfD is to improve the economic resilience in petroleum producing countries through resource, revenue and environmental management. Furthermore, Norway has since 2007 supported initiatives fostering technology development and transfer, as well as capacity building efforts in developing countries, to increase access to renewable energy, and to shift the energy mix away from fossil fuels, thus enhancing their resilience to social and economic effects of response measures taken.

Norway has issued Instructions for Official Studies and Reports (Utredningsinstruksen), laid down by Royal Decree. These Instructions deal with consequence assessments, submissions and review procedures in connection with official studies, regulations, propositions and reports to the Storting. The Instructions are intended for use by ministries and their subordinate agencies. The Instructions form part of the Government's internal provisions and deviation may only be allowed pursuant to a special resolution. The provisions make it mandatory to study and clarify financial, administrative and other significant consequences in advance.

In addition, Norway has a legal framework that deals specifically with environmental impact assessments. The purpose is to promote sustainable development for the benefit of the individual, society and future generations. The Environmental Impact Assessment framework and various guidelines and policies is revised as of 2017 and ensures that vulnerability due to climate change is included in environmental impact assessments.

4.4 Estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry activities

4.4.1 General Information

Chapters 4 and 5.3 of Norway's seventh National Communication and chapter 4.1 of this BR3 describe policies and measures that have reduced or will reduce Norway's national emissions. Chapter 4.4.2 below describes Norway's achievement and voluntarily over-achievement of its commitment in the Kyoto Protocol's first commitment period (2008-2012) and chapter 4.4.3 describes how Norway will achieve the Kyoto Protocol's second commitment period (2013-2020).

4.4.2 The Kyoto Protocol's first commitment period (2008-2012)

Norway's Assigned Amount under the Kyoto Protocol's first commitment period (2008-2012) of 1 per cent above the 1990-level, totalled about 250.6 million assigned amount units (AAU). Through the review of the inventory submitted in 2014, Norway's total emissions from Annex A sources in the years 2008-2012 were finalised to about 266.8 million tonnes CO2 equivalents.[zzz]

The review report of the 2014 inventory also contains the final accounting quantities for activities under Article 3.3 and Article 3.4. Based on the information in the review report, Norway issued 2 614 190 removal units (RMUs) in the national registry for the activity afforestation and reforestation, issued 16 491 128 RMUs in the national registry for the activity forest management and cancelled a total of 11 771 985 units in the national registry for the activity deforestation. Norway had intended to use only RMUs for the net source cancellation for deforestation, but since the net source cancellation technically in the registry had to occur early in the process, 1 824 462 AAUs were cancelled together with 9 947 523 RMUs.

Installations in Norway are covered by the European Union Emissions Trading System (EU ETS). In 2008-2012, each unit issued in the EU ETS scheme was backed by an AAU. The Norwegian installations delivered on average 4.1 million more units (AAU, ERU, and CERs) annually to the Norwegian government than Norway allocated free of charge or through sale under the EU ETS. The participation in the EU ETS in itself therefore led to a net acquisition of Kyoto units that more than closed the gap between Norway's emissions and its commitment under the Kyoto Protocol's first commitment period. Thus, Norway met its Kyoto commitment for the period 2008-2012 without any need for government purchases of Kyoto units.

Norway voluntarily chose to over-achieve the Kyoto commitment for 2008-2012 by 10 per cent, which is equivalent to about 5 million tonnes per year. In addition Norway purchased Kyoto units to compensate for emissions caused by governmental employees' international air travel in the years 2008-2011, and their travels in and out of the EEA during 2012, that would not be

[8] See review report document FCCC/ARR/2014/NOR, http://unfccc.int/resource/docs/2015/arr/nor.pdf

covered by Norway's commitments under the Kyoto Protocol and/or the European ETS, as well as emissions related to the CCS test centre at Mongstad.

Norway had stated in its "Initial Report" prior to the first commitment period that it would select forest management under Art. 3.4, for which issuance was capped at about 3% of the 1990 emissions (7 333 333 RMUs), but would meet the commitment under Art. 3.1 without using these RMUs.

A governmental procurement programme for Kyoto units was established under the Ministry of Finance in 2007. The procurement strategy for the period 2008-2012 emphasised the acquisition of units from UN-approved projects at market prices. Furthermore, a diversification of the portfolio to mitigate different risk-components was implemented. This implied inter alia the acquisition of some units from LDCs. Following the change of government in autumn 2013, the administration of the procurement programme was moved to the Ministry of Climate and Environment.

The deadline for the true up for the Kyoto Protocol's first commitment period was the 18th of November 2015. By 16 November 2015, Norway transferred a sufficient number of units to the retirement account to meet the commitment under Article 3.1, and cancelled units corresponding to the overachievement described above. In addition to this, a total of 7 333 333 RMUs from forest management were cancelled in our national registry. The total overachievement was thus 13 per cent. Further details can be found in Norway's true up period report available at the UNFCCCs webpages, and related documents, see ia. FCCC/KP/CMP/2016/CAR/NOR.

4.4.3 The Kyoto Protocol's second commitment period (2013-2020)

As explained in chapter 3, the 2020-target was made operational through the legally binding commitment for 2013-2020 under the Kyoto Protocol where average emissions in 2013-2020 shall not exceed 84 % of the 1990 level. CTF Table 4 below provides relevant information within the adopted reporting format on Norway's progress made towards meeting its commitment under the Kyoto Protocol's second commitment period. Since the reporting format does not properly reflect the implementation of the commitment, the CTF table is supplemented by Table 4.4.

The annual emissions for the years 2013-2016 are shown in CTF Table 4. It should be noted information is not reported here for 2010, 2011 and 2012 since the fulfilment of the commitment for the years 2008-2012 is demonstrated in chapter 4.4.2. The contribution from LULUCF for the years 2013-2015 for which the sector is estimated to be a net source, is in line with the information reported in CTF Table 4(a)II and the contribution in 2016 is the average for the years 2013-2015. The numbers for the use of market-based mechanisms under the Convention is explained further in relation to Table 4.4.

CTF table 4. *Reporting on progress* [a]

		Base year/period (1990)	2010	2011	2012	2013	2014	2015	2016
Total (without LULUCF)	kt CO_2 eq	51,728.79	NA	NA	NA	53,527.82	53,331.41	53,908.19	53,400.00*
Contribution from LULUCF	kt CO_2 eq	NA	NA	NA	NA	0.10	0.01	0.30	0.14**
Market-based mechanisms under the Convention	number of units	NA	NA	NA	NA	10.0	9.7	10.6	9.9
	kt CO_2 eq	NA	NA	NA	NA	10.0	9.7	10.6	9.9
Other market-based mechanisms	number of units	NA	NA	NA	NA	NA	NA	NA	NA
	kt CO_2 eq	NA	NA	NA	NA	NA	NA	NA	NA

Abbreviation: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] For the base year, information reported on the emission reduction target shall include the following: (a) total GHG emissions, excluding emissions and removals from the LULUCF sector; (b) emissions and/or removals from the LULUCF sector based on the accounting approach applied taking into consideration any relevant decisions of the Conference of the Parties and the activities and/or land that will be accounted for; (c) total GHG emissions, including emissions and removals from the LULUCF sector. For each reported year, information reported on progress made towards the emission reduction targets shall include, in addition to the information noted in paragraphs 9(a–c) of the UNFCCC biennial reporting guidelines for developed country Parties, information on the use of units from market-based mechanisms.

*preliminary estimates (2016)

** Average of 2013-2015 used for 2016.

Within the format of CTF table 4, it is not possible to present information on the issuance of AAUs. This is an important aspect for Norway, and a supplementary table is therefore necessary. Table 4.2 shows information for the period 2013-2020.

Table 4.2. ***Achieving the commitment under the Kyoto Protocol's second commitment period (million tonnes CO_2-eq.)***

	2013-2020	2013	2014	2015	2016	2017	2018	2019	2020
Emissions/projections [a]	423.7	53.5	53.3	53.9	53.4	53.0	52.6	52.2	51.8
Assigned amount units for CP2 [b]	348.9	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.6
Net LULUCF (art 3.3 and 3.4) [c]	1.1	0.1	0.0	0.3	0.1	0.1	0.1	0.1	0.1
Total acquisition [d]	75.9	10.0	9.7	10.6	9.9	9.5	9.1	8.7	8.3

[a] Reported emissions (2013-2015), preliminary estimates (2016), projections linearly interpolated for 2017-2020.

[b] AAUs for CP2 are not yet issued.

[c] Reported for 2013-2015, average of 2013-2015 used for 2016-2020. Positive figure indicates net emissions

[d] Includes actual carry-over of CERs and ERUs and planned carry-over of AAUs to party holding account, actual purchase and planned purchase.

The number of assigned amount units (AAUs) Norway can issue for the period 2013-2020 pursuant to the commitment under Article 3.1 has been determined through the review process of Norway's initial report for the second commitment period. Norway's will issue 348.9 million AAUs for the period 2013-2020, or in average 43.6 million AAUs annually. Domestic policies and measures has had considerable effect on emissions (see Figure 4.1 and Table 4.1).Still, emissions this far into the commitment period and projections in the "with measures" scenario are higher than the issuance of AAUs to Norway. Norway plans to offset this gap by units acquired through participation in the European ETS and the state procurement program. The gap has been reduced compared to the information provided in BR1 and BR2, reflecting that figures in inventories and projections are lower.

The role of LULUCF

Pursuant to the accounting approach under the Kyoto Protocol, Norway uses an activity-based approach for the LULUCF sector through 2020. Norway will account for all the activities under Article 3.3, and for forest management, cropland management and grazing land management activities under Article 3.4 at the end of the commitment period. CTF table 4(a)II is imported from the accounting table in the Common Reporting Format (CRF) table and reported as part of the CTF tables. CTF table 4(a)I is not relevant for Norway since an activity-based approach is used.

Since Norway has chosen to account for the entire commitment period, the reported values for 2013-2015 may change. However, the emissions from deforestation under Article 3.3 are for the time being higher than the removals from afforestation and reforestation under Article 3.3.

Activities under Article 3.3 therefore represent net emissions. Activities under Article 3.4 represent net removals since the removals that can be accounted[æææ9] from forest management are much higher than the emissions from the activities cropland management and grazing land management. The preliminary sum of activities under Article 3.3 and 3.4 so far indicate net emissions. They will only amount to about 1 million tonnes CO_2 for the period 2013-2020 if the trends continue.

Market-based mechanisms under the Convention

Table 4.4 shows that Norway's emissions for the period 2013-2020, including Article 3.3 and 3.4, is expected to exceed the issuance of AAUs. Norway will therefore use the market-based mechanisms under the Convention. The net contribution of units through the mechanisms could be about 75 million tonnes for the whole 2013-2020 period excluding contribution from the LULUCF accounting. This includes actual carry-over of 2.25 million CERs and 0.74 million ERUs to Norway's party holding account units already acquired and planned acquisition through the procurement program (see Box 6 in chapter 4.3.3 in NC7). The planned carry-over of 5.98 million AAUs reflects the part of ETS installations' emissions in 2013 and 2014 for which they delivered CERs and ERUs and will cover these emissions. It is uncertain to what extent the participation in the EU ETS will contribute to the fulfilment of the commitments for 2013-2020. For comparison, in 2008-2012 the contribution was 4.1 Mt/year. The arrangement between Norway and the EU on how the participation in the European ETS will relate to KP units in the second commitment period is still to be finalised.

Policies and measures that will ensure compliance with the commitment for the second commitment period under the Kyoto Protocol represent, to a large extent, a continuation of an established system that already ensured compliance in the first commitment period, and which is well integrated into Norwegian climate policy. The procurement programme for Kyoto units is authorized to acquire up to 60 million units under the CDM, for the period 2013-2020. For details see www.carbonneutralnorway.no.

The carbon market has for a number of years been characterized by low demand which has led to excess supply and low prices, both in the primary and secondary market. An implication of this is that a number of registered projects are not issuing credits, and the number of new projects submitted for registration is low. Owing to the changes in the carbon market, Norway will only acquire units from projects facing a risk of discontinuing their operations, or from new, as yet unregistered projects.

Norway has also, in line with restrictions in the EU ETS, refrained from purchasing units from so-called industrial HFC projects. Furthermore, Norway has had a policy to refrain from purchasing units from coal-based energy production without carbon capture and storage. A small part of the portfolio is procured from the UN Adaptation Fund.

Norway has contracted some 29 million CERs through the Nordic Environment Facility Cooperation (NEFCO), and is currently in process of acquiring up to 30 million CERs through a bilateral purchase program run directly by the Ministry of Climate and Environment. By December 2017, the contract volume is close to 60 Mt, the risk adjusted volume 15-20 per cent

[æææ9]The volume that can be accounted from forest management under Art. 3.4 is subject to a cap of 3.5 per cent of 1990 emissions, representing about 1.75 Mt/year. The actual net removal in 2013-2020 is much higher.

lower and the amount delivered 16 Mt. In addition, the use of CERs and ERUs by the ETS installations has resulted in another 6 million units.

In CTF Table 4(b), Parties are asked to report on the amounts of units surrendered that have not been previously surrendered by that or any other Party. Norway's accounting for the whole 2013-2020 period is likely to occur in 2022/2013 and consequently no units have been surrendered pursuant to our commitment under the Kyoto Protocol, including in 2015 and 2016. In CTF Table 4b Norway has chosen to present estimates for the net use of units from the Kyoto mechanisms based on inventory estimates for 2013-2016 and projections for the remaining period. These figures exclude contribution from LULUCF, where the contribution to be accounted is expected to be small and probably negative (accounting figures 2013-2015 varied from 0.0 to emissions of 0.3 Mt/year (see also Table 4.4). The split between CERs and AAUs has not been carried out. The acquisitions for 2013-2020 are only expected to be of AAUs and CERs, while there is a small amount (0.7 millions) of ERUs carried over.

Table 4(b)

Reporting on progress[a, b, c]

Units of market based mechanisms			*Year*	
			2015	*2016*
Kyoto Protocol units[d]	*Kyoto Protocol units*	*(number of units)*	NO	NO
		(kt CO_2 eq)	10 600	9 900
	AAUs	*(number of units)*	NE	NE
		(kt CO2 eq)	NE	NE
	ERUs	*(number of units)*	NE	NE
		(kt CO2 eq)	NE	NE
	CERs	*(number of units)*	NE	NE
		(kt CO2 eq)	NE	NE
	tCERs	*(number of units)*	NE	NE
		(kt CO2 eq)	NE	NE
	lCERs	*(number of units)*	NE	NE
		(kt CO2 eq)	NE	NE
Other units [d]	*Units from market-based mechanisms under the Convention*	*(number of units)*	NA	NA
		(kt CO_2 eq)	NA	NA
	Units from other market-based mechanisms	*(number of units)*	NA	NA
		(kt CO_2 eq)	NA	NA
Total		*(number of units)*	10 600	9 900
		(kt CO_2 eq)	10 600	9 900

Abbreviations: AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, lCERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.

Note: 2015 is the latest reporting year for which a NIR is submitted, however preliminary figures for 2016 are published.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For each reported year, information reported on progress made towards the emission reduction target shall include, in addition to the information noted in paragraphs 9(a-c) of the reporting guidelines, on the use of units from market-based mechanisms.

[c] Parties may include this information, as appropriate and if relevant to their target.

[d] Units surrendered by that Party for that year that have not been previously surrendered by that or any other Party.

5 Projections

5.1 Methodology

Since the BR2 was reported, new projections have been carried out on the basis of macroeconomic forecasts in the White Paper on Long-term Perspectives on the Norwegian Economy issued March 2017. Since BR2 and NC6, a new macroeconomic model, SNOW, is used to project emissions. As the previously used MSG-model, the SNOW-model is a computable general equilibrium (CGE) model. Projections are calibrated taking into account emissions inventory figures through 2015, which would provide the starting point. No major changes have been done with respect to the inventories after the use of IPCC 2006 GWPs was introduced. There have been no other changes in the methods or models used to project emissions. Both methodologies for inventories and for projections, as well as trends reflected in the figures, are described in more detail in NC7 (chapters 3 and 5), to which this BR is annexed. Since the BR and NC overlap, only a brief summary is presented below.

5.1.1 The baseline scenario[øøø9]

Emissions are estimated to be reduced from a peak in 2007 of 56.8 Mt to 51.8 million tonnes CO2 equivalents in 2020, and further to 48.3 million tonnes by 2030, compared to 53.9 in 2015 and 51.7 Mt in 1990. Projected emissions are 3 million tonnes of CO_2 equivalents lower in 2020 and more than 4 million tonnes lower in 2030 compared to the projection in BR2. Both CO_2 emissions and f-gas emissions, primarily HFC, contribute to this downwards adjustment. A small increase in agricultural nitrous oxide emissions have an opposite effect. The level in 2030 corresponds to 8.2 tonnes per person, down from 12.2 in 1990 and 10.3 in 2015.

The projections is a “with measures scenario” and thus represent a continuation of the current climate policy orientation. This implies that the scope and rates of the CO_2 tax and other taxes are maintained at 2017-level and that the observed EU ETS prices for future delivery are applied, see Box 15 in chapter 5 of the NC. The support for new technologies, for example via Enova, is continued at current levels. Climate policy has been strengthened in recent years; see Box 16 in the NC. The projections do not reflect the government's goals nor the effects of future new policies and measures. Agreed targets without corresponding implemented policies or measures in the form of ia. regulations, directives, taxes or agreements are not included in the baseline scenario. One exception is the ban on use of fossil fuels for heating in households and office buildings in 2020, for which a regulation proposal has been issued for public comments. Norway does not report projections under a "without measures" scenario or under a “with additional measures” scenario.

Estimates as to how current policy will influence future emissions are subject to uncertainty, and such uncertainty is greater the longer into the future the projections extend. The uncertainty is not only related to the economic outlook and future population developments, but also to developments in, and access to, low- and zero-emission technologies and the costs

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[øøø] These national projections were first presented in the Whate Paper on Long Term Perspectives on the Norwegian Economy issued in March 2017 and are also refeflected in the most recent White Paper on climate policy issued in June 2017.

of implementing such technologies. Rapid development of new solutions will influence the effect of current policies and measures on future emissions.

Greenhouse gas emissions are on average estimated to decline by about 0.75 per cent per year towards 2020 and 2030; see Table 5.1 and Table 5.2. The emissions path reflects, inter alia, the phase-out of oil-fired heating towards 2020, the closure of the gas fired power plant at Mongstad and a slight reduction in emissions from petroleum activities after 2020. The effect of an estimated reduction in transport emissions as the result of more zero-emission vehicles being entered into use only becomes truly significant after 2020. In 2030, emissions are estimated to be more than 5.5 million tonnes of CO_2 equivalents lower than in 2015.

Table 5.1: *Greenhouse gas emissions in Norway by sector. Million tonnes of CO_2 equivalents*

	1990	2015	2020	2030	1990-2015	1990-2020	1990-2030
Total Energy	30.2	39.6	38.1	35.1	31 %	26 %	16 %
- Public Electricity and Heat production	0.4	1.7	1.1	1.1	311 %	175 %	173 %
- Petroleum Refining	0.9	0.9	1.1	1.1	-3 %	22 %	17 %
- Oil and gas production	5.9	12.9	12.8	11.8	117 %	116 %	100 %
- Manufacturing Industry and Construction	4.0	3.8	3.8	3.6	-6 %	-6 %	-10 %
- Transport	10.3	13.2	12.7	11.4	29 %	23 %	11 %
- Other sectors (1A4 and 1A5)	5.1	3.5	2.9	2.8	-31 %	-43 %	-46 %
- Fugitives	3.5	3.5	3.6	3.3	1 %	3 %	-6 %
Industrial Processes	14.5	8.5	8.3	8.0	-42 %	-43 %	-45 %
Agriculture	4.8	4.5	4.4	4.4	-6 %	-10 %	-8 %
Waste	2.2	1.3	1.0	0.7	-42 %	-54 %	-67 %
Total emission (excl. LULUCF)	51.7	53.9	51.8	48.3	4 %	0 %	-7 %
Mainland economy (excl. LULUCF)	43.5	38.8	36.7	34.4	-11 %	-16 %	-21 %
LULUCF	-10.4	-24.3	-23.5	-21.3	133 %	125 %	104 %
Total emissions (incl. LULUCF)	41.3	29.6	28.3	27.0	-28 %	-31 %	-35 %
Mainland economy (incl. LULUCF)	33.0	14.5	13.2	13.1	-56 %	-60 %	-60 %

Sources: Statistics Norway, Norwegian Environment Agency, NIBIO and Ministry of Finance.

Electricity generation in Norway is almost entirely based on hydro power. Emissions from this sector are projected to remain at a low level in the decades to come. As opposed to other countries, Norway does not have the opportunity to reduce emissions from electricity generation by developing more renewable energy. Energy supply emissions, 1.7 million tonnes in 2015, stem from the burning of fossil carbon in waste and the use of fossil energy carriers in district heating and other energy supply, such as gas power or the coal-fired heating power plant in Svalbard. Energy supply emissions are in the projections estimated to be reduced by about 0.5 million tonnes of CO_2 from the current level in 2020 and 2030. The reduction is caused by the announced closure of the gas fired power plant at Mongstad. Emissions have thereby also been reduced correspondingly from the BR2 projection.

Production of oil and gas is expected to decrease. The fall in production is assumed to be stronger than the decrease in greenhouse gas emissions from the sector until 2030. This has to do with a decline in production from several fields, whilst energy needs, and thus emissions, generally do not change much on individual fields although production is in decline. Furthermore, the projections assume that just over 30 per cent of Norwegian oil and gas production over the period 2015–2030 will take place from fields with an onshore power supply. This implies that today's emissions level is prolonged. The estimate for emissions from oil and gas production in 2020 are somewhat reduced from those in the previous projection. The emissions estimate for 2030 has not been changed.

Emissions from manufacturing emissions are estimated to remain fairly stable in the years ahead, and at about the same level as in the previous BRs emissions projections. The projections assume that power-intensive industries in both 2020 and 2030 consume electrical power at about the same level as in 2016. Due to productivity growth, emissions are estimated to stay at about current levels even though production is expected to increase somewhat over time and at about the same level as in the previous BRs.

Emissions from the consumption of fossil oils in the heating of households and businesses have declined by almost 60 per cent since 1990. If this development continues, emissions will be around 0.75 million tonnes of CO_2 equivalents in 2030. The ban on the use of heating oil from 2020 means that residential building already in 2020 will have phased out emissions from such use, although there will still be some emissions from the use of gas. The ban will also accelerate the decline in the use of oil for heating in service industries. However, the projection assume emissions at just below 0.5 million tonnes of CO_2 equivalents in 2030 reflecting activities that may still be in place for energy security reasons. All in all, emissions from heating of buildings have been revised downwards by 0.75 million tonnes in both 2020 and 2030, compared to previous projections.

Road transport emissions are now estimated to decline from 10.3 million tonnes in 2015 to 9.7 million tonnes in 2020, and down to 8.4 million tonnes in 2030, compared a stable development in emissions in the BR2 projections. The primary cause of the reduction is the observed recent uptake of electric vehicles (EV) and other low emissions cars that is assumed to continue in the coming years. The number of kilometres driven per person have been stable over the last 5–10 years. It is assumed, as in the previous projection, that this trend will continue. The share of biofuel in petrol and diesel has been increased from the previous projection. In the projections, the 2017-level of the sales obligation is continued both in 2020 and 2030. The sales obligation is planned to increase to 20 per cent in 2020. This increase will, when taken in isolation, reduce emissions by about 1 million tonnes in 2020. The effect is somewhat less in 2030 due to more zero- and low-emission vehicles. It is in the projections assumed that the share of zero-emission cars will increase from the 2016 level of about 15 per cent of new car sales to 50 per cent in 2030.

Domestic shipping and fisheries emissions have declined significantly in recent years; see the discussion in NC chapter 2.9. The projections assume that this decline is permanent and that further technological development and the enhancement of policy measures over the last few years will cause emissions to keep declining on after 2020.

As before, landfill emissions are estimated to continue to decline as the result of the prohibition against the depositing of wet organic waste.

Emissions from agriculture has decreased by about 6 per cent since 1990, and were in 2015 4.5 million tonnes CO2 equivalents. Net sequestration in forest and other land areas has more than doubled from 1990 to 2015. An active forest management policy to rebuild the country after the Second World War led to a great effort to invest in forest tree planting. Former forest management policies has contributed significantly to the current high sequestration.

LULUCF projections have not been updated since the projections presented in the National Budget for 2015. Net CO_2 sequestration is expected to decline in the coming century. This is due to a combination of aging of the Norwegian forests, an assumed increase in logging and a reduction in the number of seedlings that were planted annually in the last decades. It was then estimated that the removals would decline from a level of about 25 million tonnes of CO_2 per year to just over 20 million tonnes of CO_2 in 2030 (21.3 million tons CO_2 in CTF table 6a). This development assumes, inter alia, a continuation of the historic trend in land use changes and that the harvest from about 10 million m^3 in the first decade of the century to 11,7 million m^3 in 2015 and further to just over 12.6 million m^3 in 2030 reflecting also increased share of mature forest. Despite this development, sequestration in forest and other land areas are projected to equal more than two-fifths of the projected aggregate greenhouse gas emissions from Norwegian territory in 2030.

Table 5.2: *Greenhouse gas emissions in Norway. Million tonnes of CO_2 equivalents*

	Million tonnes				Per cent change		
	1990	2015	2020	2030	1990-2015	1990-2020	1990-2030
Total emission (excl. LULUCF)	51.7	53.9	51.8	48.3	4 %	0 %	-7 %
CO2	35.7	44.7	43.1	40.4	25 %	21 %	13 %
Other greenhouse gases	16.0	9.2	8.6	7.9	-42 %	-46 %	-51 %
CH4	5.8	5.2	4.9	4.5	-10 %	-15 %	-22 %
N2O	4.2	2.6	2.5	2.5	-38 %	-40 %	-41 %
HFC	0.0	1.2	1.0	0.6			
PFC	3.9	0.1	0.2	0.2	-96 %	-96 %	-96 %
SF6	2.1	0.1	0.1	0.1	-97 %	-97 %	-97 %

Sources: Statistics Norway. Norwegian Environment Agency and Ministry of Finance.

CO_2 emissions have grown since 1990, but are now projected to decline towards 2020 and 2030. Emissions of greenhouse gases other than CO_2 have been reduced by 42 per cent from 1990 to 2015. Only a slight further decrease is projected for the next decades, see CTF Table 6(a). However, during the period up to 2020, the projections show that lower emissions of methane and nitrous oxide will to some extent be offset by higher emissions of HFC gases owing to the increased use of cooling appliances containing HFCs.

Table 5.3 summarises the historic and projected emissions of fuel sold to ships and aircraft engaged in international transport. These emissions are reported separately and are not included in previous totals. CO_2 emissions from use of international bunker in aviation are projected to increase up to 2030 by 1.8 per cent per annum. That is half of the average annual growth during the period 1990-2015. Emissions from fuel sold to ships are projected to decrease by 1.2 per cent per annum (half of the annual decrease 1990-2015) during the projection period.

Compared with the previous national communication, the emissions have been adjusted downward mainly because emissions in 2015 were lower than previously predicted.

Table 5.3 *CO_2 emissions from international bunker. Million tonnes*

	1990	2015	2020	2030
International Bunkers	2.1	2.3	2.5	2.7
Aviation	0.6	1.5	1.7	2.0
Marine	1.5	0.8	0.8	0.7

Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance.

CTF Table 5.

Table 5: Summary of key variables and assumptions used in the projections analysis [a]

Key underlying assumptions	Unit	Historical [b]						Projected			
		1990	1995	2000	2005	2010	2011	2015	2020	2025	2030
Gross domestic product ①②	billion NOK. Fixed 2013-prices	1,749.00		2,511.00				3,180.00	3,417.00		4,031.00
Of which mainland Norway	billion NOK. Fixed 2013-prices	1,250.00		1,718.00				2,499.00	2,764.00		3,443.00
Of which petroleum activities and ocean transport	billion NOK. Fixed 2013-prices	484.00		891.00				683.00	654.00		588.00
Consumption	billion NOK. Fixed 2013-prices	583.00		813.00				1,283.00	1,435.00		1,885.00
Gross fixed capital formation	billion NOK. Fixed 2013-prices	308.00		446.00				685.00	760.00		939.00
Of which mainland Norway	billion NOK. Fixed 2013-prices	220.00		327.00				508.00	625.00		776.00
Of which petroleum activities and ocean transport	billion NOK. Fixed 2013-prices	85.00		119.00				178.00	135.00		162.00
Population	thousands	4,250.00		4,503.00				5,214.00	5,483.00		5,961.00
Number of persons employed	thousands	2,058.00		2,320.00				2,753.00	2,892.00		3,047.00
Oil price	2013-NOK	257.00		340.00				423.00	416.00		483.00
Gas price	2013-NOK	1.00		1.30				1.90	1.80		1.80

Please, specify

[a] Parties should include key underlying assumptions as appropriate.

[b] Parties should include historical data used to develop the greenhouse gas projections reported.

① All values in table for 2015 are historical and not projected

② For the assumptions on GDP, consumption and gross fixed capital formation, the estimates for 2020 and 2030 are based on annual growth rates

CTF table 6(a). Information on updated greenhouse gas projections under a 'with measures' scenario [a]

Table 6(a): Information on updated greenhouse gas projections [a] (with measures)

GHG emissions projections	Unit	GHG emissions and removals [b]							GHG emission projections - Scenarios	
									With measures	
		Base year (1990)	1990	1995	2000	2005	2010	2015	2020	2030
Sector [d, e]										
Energy	kt CO_2 eq	19,896.25	19,896.25	21,641.23	24,277.84	25,674.67	27,649.09	26,372.18	25,389.00	23,735.00
Transport	kt CO_2 eq	10,267.69	10,267.69	11,103.36	11,847.66	12,652.11	13,477.90	13,230.05	12,680.00	11,376.00
Industry/industrial processes	kt CO_2 eq	14,497.79	14,497.79	11,602.03	12,082.65	10,617.76	8,203.14	8,464.24	8,307.00	7,988.00
Agriculture	kt CO_2 eq	4,823.94	4,823.94	4,708.88	4,611.18	4,588.96	4,394.22	4,547.87	4,365.00	4,448.00
Forestry/LULUCF	kt CO_2 eq	-10,449.36	-10,449.36	-13,601.17	-23,486.41	-24,592.25	-25,870.94	-24,319.53	-23,483.00	-21,287.00
Waste management/waste	kt CO_2 eq	2,243.12	2,243.12	2,122.37	1,819.85	1,572.68	1,509.05	1,293.85	1,040.00	741.00
Add a Sector										
Other (specify)	kt CO_2 eq									
Gas										
CO_2 emissions including net CO_2 from LULUCF	kt CO_2 eq	24,804.79	24,804.79	24,400.71	18,223.33	18,452.13	19,440.11	19,811.50	19,665.00	19,100.00
CO_2 emissions excluding net CO_2 from LULUCF	kt CO_2 eq	35,704.39	35,704.39	38,476.69	42,202.11	43,553.93	45,838.48	44,664.05	43,148.00	40,387.00
CH_4 emissions including CH_4 from LULUCF	kt CO_2 eq	5,940.22	5,940.22	6,026.32	5,848.47	5,636.23	5,546.73	5,341.33	4,911.00	4,538.00
CH_4 emissions excluding CH_4 from LULUCF	kt CO_2 eq	5,800.20	5,800.20	5,884.96	5,703.57	5,488.83	5,398.45	5,192.28	4,911.00	4,538.00
N_2O emissions including N_2O from LULUCF	kt CO_2 eq	4,541.04	4,541.04	4,163.80	4,287.81	4,558.30	3,000.80	3,001.30	2,527.00	2,506.00
N_2O emissions excluding N_2O from LULUCF	kt CO_2 eq	4,230.83	4,230.83	3,830.36	3,940.34	4,196.16	2,621.65	2,617.32	2,527.00	2,506.00
HFCs	kt CO_2 eq	0.04	0.04	92.00	383.27	614.26	1,064.54	1,232.90	983.00	633.00
PFCs	kt CO_2 eq	3,894.80	3,894.80	2,314.05	1,518.45	955.32	238.39	146.39	155.00	163.00
SF_6	kt CO_2 eq	2,098.54	2,098.54	579.82	891.41	297.67	71.91	55.25	57.00	59.00
NF_3	kt CO_2 eq									
Add a Gas										
Other (specify)	kt CO_2 eq									
Total with LULUCF [f]	kt CO_2 eq	41,279.43	41,279.43	37,576.70	31,152.74	30,513.91	29,362.48	29,588.67	28,298.00	26,999.00
Total without LULUCF	kt CO_2 eq	51,728.80	51,728.80	51,177.88	54,639.15	55,106.17	55,233.42	53,908.19	51,781.00	48,286.00

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 2018 is the reporting due-date year (i.e. 2014 for the first biennial report).

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

6 Provision of financial, technological and capacity-building support to developing country parties

6.1 Introduction

Norwegian climate finance is mainly concentrated in three areas; reducing emissions from deforestation and forest degradation, renewable energy, and climate adaptation including risk reduction. Norway has long emphasised the strong inter-linkages between climate change and development.

Norway has made a wide range of financial contributions related to the implementation of the Convention, including through multilateral institutions such as The Global Environment Facility, The Green Climate Fund and The Intergovernmental Panel on Climate Change, as well as other financial institutions that fund climate change adaptation, mitigation, capacity building and technology cooperation programs in developing countries.

Historically Norway has been a major contributor of climate finance to developing countries. In 2016, total public development climate finance amounted to NOK 4 339 million. Of this, 3 554 million was earmarked climate change, and 785 million was estimated climate shares of core support to a selection of multilateral organisations. In 2015, total public development climate finance amounted to NOK 5 257 million. Of this, 4 354 million was earmarked climate change, and 903 million was estimated climate shares of core support to selection of multilateral organisations.

Norway's financial contribution will be elaborated in tables 7 (a-b), with a concise summary in table 7. Table 7(a) provides information on public financial support through multilateral channels. Table 7(b) provides information on public financial support through bilateral, regional and other channels. Table 7, 7(a) and 7(b) are equivalent to table 7.3(a-b), 7.4(a-b) and 7.5(a-b) in Norway's Seventh National Communication. Applied methodology on tracking and reporting climate finance and table descriptions are not reported here, but available in Norway's Seventh National Communication.

The Norwegian Government's White Paper to Parliament "Common Responsibility for Common Future" (April 2017) establishes that Norway will continue to be at the forefront of efforts to safeguard climate and environment in line with developing countries' own plans. According to the guidance for preparation and approval of Norwegian support, an assessment should be made of the relevance of the project or programme to the recipient country and/or cooperation partner's priorities and plans. If the cooperation partner is not the authorities of the grant recipient country, the guidance underlines that it might be relevant to assess the project's relevance to the target group and the needs in the recipient country. This is aiming at ensuring that the resources effectively address the needs of developing country parties. When relevant and possible, multi-annual agreements are entered into for better predictability in the flow of funds.

Norway has no activities to report on with regards to information on the financial support committed and/or pledged for the purpose of assisting non-Annex I Parties to adapt to any economic and social consequences of response measures.

Table 7: *Provision of public financial support: summary information 2015*

Year - 2015										
Allocation channels	NOK mill.					USD mill.				
	Climate-related share of multilateral core contributions	Climate-specific				Climate-related share of multilateral core contributions	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels	902,6	75,7		48,6	1371,0	111,9	9,4		6,0	170,0
Multilateral climate change funds	402,9					50,0				
Other multilateral climate change funds	94,7				619,8	11,7				76,9
Multilateral financial institutions, including regional development banks	332,7	68,5		27,6	150,6	41,3	8,5		3,4	18,7
Specialized United Nations bodies	72,3	7,2		21,0	600,7	9,0	0,9		2,6	74,5
Total contributions through bilateral, regional and other channels		2159,5	279,9	419,5			267,8	34,7	52,0	
Total	**902,6**	**2235,2**	**279,9**	**468,1**	**1371,0**	**111,9**	**277,2**	**34,7**	**58,0**	**170,0**

Table 7: *Provision of public financial support: summary information 2016*

Year - 2016										
Allocation channels	NOK mill.					USD mill.				
	Climate-related share of multilateral core contributions	Climate-specific				Climate-related share of multilateral core contributions	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels	784,7	38,7			1074,9	93,4	4,6			128,0
Multilateral climate change funds	370,6					44,1				
Other multilateral climate change funds	56,8				76,7	6,8				9,1
Multilateral financial institutions, including regional development banks	271,6	33,5			409,8	32,3	4,0			48,8
Specialized United Nations bodies	85,7	5,2			588,4	10,2	0,6			70,0
Total contributions through bilateral, regional and other channels		1941,5	228,3	270,5			231,1	27,2	32,2	
Total	**784,7**	**1980,2**	**228,3**	**270,5**	**1074,9**	**93,4**	**235,7**	**27,2**	**32,2**	**128,0**

6.2 Norwegian contributions and support in main areas and other actions

Norway’s Seventh National Communication includes a description of Norwegian contributions and support in the main areas of Norwegian climate finance, including Norway’s International Climate and Forest Initiative

6.3 Support through multilateral channels

Table 7(a) provides estimates of Norwegian financial support for climate change channelled through multilateral organisations for the years 2015 – 2016. For 2013-2014 see Norway's second Biennial Report. Applied methodology on reported multilateral climate finance and table descriptions are available in Norway’s Seventh National Communication, section 7.4.2.

Table 7(a): *Provision of public financial support: contribution through multilateral channels in 2015*

Year - 2015									
Donor funding	Total Amount				Status	Funding source	Financial instrument	Type of support	Sector
	Climate relevant share of core contributions		Climate-specific						
	NOK mill.	USD mill.	NOK mill.	USD mill.					
Multilateral climate change funds									
1. Global Environment Facility	67.2	8.3			Disbursed	ODA	Grant		
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund	335.8	41.6			Disbursed	ODA	Grant		
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									

NDF - Nordic Development Fund	37.0	4.6			Disbursed	ODA	Grant		
SCF - Strategic Climate Fund	10.0	1.2			Disbursed	ODA	Grant		
GGGI - Global Green Growth Institute	37.3	4.6	50.3	6.2	Disbursed	ODA	Grant	Mitigation (74 %); Cross-cutting (26 %)	410 - General environmental protection
Multilateral Fund for the Implementation of the Montreal Protocol	10.4	1.3			Disbursed	ODA	Grant		
Other	Not available	Not available	569.5	70.6	Disbursed	ODA	Grant	Adaptation (2 %); Mitigation (93 %); Cross-cutting (5 %)	231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (2 %); 311 - Agriculture (4 %); 410 - General environmental protection (90 %); 740 - Disaster prevention and preparedness (2 %)
Subtotal	497.6	61.7	619.8	76.9					
Multilateral financial institutions, including									

regional development banks									
1. World Bank			78.0	9.7	Disbursed	ODA	Grant	Adaptation (26 %); Mitigation (44 %); Cross-cutting (31 %)	231 - Energy generation, distribution and efficiency – general (33 %); 311 - Agriculture (56 %); 410 - General environmental protection (10 %)
2. International Finance Corporation			10.0	1.2	Disbursed	ODA	Grant	Mitigation	321 - Industry
3. African Development Bank	7.7	1.0			Disbursed	ODA	Grant		
4. Asian Development Bank			49.0	6.1	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (39 %); 232 - Energy generation, renewable sources (61 %)
5. European Bank for Reconstruction and Development			9.5	1.2	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general
6. Inter-American Development Bank	0.8	0.1	27.6	3.4	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection
7. Other									
AFDF - African Development Fund	126.4	15.7			Disbursed	ODA	Grant		

ASDF - Asian Development Fund	14.7	1.8			Disbursed	ODA	Grant		
IBRD - International Bank for Recontruction and Development	6.0	0.7	72.6	9.0	Disbursed	ODA	Grant	Mitigation (90 %); Cross-cutting (10 %)	231 - Energy generation, distribution and efficiency – general (2 %); 410 - General environmental protection (98 %)
IDA - HIPC	20.4	2.5			Disbursed	ODA	Grant		
IDA - International Development Association	156.8	19.4			Disbursed	ODA	Grant		
Subtotal	332.7	41.3	246.7	30.6					
Specialized United Nations bodies									
1. United Nations Development Programme	Not available	Not available	280.1	34.7	Disbursed	ODA	Grant	Adaptation (5 %); Mitigation (74 %); Cross-cutting (21 %)	410 - General environmental protection (91 %); 430 - Other multisector (8 %); 740 - Disaster prevention and preparedness (1 %)
2. United Nations Environment Programme	Not available	Not available	49.0	6.1	Disbursed	ODA	Grant	Mitigation (30 %); Cross-cutting (70 %)	231 - Energy generation, distribution and efficiency – general (8 %); 410 - General environmental protection (92 %)
3. Other									

IFAD - International Fund for Agricultural Development	63.2	7.8	21.0	2.6	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture
UNFCCC - United Nations Framework Convention on Climate Change	9.1	1.1			Disbursed	ODA	Grant		
ILO - International Labour Organisation	0.05	0.01	7.2	0.9	Disbursed	ODA	Grant	Mitigation	321 - Industry
Other	Not available	Not available	271.6	33.7	Disbursed	ODA	Grant	Adaptation (13 %); Mitigation (80 %); Cross-cutting (8 %)	151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (1 %); 311 - Agriculture (1 %); 410 - General environmental protection (81 %); 430 - Other multisector (4 %); 740 - Disaster prevention and preparedness (12 %)
Subtotal	72.3	9.0	628.9	78.0					
Total contributions through multilateral channels	902.6	111.9	1 495.3	185.4					

Table 7(a): *Provision of public financial support: contribution through multilateral channels in 2016*

Year - 2016									
Donor funding	Total Amount				Status	Funding source	Financial instrument	Type of support	Sector
	Climate relevant share of core contributions		Climate-specific						
	NOK mill.	USD mill.	NOK mill.	USD mill.					
Multilateral climate change funds									
1. Global Environment Facility	34.8	4.1			Disbursed	ODA	Grant		
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund	335.8	40.0			Disbursed	ODA	Grant		
6. UNFCCC Trust Fund for Supplementary Activities									

7. Other multilateral climate change funds									
NDF - Nordic Development Fund									
SCF - Strategic Climate Fund	30.0	3.6			Disbursed	ODA	Grant		
GGGI - Global Green Growth Institute	16.4	1.9	20.6	2.5	Disbursed	ODA	Grant	Mitigation (90 %); Cross-cutting (10 %)	410 - General environmental protection
Multilateral Fund for the Implementation of the Montreal Protocol	10.4	1.2			Disbursed	ODA	Grant		
Other	Not available	Not available	56.1	6.7	Disbursed	ODA	Grant	Adaptation (23 %); Mitigation (65 %); Cross-cutting (12 %)	231 - Energy generation, distribution and efficiency – general (12 %); 232 - Energy generation, renewable sources (11 %); 311 - Agriculture (12 %); 410 - General environmental protection (42 %); 740 - Disaster prevention and preparedness (23 %)
Subtotal	427.4	50.9	76.7	9.1					
Multilateral financial institutions, including regional development banks									
1. World Bank			302.8	36.0	Disbursed	ODA	Grant	Adaptation (7 %); Mitigation	231 - Energy generation, distribution and efficiency – general (5 %); 311 -

								(85 %); Cross-cutting (8 %)	Agriculture (15 %); 410 - General environmental protection (81 %)
2. International Finance Corporation			3.4	0.4	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (52 %); 232 - Energy generation, renewable sources (48 %)
3. African Development Bank	3.0	0.4			Disbursed	ODA	Grant		
4. Asian Development Bank			30.2	3.6	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (66 %); 236 - Heating, cooling and energy distribution (34 %)
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other									
AFDF - African Development Fund	80.6	9.6			Disbursed	ODA	Grant		
ASDF - Asian Development Fund	10.7	1.3			Disbursed	ODA	Grant		
IBRD - International Bank for Recontruction and Development			107.0	12.7	Disbursed	ODA	Grant	Mitigation (99 %); Cross-cutting (1 %)	410 - General environmental protection

IDA - HIPC	20.4	2.4			Disbursed	ODA	Grant		
IDA - International Development Association	156.8	18.7			Disbursed	ODA	Grant		
Subtotal	271.6	32.3	443.3	52.8					
Specialized United Nations bodies									
1. United Nations Development Programme	Not available	Not available	390.8	46.5	Disbursed	ODA	Grant	Adaptation (1 %); Mitigation (96 %); Cross-cutting (3 %)	410 - General environmental protection (97 %); 430 - Other multisector (2 %); 740 - Disaster prevention and preparedness (1 %)
2. United Nations Environment Programme	Not available	Not available	33.2	3.9	Disbursed	ODA	Grant	Adaptation (42 %); Mitigation (31 %); Cross-cutting (26 %)	
3. Other									
IFAD - International Fund for Agricultural Development	85.6	10.2			Disbursed	ODA	Grant		
UNFCCC - United Nations Framework Convention on Climate Change									

ILO - International Labour Organisation	0.05	0.01	5.2	0.6	Disbursed	ODA	Grant	Mitigation	321 - Industry
Other			164.4	19.6	Disbursed	ODA	Grant	Adaptation (15 %); Mitigation (81 %); Cross-cutting (4 %)	410 - General environmental protection (94 %); 740 - Disaster prevention and preparedness (6 %)
Subtotal	85.7	10.2	593.6	70.7					
Total contributions through multilateral channels	784.7	93.4	1 113.6	132.6					

6.3.1 Support through bilateral, regional and other channels

Table 7(b) provides a summary of bilateral climate finance in 2015 and 2016. Applied methodology on reported bilateral climate finance and table descriptions are available in Norway’s Seventh National Communication, section 7.4.1.

Table 7(b): *Provision of public financial support: contribution through bilateral, regional and other channels in 2015*

Year - 2015								
Region	**Recipient country or region**	**Total amount (NOK mill.)**	**Total amount (USD mill.)**	**Status**	**Funding source**	**Financial instrument**	**Type of support**	**Sector**
Africa	Africa Regional	10.02	1.24	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (3 %); 311 - Agriculture (15 %); 740 - Disaster prevention and preparedness (82 %)
	Africa Regional	2.88	0.36	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (37 %); 151 - Government and civil society, general (11 %); 322 - Mineral resources/ mining (51 %)
	Africa Regional	5.04	0.62	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (3 %); 311 - Agriculture (15 %); 410 - General environmental protection (82 %)
	Angola	0.54	0.07	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Angola	2.53	0.31	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Benin	0.15	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Burundi	0.39	0.05	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)

	Cameroon	3.44	0.43	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (15 %); 312 - Forestry (16 %); 410 - General environmental protection (70 %)
	Cameroon	0.33	0.04	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (42 %); 410 - General environmental protection (58 %)
	Central African Rep.	0.47	0.06	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Congo, Dem. Rep.	0.88	0.11	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (100 %)
	Congo, Dem. Rep.	32.36	4.01	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (27 %); 311 - Agriculture (3 %); 312 - Forestry (2 %); 410 - General environmental protection (69 %)
	Congo, Dem. Rep.	3.50	0.43	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (11 %); 410 - General environmental protection (89 %)
	Congo, Rep.	0.34	0.04	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Ethiopia	7.84	0.97	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (26 %); 140 - Water and sanitation (13 %); 151 - Government and civil society, general (0 %); 311 - Agriculture (59 %); 430 - Other multisector (2 %)
	Ethiopia	14.59	1.81	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (3 %); 232 - Energy generation, renewable sources (9 %); 240 - Banking and financial services (3 %); 311 - Agriculture (3 %); 410 - General environmental protection (82 %)

	Ethiopia	36.93	4.58	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (22 %); 151 - Government and civil society, general (1 %); 311 - Agriculture (56 %); 410 - General environmental protection (21 %)
	Gabon	0.53	0.07	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Ghana	0.06	0.01	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Ghana	0.65	0.08	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (19 %); 410 - General environmental protection (81 %)
	Kenya	0.90	0.11	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (13 %); 410 - General environmental protection (87 %)
	Kenya	25.11	3.11	Disbursed	ODA (10 %); OOF (90 %)	Grant (10 %); Equity (90 %)	Mitigation	151 - Government and civil society, general (3 %); 231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (92 %); 236 - Heating, cooling and energy distribution (1 %); 410 - General environmental protection (2 %)
	Kenya	5.69	0.71	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (6 %); 232 - Energy generation, renewable sources (19 %); 311 - Agriculture (46 %); 410 - General environmental protection (29 %)
	Liberia	0.38	0.05	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Liberia	82.44	10.22	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %); 410 - General environmental protection (0 %)

	Madagascar	6.04	0.75	Disbursed	ODA	Grant	Adaptation	232 - Energy generation, renewable sources (2 %); 313 - Fishing (20 %); 410 - General environmental protection (79 %)
	Madagascar	0.88	0.11	Disbursed	ODA	Grant	Cross-cutting	313 - Fishing (98 %); 410 - General environmental protection (2 %)
	Malawi	6.84	0.85	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (12 %); 410 - General environmental protection (88 %)
	Malawi	12.47	1.55	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (83 %); 312 - Forestry (1 %); 410 - General environmental protection (16 %)
	Malawi	54.41	6.75	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (93 %); 410 - General environmental protection (1 %); 740 - Disaster prevention and preparedness (6 %)
	Mali	32.11	3.98	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (1 %); 311 - Agriculture (65 %); 430 - Other multisector (22 %); 740 - Disaster prevention and preparedness (12 %)
	Mali	0.13	0.02	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Mozambique	30.70	3.81	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (0 %); 236 - Heating, cooling and energy distribution (0 %); 311 - Agriculture (44 %); 313 - Fishing (52 %); 410 - General environmental protection (3 %)
	Mozambique	17.15	2.13	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (62 %); 232 - Energy generation, renewable sources (9 %); 312 - Forestry (28 %); 313 - Fishing (2 %)

	Mozambique	10.43	1.29	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Namibia	1.40	0.17	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Namibia	0.17	0.02	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Niger	0.90	0.11	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nigeria	2.23	0.28	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (28 %); 322 - Mineral resources/ mining (63 %); 410 - General environmental protection (9 %)
	Rwanda	0.72	0.09	Disbursed	ODA	Grant	Mitigation	113 - Secondary education (100 %)
	Rwanda	0.16	0.02	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Somalia	8.12	1.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (2 %); 311 - Agriculture (39 %); 740 - Disaster prevention and preparedness (59 %)
	Somalia	1.00	0.12	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	South Africa	-23.07	-2.86	Disbursed	ODA (-19 %); OOF	Grant (-19 %); Equity	Mitigation	231 - Energy generation, distribution and efficiency – general (-17 %); 232 - Energy generation, renewable sources (118 %); 410 - General environmental protection (-2 %)

					(119 %)	and loan (119 %)		
	South Africa	19.02	2.36	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (1 %); 410 - General environmental protection (93 %); 430 - Other multisector (6 %)
	South of Sahara Regional	3.12	0.39	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (78 %); 430 - Other multisector (12 %); 740 - Disaster prevention and preparedness (10 %)
	South of Sahara Regional	32.64	4.05	Disbursed	ODA (101 %); OOF (-1 %)	Grant (101 %); Equity (-1 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (7 %); 312 - Forestry (1 %); 313 - Fishing (2 %); 322 - Mineral resources/ mining (4 %); 410 - General environmental protection (86 %)
	South of Sahara Regional	45.72	5.67	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (12 %); 311 - Agriculture (88 %)
	South Sudan	2.95	0.37	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (81 %); 231 - Energy generation, distribution and efficiency – general (19 %)
	South Sudan	0.16	0.02	Disbursed	ODA	Grant	Cross-cutting	112 - Basic education (100 %)
	Sudan	0.66	0.08	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Tanzania	15.95	1.98	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (18 %); 151 - Government and civil society, general (13 %); 311

								- Agriculture (34 %); 410 - General environmental protection (35 %)
	Tanzania	24.73	3.07	Disburs ed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (11 %); 311 - Agriculture (6 %); 312 - Forestry (1 %); 410 - General environmental protection (79 %)
	Tanzania	25.26	3.13	Disburs ed	ODA	Grant	Cross-cutting	114 - Post-secondary education (16 %); 151 - Government and civil society, general (2 %); 160 - Other social infrastructure and services (0 %); 232 - Energy generation, renewable sources (13 %); 250 - Business and other services (7 %); 311 - Agriculture (23 %); 312 - Forestry (0 %); 410 - General environmental protection (38 %)
	Togo	1.07	0.13	Disburs ed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Togo	0.12	0.02	Disburs ed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Tunisia	0.88	0.11	Disburs ed	ODA	Grant	Adaptatio n	232 - Energy generation, renewable sources (9 %); 311 - Agriculture (91 %)
	Tunisia	1.58	0.20	Disburs ed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Uganda	25.06	3.11	Disburs ed	ODA	Grant	Adaptatio n	114 - Post-secondary education (17 %); 232 - Energy generation, renewable sources (77 %); 311 - Agriculture (3 %); 410 - General environmental protection (3 %)

	Uganda	38.55	4.78	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (18 %); 232 - Energy generation, renewable sources (12 %); 236 - Heating, cooling and energy distribution (65 %); 312 - Forestry (4 %); 410 - General environmental protection (1 %)
	Uganda	11.01	1.37	Disbursed	ODA (99 %); OOF (1 %)	Grant (99 %); Equity (1 %)	Cross-cutting	114 - Post-secondary education (40 %); 151 - Government and civil society, general (8 %); 231 - Energy generation, distribution and efficiency – general (1 %); 232 - Energy generation, renewable sources (16 %); 311 - Agriculture (5 %); 410 - General environmental protection (12 %); 740 - Disaster prevention and preparedness (18 %)
	Zambia	7.21	0.89	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Zambia	0.77	0.10	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Zambia	41.92	5.20	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (2 %); 311 - Agriculture (97 %); 410 - General environmental protection (0 %)
	Zimbabwe	0.74	0.09	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Zimbabwe	1.94	0.24	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (9 %); 311 - Agriculture (91 %)
America	America Regional	1.43	0.18	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (45 %); 410 - General environmental protection (55 %)

	Bolivia	0.47	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Brazil	963.13	119.43	Disbursed	ODA (126 %); OOF (-26 %)	Grant (126 %); Equity (-26 %)	Mitigation	151 - Government and civil society, general (0 %); 232 - Energy generation, renewable sources (-26 %); 311 - Agriculture (1 %); 410 - General environmental protection (124 %)
	Brazil	6.92	0.86	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (14 %); 311 - Agriculture (75 %); 410 - General environmental protection (11 %)
	Chile	46.67	5.79	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Colombia	4.75	0.59	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Colombia	0.44	0.05	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Costa Rica	0.34	0.04	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Costa Rica	0.25	0.03	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Costa Rica	0.45	0.06	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Cuba	0.13	0.02	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)

	Ecuador	0.23	0.03	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Ecuador	2.42	0.30	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	El Salvador	0.38	0.05	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Guatemala	4.85	0.60	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (10 %); 311 - Agriculture (30 %); 410 - General environmental protection (15 %); 430 - Other multisector (37 %); 740 - Disaster prevention and preparedness (8 %)
	Guatemala	2.00	0.25	Disbursed	ODA	Grant	Mitigation	236 - Heating, cooling and energy distribution (100 %)
	Guatemala	1.29	0.16	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (62 %); 410 - General environmental protection (38 %)
	Guyana	0.63	0.08	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Guyana	14.55	1.80	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Haiti	0.80	0.10	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Haiti	0.51	0.06	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (53 %); 232 - Energy generation, renewable sources (47 %)
	Honduras	0.84	0.10	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	Honduras	31.07	3.85	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.51	0.06	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Mexico	2.37	0.29	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (17 %); 410 - General environmental protection (83 %)
	Mexico	3.92	0.49	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (87 %); 410 - General environmental protection (13 %)
	Nicaragua	0.52	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nicaragua	0.67	0.08	Disbursed	ODA	Grant	Mitigation	312 - Forestry (52 %); 410 - General environmental protection (48 %)
	Nicaragua	9.29	1.15	Disbursed	ODA	Grant	Cross-cutting	113 - Secondary education (11 %); 311 - Agriculture (89 %)
	North & Central America Regional	8.07	1.00	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	North & Central America Regional	0.30	0.04	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	North & Central	0.47	0.06	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)

	America Regional							
	Panama	24.49	3.04	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Peru	393.03	48.74	Disbursed	ODA (3 %); OOF (97 %)	Grant (3 %); Equity (97 %)	Mitigation	151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (97 %); 410 - General environmental protection (2 %)
	Peru	0.55	0.07	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	South America Regional	0.47	0.06	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	South America Regional	10.00	1.24	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
Asia	Afghanistan	8.12	1.01	Disbursed	ODA	Grant	Adaptation	430 - Other multisector (100 %)
	Afghanistan	0.27	0.03	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (100 %)
	Afghanistan	3.50	0.43	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Armenia	0.30	0.04	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)

	Armenia	0.08	0.01	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (100 %)
	Asia Regional	42.87	5.32	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (2 %); 410 - General environmental protection (86 %); 740 - Disaster prevention and preparedness (12 %)
	Asia Regional	2.41	0.30	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Asia Regional	7.01	0.87	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Azerbaijan	0.04	0.00	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Bangladesh	0.79	0.10	Disbursed	ODA	Grant	Adaptation	122 - Basic health (16 %); 151 - Government and civil society, general (46 %); 311 - Agriculture (32 %); 410 - General environmental protection (6 %)
	Bangladesh	0.12	0.01	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Bangladesh	0.62	0.08	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (87 %); 740 - Disaster prevention and preparedness (13 %)
	Bhutan	0.05	0.01	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Bhutan	2.82	0.35	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Bhutan	0.97	0.12	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (74 %); 311 - Agriculture (15 %); 410 - General environmental protection (11 %)

	Cambodia	0.22	0.03	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (61 %); 311 - Agriculture (39 %)
	Cambodia	2.37	0.29	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (4 %); 410 - General environmental protection (96 %)
	China	12.26	1.52	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (16 %); 231 - Energy generation, distribution and efficiency – general (15 %); 410 - General environmental protection (45 %); 430 - Other multisector (24 %)
	China	2.99	0.37	Disbursed	ODA	Grant	Cross-cutting	321 - Industry (6 %); 332 - Tourism (9 %); 410 - General environmental protection (85 %)
	Far East Asia Regional	1.03	0.13	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Georgia	2.05	0.25	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	India	18.44	2.29	Disbursed	ODA	Grant	Adaptation	122 - Basic health (1 %); 410 - General environmental protection (39 %); 430 - Other multisector (59 %); 740 - Disaster prevention and preparedness (2 %)
	India	-78.71	-9.76	Disbursed	ODA (-6 %); OOF (106 %)	Grant (-6 %); Equity (106 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (0 %); 232 - Energy generation, renewable sources (106 %); 321 - Industry (0 %); 410 - General environmental protection (-4 %); 430 - Other multisector (-2 %)
	India	7.22	0.90	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (16 %); 430 - Other multisector (84 %)

	Indonesia	44.33	5.50	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (6 %); 151 - Government and civil society, general (1 %); 311 - Agriculture (4 %); 410 - General environmental protection (89 %)
	Indonesia	10.50	1.30	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (0 %); 232 - Energy generation, renewable sources (2 %); 410 - General environmental protection (98 %)
	Kazakhstan	0.75	0.09	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Kyrgyz Rep.	1.12	0.14	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Laos	22.64	2.81	Disbursed	ODA (4 %); OOF (96 %)	Grant (4 %); Loan (96 %)	Mitigation	232 - Energy generation, renewable sources (99 %); 410 - General environmental protection (1 %)
	Laos	1.41	0.17	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (3 %); 410 - General environmental protection (97 %)
	Malaysia	0.57	0.07	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Maldives	0.01	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	1.11	0.14	Disbursed	ODA (99 %); OOF (1 %)	Grant (99 %); Equity (1 %)	Adaptation	122 - Basic health (12 %); 232 - Energy generation, renewable sources (1 %); 410 - General environmental protection (87 %)

	Myanmar	18.48	2.29	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (46 %); 232 - Energy generation, renewable sources (13 %); 410 - General environmental protection (41 %)
	Myanmar	9.40	1.17	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (43 %); 312 - Forestry (47 %); 410 - General environmental protection (11 %)
	Nepal	3.24	0.40	Disbursed	ODA	Grant	Adaptation	112 - Basic education (0 %); 114 - Post-secondary education (48 %); 122 - Basic health (6 %); 151 - Government and civil society, general (12 %); 311 - Agriculture (32 %); 410 - General environmental protection (2 %)
	Nepal	0.97	0.12	Disbursed	ODA (2133 %); OOF (-2033 %)	Grant (2133 %); Equity (-2033 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (102 %); 232 - Energy generation, renewable sources (-96 %); 410 - General environmental protection (95 %)
	Nepal	2.94	0.37	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (7 %); 311 - Agriculture (24 %); 331 - Trade policy and regulations and trade-related adjustments (10 %); 410 - General environmental protection (59 %)
	Pakistan	1.50	0.19	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (2 %); 410 - General environmental protection (4 %); 740 - Disaster prevention and preparedness (94 %)
	Pakistan	0.44	0.05	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)

	Pakistan	3.00	0.37	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Philippines	4.14	0.51	Disbursed	ODA (7 %); OOF (93 %)	Grant (7 %); Equity (93 %)	Mitigation	232 - Energy generation, renewable sources (93 %); 410 - General environmental protection (7 %)
	Sri Lanka	2.02	0.25	Disbursed	ODA	Grant	Adaptation	122 - Basic health (4 %); 151 - Government and civil society, general (21 %); 311 - Agriculture (13 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (59 %)
	Sri Lanka	-0.69	-0.08	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Sri Lanka	0.28	0.03	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (67 %); 311 - Agriculture (33 %)
	Thailand	0.11	0.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (117 %); 160 - Other social infrastructure and services (31 %); 313 - Fishing (-48 %)
	Thailand	0.04	0.01	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Uzbekistan	0.38	0.05	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Viet Nam	3.61	0.45	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (76 %); 121 - Health, general (3 %); 151 - Government and civil society, general (10 %); 160 - Other social infrastructure and services (3 %); 311 - Agriculture

								(2 %); 740 - Disaster prevention and preparedness (6 %)
	Viet Nam	3.64	0.45	Disbursed	ODA	Grant	Mitigation	121 - Health, general (1 %); 151 - Government and civil society, general (9 %); 231 - Energy generation, distribution and efficiency – general (6 %); 232 - Energy generation, renewable sources (12 %); 410 - General environmental protection (72 %)
	Viet Nam	1.80	0.22	Disbursed	ODA	Grant	Cross-cutting	232 - Energy generation, renewable sources (18 %); 311 - Agriculture (54 %); 410 - General environmental protection (16 %); 740 - Disaster prevention and preparedness (13 %)
Europe	Europe Regional	2.00	0.25	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Macedonia (Fyrom)	0.01	0.00	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Montenegro	-1.47	-0.18	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (133 %); 232 - Energy generation, renewable sources (-33 %)
	Serbia	0.62	0.08	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (46 %); 250 - Business and other services (4 %); 430 - Other multisector (44 %); 730 - Reconstruction relief and rehabilitation (5 %)
	Ukraine	4.39	0.54	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (48 %); 232 - Energy generation, renewable sources (52 %)

Oceania	Papua New Guinea	13.47	1.67	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (34 %); 410 - General environmental protection (66 %)
The Middle East	Lebanon	0.92	0.11	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Middle East Regional	1.35	0.17	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Palestine	1.20	0.15	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
Not geographically allocated	Global Unspecified	20.44	2.53	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (9 %); 322 - Mineral resources/ mining (2 %); 410 - General environmental protection (76 %); 720 - Emergency Response (14 %); 740 - Disaster prevention and preparedness (0 %)
	Global Unspecified	343.30	42.57	Disbursed	ODA (71 %); OOF (29 %)	Grant (71 %); Loan and other (29 %)	Mitigation	140 - Water and sanitation (0 %); 151 - Government and civil society, general (0 %); 231 - Energy generation, distribution and efficiency – general (4 %); 232 - Energy generation, renewable sources (38 %); 311 - Agriculture (2 %); 312 - Forestry (0 %); 410 - General environmental protection (56 %); 998 - Unallocated/unspecified (0 %)
	Global Unspecified	55.96	6.94	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (4 %); 311 - Agriculture (14 %); 410 - General environmental protection (76 %); 430 - Other multisector (6 %)
Total contributions through		**2 858.82**	**354.50**					

bilateral, regional and other channels								

__Table 7(b):__ Provision of public financial support: contribution through bilateral, regional and other channels in 2016

Year - 2016								
Region	**Recipient country or region**	**Total amount (NOK mill.)**	**Total amount (USD mill.)**	**Status**	**Funding source**	**Financial instrument**	**Type of support**	**Sector**
Africa	Africa Regional	9.46	1.13	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (1 %); 311 - Agriculture (19 %); 740 - Disaster prevention and preparedness (80 %)
	Africa Regional	3.81	0.45	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (35 %); 232 - Energy generation, renewable sources (13 %); 322 - Mineral resources/ mining (52 %)
	Angola	1.77	0.21	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)
	Angola	1.55	0.18	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)
	Benin	0.15	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Burundi	2.60	0.31	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (81 %); 321 - Industry (4 %); 740 - Disaster prevention and preparedness (15 %)
	Burundi	1.72	0.20	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)

	Cameroon	1.53	0.18	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (33 %); 312 - Forestry (41 %); 410 - General environmental protection (26 %)
	Cameroon	0.06	0.01	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (100 %)
	Central African Rep.	0.63	0.07	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Congo, Dem. Rep.	1.47	0.18	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (100 %)
	Congo, Dem. Rep.	24.69	2.94	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (24 %); 311 - Agriculture (4 %); 312 - Forestry (1 %); 410 - General environmental protection (71 %)
	Congo, Dem. Rep.	0.34	0.04	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (118 %); 410 - General environmental protection (-18 %)
	Congo, Rep.	0.89	0.11	Disbursed	ODA	Grant	Mitigation	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Egypt	4.83	0.57	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Ethiopia	11.66	1.39	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (6 %); 140 - Water and sanitation (11 %); 311 - Agriculture (83 %); 430 - Other multisector (0 %)
	Ethiopia	7.18	0.85	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (5 %); 240 - Banking and financial services (7 %); 311 - Agriculture (7 %); 410 - General environmental protection (80 %)

	Ethiopia	59.47	7.08	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (17 %); 151 - Government and civil society, general (1 %); 232 - Energy generation, renewable sources (0 %); 311 - Agriculture (23 %); 410 - General environmental protection (60 %)
	Gabon	0.89	0.11	Disbursed	ODA	Grant	Mitigation	312 - Forestry (71 %); 410 - General environmental protection (29 %)
	Ghana	0.12	0.01	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Kenya	0.73	0.09	Disbursed	ODA	Grant	Adaptation	250 - Business and other services (2 %); 410 - General environmental protection (98 %)
	Kenya	0.35	0.04	Disbursed	ODA (42 %); OOF (58 %)	Grant (42 %); Equity (58 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (-15 %); 232 - Energy generation, renewable sources (58 %); 410 - General environmental protection (57 %)
	Kenya	5.59	0.67	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (6 %); 250 - Business and other services (1 %); 311 - Agriculture (77 %); 410 - General environmental protection (15 %)
	Liberia	0.47	0.06	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (100 %)
	Liberia	16.41	1.95	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (62 %); 410 - General environmental protection (38 %)
	Madagascar	5.66	0.67	Disbursed	ODA	Grant	Adaptation	313 - Fishing (17 %); 410 - General environmental protection (83 %)

	Madagascar	0.14	0.02	Disbursed	ODA	Grant	Cross-cutting	313 - Fishing (100 %)
	Malawi	2.92	0.35	Disbursed	ODA (92 %); OOF (8 %)	Grant (92 %); Equity (8 %)	Adaptation	111 - Education, level unspecified (10 %); 311 - Agriculture (22 %); 410 - General environmental protection (69 %)
	Malawi	9.82	1.17	Disbursed	ODA	Grant	Mitigation	311 - Agriculture (76 %); 410 - General environmental protection (24 %)
	Malawi	68.81	8.19	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (99 %); 410 - General environmental protection (1 %)
	Mali	20.23	2.41	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (42 %); 430 - Other multisector (39 %); 740 - Disaster prevention and preparedness (20 %)
	Mozambique	22.08	2.63	Disbursed	ODA	Grant	Adaptation	236 - Heating, cooling and energy distribution (1 %); 311 - Agriculture (76 %); 313 - Fishing (19 %); 410 - General environmental protection (5 %)
	Mozambique	8.59	1.02	Disbursed	ODA (93 %); OOF (7 %)	Grant (93 %); Equity (7 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (82 %); 232 - Energy generation, renewable sources (7 %); 312 - Forestry (9 %); 313 - Fishing (2 %)
	Mozambique	7.41	0.88	Disbursed	ODA	Grant	Cross-cutting	250 - Business and other services (1 %); 311 - Agriculture (99 %)
	Namibia	-0.08	-0.01	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (100 %)

	Niger	10.00	1.19	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nigeria	4.68	0.56	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (13 %); 232 - Energy generation, renewable sources (57 %); 322 - Mineral resources/ mining (30 %)
	Rwanda	1.71	0.20	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Somalia	10.82	1.29	Disbursed	ODA	Grant	Adaptation	152 - Conflict prevention and resolution, peace and security (0 %); 311 - Agriculture (17 %); 720 - Emergency Response (37 %); 740 - Disaster prevention and preparedness (46 %)
	South Africa	0.03	0.00	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	South Africa	7.35	0.88	Disbursed	ODA (3 %); OOF (97 %)	Grant (3 %); Equity and loan (97 %)	Mitigation	232 - Energy generation, renewable sources (100 %)
	South Africa	9.46	1.13	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (2 %); 410 - General environmental protection (98 %); 430 - Other multisector (0 %)
	South of Sahara Regional	2.62	0.31	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)

	South of Sahara Regional	46.09	5.49	Disbursed	ODA (101 %); OOF (-1 %)	Grant (101 %); Equity (-1 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (5 %); 312 - Forestry (1 %); 322 - Mineral resources/ mining (3 %); 410 - General environmental protection (91 %)
	South of Sahara Regional	-4.87	-0.58	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	South Sudan	2.53	0.30	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (87 %); 231 - Energy generation, distribution and efficiency – general (13 %)
	Tanzania	17.67	2.10	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (22 %); 311 - Agriculture (34 %); 410 - General environmental protection (44 %)
	Tanzania	12.10	1.44	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (0 %); 232 - Energy generation, renewable sources (26 %); 311 - Agriculture (-1 %); 410 - General environmental protection (75 %)
	Tanzania	13.69	1.63	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (15 %); 151 - Government and civil society, general (1 %); 160 - Other social infrastructure and services (0 %); 232 - Energy generation, renewable sources (10 %); 250 - Business and other services (14 %); 311 - Agriculture (16 %); 410 - General environmental protection (45 %)
	Togo	1.07	0.13	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (100 %)

	Togo	0.12	0.01	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Tunisia	0.88	0.10	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Uganda	1.88	0.22	Disbursed	ODA	Grant	Adaptation	114 - Post-secondary education (54 %); 311 - Agriculture (4 %); 410 - General environmental protection (42 %)
	Uganda	75.69	9.01	Disbursed	ODA (87 %); OOF (13 %)	Grant (87 %); Loan (13 %)	Mitigation	231 - Energy generation, distribution and efficiency – general (9 %); 232 - Energy generation, renewable sources (16 %); 236 - Heating, cooling and energy distribution (75 %); 312 - Forestry (0 %); 410 - General environmental protection (1 %)
	Uganda	11.88	1.41	Disbursed	ODA	Grant	Cross-cutting	114 - Post-secondary education (62 %); 151 - Government and civil society, general (8 %); 232 - Energy generation, renewable sources (6 %); 311 - Agriculture (5 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (17 %)
	Zambia	8.69	1.03	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Zambia	1.37	0.16	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (71 %); 311 - Agriculture (29 %)
	Zimbabwe	0.37	0.04	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Zimbabwe	2.43	0.29	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (7 %); 311 - Agriculture (93 %)

America	America Regional	1.07	0.13	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	America Regional	0.83	0.10	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (43 %); 410 - General environmental protection (57 %)
	Bolivia	0.28	0.03	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Brazil	887.31	105.63	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Brazil	1.41	0.17	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Chile	37.08	4.41	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Colombia	115.10	13.70	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Colombia	0.81	0.10	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Costa Rica	0.17	0.02	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Cuba	-0.84	-0.10	Disbursed	ODA	Grant	Mitigation	140 - Water and sanitation (128 %); 232 - Energy generation, renewable sources (-28 %)
	Dominican Republic	0.15	0.02	Disbursed	ODA	Grant	Adaptation	160 - Other social infrastructure and services (100 %)
	Ecuador	1.11	0.13	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)

	Ecuador	-0.05	-0.01	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	El Salvador	0.41	0.05	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Guatemala	3.21	0.38	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (30 %); 311 - Agriculture (35 %); 430 - Other multisector (19 %); 740 - Disaster prevention and preparedness (16 %)
	Guatemala	0.02	0.00	Disbursed	ODA	Grant	Mitigation	236 - Heating, cooling and energy distribution (100 %)
	Guatemala	1.02	0.12	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (37 %); 160 - Other social infrastructure and services (63 %)
	Guyana	15.95	1.90	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Guyana	4.40	0.52	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Haiti	1.19	0.14	Disbursed	ODA	Grant	Adaptation	160 - Other social infrastructure and services (82 %); 740 - Disaster prevention and preparedness (18 %)
	Haiti	0.40	0.05	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.50	0.06	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)

	Honduras	25.92	3.09	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Honduras	0.33	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Mexico	-0.03	0.00	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Nicaragua	0.25	0.03	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	Nicaragua	0.20	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Nicaragua	2.45	0.29	Disbursed	ODA	Grant	Cross-cutting	113 - Secondary education (39 %); 311 - Agriculture (61 %)
	North & Central America Regional	4.25	0.51	Disbursed	ODA	Grant	Adaptation	311 - Agriculture (100 %)
	North & Central America Regional	0.37	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (100 %)
	Panama	3.79	0.45	Disbursed	OOF	Equity	Mitigation	232 - Energy generation, renewable sources (100 %)
	Peru	49.53	5.90	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (3 %); 410 - General environmental protection (97 %)

	South America Regional	-0.33	-0.04	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
Asia	Afghanistan	1.47	0.17	Disburs ed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Asia Regional	42.56	5.07	Disburs ed	ODA	Grant	Adaptatio n	410 - General environmental protection (82 %); 740 - Disaster prevention and preparedness (18 %)
	Asia Regional	0.10	0.01	Disburs ed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Asia Regional	5.91	0.70	Disburs ed	ODA	Grant	Cross-cutting	312 - Forestry (85 %); 410 - General environmental protection (15 %)
	Bangladesh	0.99	0.12	Disburs ed	ODA	Grant	Adaptatio n	151 - Government and civil society, general (96 %); 250 - Business and other services (1 %); 410 - General environmental protection (3 %)
	Bangladesh	0.94	0.11	Disburs ed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (93 %); 410 - General environmental protection (7 %)
	Bangladesh	0.20	0.02	Disburs ed	ODA	Grant	Cross-cutting	112 - Basic education (47 %); 410 - General environmental protection (53 %)
	Bhutan	0.02	0.00	Disburs ed	ODA	Grant	Adaptatio n	410 - General environmental protection (100 %)
	Bhutan	0.69	0.08	Disburs ed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Bhutan	0.27	0.03	Disburs ed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (100 %)

	Cambodia	0.01	0.00	Disbursed	ODA	Grant	Adaptation	313 - Fishing (100 %)
	China	-1.27	-0.15	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	China	25.84	3.08	Disbursed	ODA (102 %); OOF (-2 %)	Grant (102 %); Equity (-2 %)	Mitigation	114 - Post-secondary education (9 %); 250 - Business and other services (2 %); 321 - Industry (-2 %); 410 - General environmental protection (79 %); 430 - Other multisector (12 %)
	China	-0.86	-0.10	Disbursed	ODA	Grant	Cross-cutting	332 - Tourism (-30 %); 410 - General environmental protection (130 %)
	Georgia	2.24	0.27	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	India	15.00	1.79	Disbursed	ODA	Grant	Adaptation	250 - Business and other services (0 %); 410 - General environmental protection (23 %); 430 - Other multisector (74 %); 740 - Disaster prevention and preparedness (3 %)
	India	8.26	0.98	Disbursed	ODA (54 %); OOF (46 %)	Grant (54 %); Equity (46 %)	Mitigation	121 - Health, general (-7 %); 232 - Energy generation, renewable sources (57 %); 410 - General environmental protection (48 %); 430 - Other multisector (2 %)
	India	20.15	2.40	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (0 %); 250 - Business and other services (0 %); 410 - General environmental protection (0 %); 430 - Other multisector (99 %)

	Indonesia	114.33	13.61	Disbursed	ODA	Grant	Mitigation	114 - Post-secondary education (2 %); 410 - General environmental protection (98 %)
	Indonesia	2.29	0.27	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Laos	4.14	0.49	Disbursed	ODA (8 %); OOF (92 %)	Grant (8 %); Loan (92 %)	Mitigation	232 - Energy generation, renewable sources (92 %); 410 - General environmental protection (8 %)
	Malaysia	0.19	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Maldives	0.00	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	0.00	0.00	Disbursed	ODA	Grant	Adaptation	410 - General environmental protection (100 %)
	Myanmar	30.83	3.67	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (4 %); 231 - Energy generation, distribution and efficiency – general (45 %); 232 - Energy generation, renewable sources (7 %); 410 - General environmental protection (44 %)
	Myanmar	7.00	0.83	Disbursed	ODA	Grant	Cross-cutting	312 - Forestry (100 %)
	Nepal	1.29	0.15	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (30 %); 250 - Business and other services (0 %); 311 - Agriculture (57 %); 313 - Fishing (9 %); 410 - General environmental protection (3 %)

	Nepal	1.89	0.23	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (53 %); 232 - Energy generation, renewable sources (25 %); 410 - General environmental protection (22 %)
	Nepal	0.98	0.12	Disbursed	ODA	Grant	Cross-cutting	231 - Energy generation, distribution and efficiency – general (0 %); 250 - Business and other services (4 %); 311 - Agriculture (66 %); 331 - Trade policy and regulations and trade-related adjustments (18 %); 410 - General environmental protection (11 %)
	Pakistan	0.63	0.07	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (5 %); 410 - General environmental protection (5 %); 740 - Disaster prevention and preparedness (91 %)
	Pakistan	3.32	0.40	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
	Pakistan	1.90	0.23	Disbursed	ODA	Grant	Cross-cutting	740 - Disaster prevention and preparedness (100 %)
	Philippines	2.41	0.29	Disbursed	ODA (8 %); OOF (92 %)	Grant (8 %); Equity (92 %)	Mitigation	232 - Energy generation, renewable sources (92 %); 410 - General environmental protection (8 %)
	South Asia Regional	0.21	0.02	Disbursed	ODA	Grant	Cross-cutting	410 - General environmental protection (100 %)
	Sri Lanka	1.01	0.12	Disbursed	ODA	Grant	Adaptation	151 - Government and civil society, general (21 %); 311 - Agriculture (17 %); 410 - General environmental protection (3 %); 740 - Disaster prevention and preparedness (59 %)

	Sri Lanka	0.04	0.00	Disbursed	ODA	Grant	Cross-cutting	160 - Other social infrastructure and services (100 %)
	Thailand	0.17	0.02	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Viet Nam	6.71	0.80	Disbursed	ODA	Grant	Adaptation	111 - Education, level unspecified (9 %); 114 - Post-secondary education (58 %); 151 - Government and civil society, general (30 %); 740 - Disaster prevention and preparedness (4 %)
	Viet Nam	3.46	0.41	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (16 %); 160 - Other social infrastructure and services (0 %); 410 - General environmental protection (84 %)
	Viet Nam	0.34	0.04	Disbursed	ODA	Grant	Cross-cutting	311 - Agriculture (135 %); 740 - Disaster prevention and preparedness (-35 %)
Europe	Europe Regional	0.40	0.05	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Europe Regional	0.20	0.02	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (100 %)
	Macedonia (Fyrom)	0.01	0.00	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Montenegro	0.40	0.05	Disbursed	ODA	Grant	Mitigation	312 - Forestry (100 %)
	Serbia	0.25	0.03	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (78 %); 250 - Business and other services (22 %)

	Ukraine	3.55	0.42	Disbursed	ODA	Grant	Mitigation	231 - Energy generation, distribution and efficiency – general (32 %); 232 - Energy generation, renewable sources (68 %)
Oceania	Papua New Guinea	6.41	0.76	Disbursed	ODA	Grant	Mitigation	151 - Government and civil society, general (32 %); 410 - General environmental protection (68 %)
The Middle East	Jordan	2.15	0.26	Disbursed	ODA	Grant	Mitigation	410 - General environmental protection (100 %)
	Lebanon	0.53	0.06	Disbursed	ODA	Grant	Adaptation	740 - Disaster prevention and preparedness (100 %)
	Palestine	0.08	0.01	Disbursed	ODA	Grant	Mitigation	232 - Energy generation, renewable sources (100 %)
Not geographically allocated	Global Unspecified	18.88	2.25	Disbursed	ODA	Grant	Adaptation	140 - Water and sanitation (11 %); 151 - Government and civil society, general (2 %); 410 - General environmental protection (85 %); 740 - Disaster prevention and preparedness (3 %)
	Global Unspecified	360.77	42.95	Disbursed	ODA (64 %); OOF (36 %)	Grant (64 %); Loan, equity and other (36 %)	Mitigation	140 - Water and sanitation (0 %); 151 - Government and civil society, general (0 %); 231 - Energy generation, distribution and efficiency – general (2 %); 232 - Energy generation, renewable sources (39 %); 410 - General environmental protection (59 %); 740 - Disaster prevention and preparedness (0 %)
	Global Unspecified	40.53	4.82	Disbursed	ODA	Grant	Cross-cutting	151 - Government and civil society, general (1 %); 410 - General environmental protection (99 %)
Total contributio		**2 440.30**	**290.50**					

ns through bilateral, regional and other channels								

6.4 National approach to tracking and reporting provision of support

A description of Norway's approach on tracking and reporting climate change finance is available in Norway's Seventh National Communication, section 7.4.

6.5 Private Finance

The private sector has a critical role in financing low-emissions and climate-resilient economies. Tracking climate-related private finance is, thus, key for assessing progress towards the fulfillment of intended contributions and commitments under the United Nations Framework Conventions on Climate Change (UNFCCC).

Further, under the UNFCCC, developed countries committed to mobilize jointly USD 100 billion a year in climate finance by 2020 for climate action in developing countries. These funds are to come from a mix of public and private sources. Besides tracking public climate finance, making an assessment of progress towards this commitment also requires the measurement of private finance mobilized by developed countries' public interventions.

The OECD DAC is working to modernize its statistical framework to better reflect the current development co-operation landscape in support of the 2030 agenda and the sustainable development goals. One key element of modernization is the implementation of a regular data collection, at the activity-level, on amounts mobilized from the private sector by official development finance interventions, including for climate action. This work is being conducted in close co-operation with the OECD Research Collaborative on Tracking Private Climate Finance.

To date, methodologies have been developed for the following official development finance mechanisms: guarantees, syndicated loans, shares in collective investment vehicles (CIVs), direct investment in companies, and credit lines. Methodologies for measuring the mobilization effect of other instruments and mechanisms are under development e.g. standard grants and loans in co-financing schemes, complex finance structures.

Tracking private finance is challenging, and Norway is still working towards implementing the OECD's tracking methods. The quality of data on mobilized private finance available to date is limited because of various reasons. First, separating private from official finance is crucial to identify the amount mobilized from the private sector. It is, however, not always straightforward to do as co-financiers often have mixed ownership of private, public and multilateral owners. Second, to prevent double counting, amounts of mobilized private finance should be attributed among public contributors. The use and combination of complex instruments can make this task difficult. As a result of these limitations, Norway is for the time being only able to present examples of private finance mobilized by Norfund, the Norwegian Export Credit Guarantee Agency (GIEK) and Export Credit Norway. In these examples, no attempt is made to attribute mobilized amount between public contributors.

Below, we present two examples of private finance mobilized by Norfund and other public co-financiers in 2016. Norfund is Norway's development finance institution (DFI), and provides investments in private sector in developing countries through equity, indirect equity (funds), loans and guarantees. In both projects, Norfund is involved partly through KLP Norfund Investments, an investment vehicle financed 50/50 by KLP (private) and Norfund. The mixed ownership issue makes it unclear how the financing through KLP Norfund Investments should be considered.

- In 2016, Norfund mobilized private capital by their commitment to support a 40 MWp solar PV project in Mozambique (Central solar de Mocuba). The project is the first large-scale solar plant to be built in the country and represents an important first step in realizing Mozambique's ambition to increase renewable power generation in its energy mix. The total project investment is 84 million USD. 74 million USD is financed by public sector (Norfund, through equity, and Electricidade de Mozambique (equity)) and multilateral finance institutions (International Finance Corporation (loans)). 10,4 million USD is mobilized from the private sector through Scatec Solar and KLP, the latter trough Norfunds ongoing cooperation through the firm KLP Norfund Investments. Norfund also provide guarantees towards Government and lenders to support the project.

- In 2016, KLP Norfund Investments and other contributors provided funds for d.light. D.light is the leading provider of off-grid solar solutions and has commanding market share in emerging markets, with focus on Africa and Asia. I 2016, d.light secured 13 million USD to expand its operations: 5 million USD in equity from the new investor KLP Norfund, along with 5,5 million USD in grant funding from Beyond the Grid and Shell Foundation, as well as 2,5 million USD in debt from SunFunder. KLP, SunFunder and partly Beyond the Grid and Shell Fundation are private contributors.

In addition to mobilization by public development finance, other types of public finance also mobilize private climate finance to developing countries. An example of this is the Norwegian Export Credit Guarantee Agency (GIEK) and Export Credit Norway which facilitate export financing through guarantees and loans for exporters, buyers and banks. GIEK is a government entity and Export Credit Norway is owned by the Norwegian state. Work is in progress to gather information on the scope of these interventions and their contribution to mobilizing private climate finance. Below, we present an example of a project involving private finance that was supported by GIEK, Export Credit Norway and other public co-financiers.

- In 2016, Export Credit Norway provided a loan guaranteed by GIEK of 51.3 million USD to support a solar power plant project in Honduras (Proderssa). The total project investment amounted to 124.5 million USD. Scatec Solar, Norfund and the local partner PEMSA provided equity to the project. In addition to GIEK and Export Credit Norway, loans were provided by CIFI (Inter-American Investment Corporation). Scatec Solar, PEMSA and partly CIFI are private contributors.

6.6 Technology Transfer

See Norway's Seventh National Communication, section 7.5 and table 8 below.

Table 8: **Provision of technology development and transfer support [a, b]**

Recipient country and region	Targeted area	Measures and activities related to technology transfer	Sector [c]	Source of the funding for technology transfer	Activities undertaken by	Status	Additional Information[d]
	Mitigation *Adaptation* *Mitigation and adaptation*		*Energy* *Transport* *Industry* *Agriculture* *Water and sanitation* *Other*	*Private* *Public* *Private and public*	*Private* *Public* *Private and public*	*Implemented* *Planned*	

Angola, Bhutan, Haiti, China, Liberia, Mozambique, Myanmar, Nepal, Palestine, Tanzania and Uganda	Mitigation and adaptation	**The Norwegian Clean Energy for Development Initiative** supports development of low-carbon and energy sector strategies, strengthen technical and institutional capacity to support private sector investment in developing countries, and contributes to the international transfer of energy-related technology. Norway further supports investment in infrastructure and clean energy production capacity in the energy sector of developing countries. Such investment support is frequently supplemented by institutional and human resource development measures that improve the technological expertise of the recipient country (e.g. support to HydroLab in Nepal).	Renewable energy Energy access Energy efficiency	Public	Private and public	Implemented	
Focus on Non-Annex 1 countries	Mitigation and adaptation	**Norfund – Renewable Energy.** Norfund is the development finance institution that serves as the commercial investment instrument of Norway's development policy. Through	Clean energy Energy efficiency	Private and public	Private and public	Implemented	

		investment in profitable companies and the transfer of knowledge and technology, it contributes to reducing poverty and to economic progress in poor countries.	Energy access Industry Transport				
Focus on Non-Annex 1 countries	Mitigation	Norway is one of the contributors to the partnership **Energising Development** (EnDev). EnDev is an impact-oriented initiative between the Netherlands, Germany, Norway, Australia, the United Kingdom and Switzerland. EnDev promotes the supply of modern energy technologies to households and small-scale businesses. The Partnership cooperates with 24 countries in Africa, Latin America and Asia. Since its start in 2005, EnDev has taken a leading role in promoting access to sustainable energy for all.	Renewable energy Energy efficiency Energy access Industry	Public	Private and public	Implemented	Norway's contribution to EnDev is NOK 228 million in the period 2011-2015.
Non-Annex I	Mitigation	Norway has been an active supporter of the **International Renewable Energy Institute** (IRENA) since the early planning	Renewable energy	Public	Private and public	Implemented	

		stage, and signed the statutes in January 2009. We strive to involve our private sector companies and our technological institutions as much as possible in the endeavour to promote the widespread use of renewable energy. Norway has contributed to the Global Renewable Energy Atlas and Renewable Energy Roadmap, as well as a range of other products and resources IRENA is developing to support developing countries develop their own renewable energy resources and industries.	Energy Access				
Both Annex I and Non-Annex I	Mitigation	**The International Centre for Hydropower (ICH)** is based in Norway and has members from the hydropower industry as well as Norwegian public institutions. Its aim is promoting hydropower and power market competence in emerging markets and developing countries. Institutional frameworks and capacity building as well as	Renewable energy Energy efficiency Energy access	Public	Public and Private	Implemented	

		technological transfer are central in ICH's programmes.					
Both Annex I and Non-Annex I	Mitigation	Norway is a member of the **Clean Energy Ministerial (CEM)**. CEM is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Initiatives are based on areas of common interest among participating governments and other stakeholders.	Renewable energy Energy efficiency Energy access	Public	Public and Private	Implemented	The CEM is focused on three global climate and energy policy goals: • Improve energy efficiency worldwide • Enhance clean energy supply • Expand clean energy access The main objective is improving policies and enhanced

							deployment of clean energy technologies.
Non-Annex I	Mitigation and adaptation	**Private Finance Advisory Network , UNIDO.** The Private Financing Advisory Network (PFAN) is a multilateral public private partnership initiated by the Climate Technology Initiative and the United Nations Framework Convention on Climate Change (UNFCCC). It identifies and nurtures promising, innovative clean and renewable energy projects by bridging the gap between investors, clean energy entrepreneurs and project developers.	Renewable energy Energy efficiency Energy access	Private and Public	Private and public	Implemented	Capacitate small and medium sized businesses to develop bankable projects.
Non-Annex I	Mitigation and adaptation	**Clean Technology Center and Network.** The Climate Technology Centre and Network facilitates the provision of information, training and support to build and/or strengthen the capacity of developing countries to identify technology options, make technology choices and	Renewable energy Energy efficiency Energy access	Public	Private and public	Implemented	.

		operate, maintain and adapt technology.						
Both Annex-I and Non-Annex-I	Mitigation	**The Global Carbon Capture and Storage Institute**: The Global Carbon Capture and Storage Institute (GCCSI) was established at the initiative of the Australian authorities. The aim of the institute is to contribute to a more rapid international dissemination of CO_2 capture and storage technologies. The Norwegian state enterprise Gassnova is a member of the institute	Energy Industry	Public and private	Public and private	Implemented		
Both Annex I and Non-Annex I	Mitigation	**The technology centre for CO_2 capture at Mongstad (TCM)** is the world's largest facility for testing and improving CO2 capture. TCM is an arena for targeted development, testing and qualification of CO2 capture technologies. International dissemination of the centre's experiences and results is important to reduce the costs and risks associated with large-scale CO2 capture. Knowledge gained will prepare the ground for CO2 capture initiatives to combat	Energy Industry	Private and Public	Private and public	Implemented		

		climate change. TCM is a joint venture between the Norwegian state, Statoil, Shell and Total.					
Non-Annex I	Mitigation	**GEEREF** is an innovative fund that aims to mobilise private sector finance. By providing new risk-sharing and contributing to co-financing options, GEEREF plays a role in increasing the uptake of renewables and energy efficiency in developing countries. The approach is demand-driven in markets that need more risk capital to evolve. GEEREF's support to regional sub-funds tailored to regional needs and conditions stimulates these markets.	Renewable energy Energy efficiency	Public	Private and public	Implemented	Norway participated in the establishment of the Global Energy Efficiency and Renewable Energy Fund (GEEREF) in 2008 together with the European Commission and Germany. Norway has contributed to GEEREF with totally NOK 110 million.
Tanzania, Malawi	Adaptation	**Global Framework for Climate Services (GFCS) Adaptation Programme in Africa.** Enhanced capacity of National Meteorological and Hydrological Services to provide climate	Agriculture/ food security, Health, DRR	Public	Public	Implemented	The project is administered by the GFCS secretariat located at WMO in Geneva.

		services, and enhanced capacity of the health, agriculture/food security and DRR sectors to use climate services in decision-making processes.					NOK 60 million for the period 2013-2016
Regional Africa	Adaptation	**Global Framework for Climate Services (GFCS) – Adaptation and disaster risk reduction in Africa**. Building capacity for the prediction of severe weather in Africa. Support to meteorological services.	Agriculture/ food security, Health, DRR, energy, water (GFCS priority sectors)	Public	Public	Implemented	Support through WMO to regional meteorological offices and to the GFCS secretariat in Geneve. NOK 56,8 million for the period 2011-2015
Regional Africa	Adaptation	**Strengthening the capacity of climate services in Africa through expert deployments**	Agriculture/food Security, health, DRR	Public	Public	Implemented	Support through Norwegian Refugee Council, in coordination with GFCS and its partners. NOK 24, 2 mill 2015-2017

Focus on Non-Annex 1	Adaptation some Mitigation	Agricultural Research through the Consultative Group on International Agricultural Research (CGIAR). The research focusses on reducing poverty, improving food and nutrition security for health and improved natural resource systems and ecosystem services. This includes adaptation to a changing climate. Research in partnership with national and international institutions. National ownership including training, is central.	Agriculture, Fisheries, forestry, Food Security	Public	Public	Implementing	NOK 86 million in 2015 and NOK 65 million in 2016
Focus on Non-Annex 1	Adaptation	Agricultural Research through the Global Crop Diversity Trust on Crop Wild Relatives to collect crop genetic material amongst crop wild relatives which show a specific tolerance to various climate stresses. The collected genetic material is used in pre-breeding programmes to breed the climate stress tolerant genetic traits into the domesticated crops.	Agriculture, Food Security	Public	Public	Implementing	NOK 40 million per year 2015-2016

Focus on Non-Annex I	Adaptation	**Climate adaptation in agriculture and food production.** A number of projects are supported through NGO's, the Rome based UN agencies (FAO, WFP and IFAD) and national/regional institutions with the aim to contribute to climate change adaptation, especially among small scale farmers and fishermen in developing countries.	Agriculture/ fisheries/ food production/ food security	Public	Public and private	Implemented Planned	

[1] To be reported to the extent possible

[1] The tables should include measures and activities since the last national communication or biennial report

[1] Parties may report sectoral disaggregation, as appropriate.

[1] Additional information may include, for example funding for technology development and transfer provided, a short description of the measure or activity and co-financing arrangements.

6.7 Capacity building

See Norway's Seventh National Communication, section 7.5 and table 9 below.

Table 9: *Provision of capacity-building support* [a]

Recipient country/ region	Targeted area	Programme or project title	Description of programme or project [b, c]
	Mitigation Adaptation Technology development and transfer		
Various REDD+ partner countries	Mitigation	**The UN-REDD Programme**	The UN-REDD Programme is a collaborative partnership bringing together the expertise of the UN Food and Agricultural Organization (FAO), the UN Development Program (UNDP) and the UN Environment Program (UNEP). The Programme has over 60 partner countries. Through its global activities UN-REDD contributes to the development of methodology and building of capacity within areas such as REDD+ governance, MRV, biodiversity and green economic development.
Various REDD+ partner countries	Mitigation	**The Forest Investment Program (FIP)**	The Forest Investment Program (FIP) under the CIF provides financing at scale to a limited number of pilot countries to support the implementation of their national REDD+ strategies. Over time, the intention is to help countries access larger and more sustainable results-based REDD+ payments.

Various REDD+ partner countries	Mitigation	**Forest Carbon Partnership Facility (FCPF)**	The Forest Carbon Partnership Facility is a global partnership of governments, businesses, civil society, and Indigenous Peoples focused on reducing emissions from deforestation and forest degradation. The objective is to pilot a performance-based payment system for REDD+ activities and to test ways to sustain or enhance livelihoods of local communities and to conserve biodiversity.
Various REDD+ partner countries	Mitigation	BioCarbon Fund Initiative for Sustainable Forest Landscapes (**BioCF ISFL)**	Norway is a contributor to the ISFL, managed by the World Bank. It promotes reducing greenhouse gas emissions from the land sector, from deforestation and forest degradation in developing countries (REDD+), and from sustainable agriculture, as well as smarter land-use planning, policies and practices. ISFL aims to support economic development by protecting forests, restoring degraded lands, enhancing agricultural productivity, and by improving livelihoods and local environments. The fund provides technical assistance that impact multiple sectors of the economy and result-based payments to incentivize and sustain program activities.
Angola, Bhutan, Haiti, China, Liberia, Mozambique, Myanmar, Nepal, Palestine, Tanzania and Uganda	Mitigation Adaptation Technology development and transfer	**The Norwegian Clean Energy for Development Initiative**	The Norwegian Clean Energy for Development Initiative contributes to strengthen technical and institutional capacity to support private sector investment in developing countries. In this regard it will support the implementation of policy and legal reforms , as well as transfer of energy-related technology by supporting investment in infrastructure and clean energy production capacity

Both Annex I and Non-Annex I	Mitigation	**NORWEP (Norwegian Energy Partners)**	NORWEP is a public-private partnership between three Government Ministries and Norwegian energy companies. The aim is to promote Norwegian energy competence in international markets, which also implies capacity-building in developing countries.
Both Annex I and Non-Annex I	Mitigation Adaptation Technology development and transfer	**The International Centre for Hydropower (ICH)**	**The International Centre for Hydropower (ICH)** is based in Norway and has members from the hydropower industry as well as Norwegian public institutions. Its aim is promoting hydropower and power market competence in emerging markets and developing countries. Institutional frameworks and capacity building as well as technological transfer are central in ICH's programmes.
Both Annex I and Non-Annex I	Mitigation Technology development and transfer	**The Clean Energy Ministerial (CEM)**	CEM is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Initiatives are based on areas of common interest among participating governments and other stakeholders. The CEM is focused on three global climate and energy policy goals: • Improve energy efficiency worldwide • Enhance clean energy supply

			• Expand clean energy access The main objective is improving policies and enhanced deployment of clean energy technologies.
Both Annex I and Non-Annex I	Mitigation Technology development and transfer	**The Carbon Sequestration Leadership Forum**	The Carbon Sequestration Leadership Forum (CSLF) has 26 member states. It is a Ministerial-level international climate change initiative that is focused on the development of improved cost-effective technologies for carbon capture and storage (CCS). It also promotes awareness and champions legal, regulatory, financial, and institutional environments conducive to such technologies.
Both Annex I and Non-Annex I	Mitigation Adaptation	**Sustainable Energy for All (SE4All)**	Norway has supported the SE4All initiative since its launch in Oslo in 2011.
Coastal developing countries south of Sahara through FAO	Adaptation	**EAF Nansen Project**	The research vessel Dr. Fridtjof Nansen has assisted developing countries in collecting marine data since the 1970s. The vessel is part of the Nansen programme that is run by the Food and Agriculture Organization (FAO). The vessel is flying the UN-flag and is operated by Norway's Institute of Marine Research (IMR). Both the vessel and the programme is funded by Norway. From 2010 to 2015 Norway supported the project “Climate effects on biodiversity, abundance and distribution of marine organisms in the Benguela Current (NansClim)”. The objective was to

			identify and describe possible trends in ocean climate and corresponding changes in marine biodiversity and fisheries in the region, using data collected through the "Nansen Programme" together with relevant available data. Based on the results from NansClim it was decided that the new Nansen Programme starting in 2017 should incorporate climate issues to a larger degree. This is reflected in the research topics and in the title of the new programme: "Supporting the Application of the Ecosystem Approach to Fisheries Management considering Climate and Pollution Impacts". The vessel now has a laboratory specifically designed for climate studies.
Tanzania	Adaptation	**Tanzania Agricultural Partnership (TAP) phase II**	The overall Project goal is the establishment of a public-private sector platform that provides commercial and developmental support to sustainable and profitable small-holder agriculture in Tanzania.
Malawi	Adaptation	**AIIC – Malawi Agriculture Partnership (MAP) II**	The overall Project goal is the establishment of a public-private sector platform that provides commercial and developmental support to sustainable and profitable small-holder agriculture in Malawi.
Regional (south of Sahara)	Adaptation, Mitigation	**Comesa, EAC, SADC. Climate change.**	Support to scaling up climate change mitigation and adaptation programs (Conservation Agriculture) in agriculture in the COMESA (Common Market for Eastern and Southern Africa), SADC (Southern African Development Community) and EAC (East African Community)

			region. Multi donor financing program.
Regional (Uganda, Malawi, Kenya, Tanzania)	Adaptation, Food Security, Capacity Building	CFU – Conservation Agricultural Regional Program	Linked to the COMESA Programme on Climate Change Mitigation and Adaptation in the ESA (COMESA-EAC-SADC) Region. Focus on the establishment of early actions in scaling up conservation agriculture.
Zambia	Adaptation, Food Security, Capacity Building	**Conservation agriculture programme (CAP) phase II**	Support to the CFU Zambia programme to scale up conservation agriculture in Zambia. The programme is implemented in collaboration with the Ministry of Agriculture
Focus on Non-Annex 1	Adaptation, Mitigation, Technology development and transfer, Capacity Building	**CGIAR 2015 CGIAR 2016**	CGIAR (Consultative Group on International Agricultural Research), research is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources. It is carried out by 15 Centers. The 15 Research Centers generate and disseminate knowledge, technologies, and policies for agricultural development through 15 large development Programs.
Focus on Non-Annex 1	Adaptation, Mitigation, Technology development and transfer, Capacity Building	**GCDT – Genetic Resources – Crop Wild Relatives Project**	Global Crop Diversity Trust- Crop Wild Relatives - CWR- work with the wild relatives of 29 major food crops. The project collect the wild plants (crop relatives); evaluate them for the useful traits; make the resulting information widely available; provide them to genebanks for conservation; and prepare them (‘pre-breeding’) for use in breeding crops for new climates. Pre-bred material is fed into ongoing, active breeding initiatives in developing countries.

Focus on Non-Annex 1	Adaptation	**Climate Change, Fisheries and Aquaculture. Adaptation and mitigation.**	The project aims at testing methods for vulnerability analyses related to climate, and adaptation strategies within fisheries and fish farming in various regions.

[a] To be reported to the extent possible

[b] Each party included in Annex II to the Convention shall provide information, to the extent possible on how it has provided capacity building support that responds to the existing and emergency capacity-building needs identified by Parties not included in Annex I to the Convention in the areas of mitigation, adaptation and technology development transfer.

[c] Additional information may be provided on, for example, the measure of activity and co-financing arrangements

7 Other reporting matters

7.1 Process of self-assessment

The UNFCCC biennial reporting guidelines encourages Parties to report to the extent possible, on the domestic arrangements established for the process of the self-assessment of compliance with emission reductions in comparison with emission reduction commitments or the level of emission reduction that is required by science.

Norway has had a quantitative emission reduction commitment for the Kyoto Protocol's first commitment period and has taken a quantitative emission reduction commitment for the Kyoto Protocol's second commitment period. Through its annual submissions of its GHG inventory and the review of these inventories, Norway has a sound knowledge of its emissions and removals. Chapter 4 and 5 of our seventh National Communication shows Norway'spolicies and measures implemented to reduce emissions and enhance removals, and their effects. Moreover, chapter 4.4 of the BR2 explains how the Kyoto mechanisms were used to fulfil the commitment for the first commitment period (2008-2012) and how Norway plans to fulfil its commitment for the second commitment period (2013-2020). Norway has through its submission of the SEF tables reported the number of units transferred to its retirement account each year.

7.2 National rules for taking local action against domestic non-compliance

The UNFCCC biennial reporting guidelines encourages Parties to report, to the extent possible, on the progress made in the establishment of national rules for taking local action against domestic non-compliance with emission reduction targets. In Norway’s environmental legislation, there are provisions for enforcement of different obligations and decisions made in accordance with the law. For more information about the Pollution Control Act, the Greenhouse Gas Emissions Trading Act and the Climate Change Act, see chapter 4 of NC7.

7.3 Other matters

The UNFCCC biennial reporting guidelines encourages Parties to report any other information that the Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its biennial report. Norway has made its 2020 target operational through the target for 2013-2020 under the Kyoto Protocol. The demonstration of compliance with these targets internationally assumes ia. issuance and transfers of AAUs pursuant to the cooperation with the EU on a common emissions trading system, similar to what was done for the first commitment period. The Doha amendment, which Norway ratified 12 June 2014, has still not entered into force when this BR 3 is issued. Thus, issuance and transfer of AAUs, as well as carry over of AAUs, has so far not been possible. Norway does not have any other information to report on this matter in its BR3.

List of acronyms

AAU	Assigned Amount Unit
ABA	Arctic Biodiversity Assessment
ADPC	Asian Disaster Preparedness Center
ACTRIS	Aerosols, Clouds, and Trace gases Research Infrastructure Network
AGAGE	Advanced Global Atmospheric Gases ExperimentOS
AMAP	Arctic Monitoring and Assessment Programme
ASAP	Automated Shipboard Aerological Programme
AWG	Ad-hoc Working Group
BAT	Best Available Techniques
BR	Biennial Report
BRA	Available area
CAEP	Civil Aviation Environment Programme
CAFF	Conservation of Arctic Flora and Fauna
CAFI	Central African Forest Initiative
CCAC	Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants
CASTOR	CO_2 from Capture to Storage
CCAP	Center for Clean Air Policy
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CICERO	Centre for International Climate and Environmental Research
CIF	Climate Investment Funds
CLRTAP	Convention on Long-range Transboundary Air Pollution
CMIP6	Coupled Model Intercomparison Project Phase 6
COAT	Arctic Climate-ecological Observatory for Arctic Tundra
CRF	Common Reporting Format

CSLF	Carbon Sequestration Leadership Forum
CTCN	Climate Technology Centre and Network
CSEUR	Consolidated System of European Union Registries
CTCN	Climate and Technology Centre and Network
CTF	Common Tabular Format
DDR	Disaster Risk Reduction
DES	Data Exchange Standards
ECA&D	European Climate Assessment and Dataset
ECAC	European Civil Aviation Conference
ECAS	European Commission Authentication Service
ECCSEL	European Carbon Dioxide Capture and Storage Laboratory Infrastructure
ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	European Economic Area
EEH	EPIM Environmental Hub
EFTA	European Free Trade Association
EMEP	European Monitoring and Evaluation Programme
EnDev	Energising Development
ENOVA	The Norwegian Energy Fund
ERA	European Research Area
ERT	Expert Review Team
ERU	Emission Reduction Unit
ESFRI	European Strategy Forum on Research Infrastructures
ESI	Environmental Ship Index
ESMAP	Energy Sector Management Assistance Program
EV	Electric Vehicles
EU ETS	European Union Emission Trading System
EU	European Union
EUMETNET	European Meteorological Services Network
EUR	Euros

FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FEED	Front End Engineering and Design
FFFSR	Friends of Fossil Fuel Subsidy Reform
FIP	Forest Investment Program
GAW	Global Atmosphere Watch of WMO
GCIAR	Consultative Group on International Agricultural Research
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GCF	Green Climate Fund
GEF	Global Environment Facility
GFCS	Global Framework for Climate Services
GGGI	Global Green Growth Institute
GHG	Greenhouse gases
GIS	Gas-insulated switchgear
GNI	Gross National Income
GSI	Global Subsidies Initiative
GTOS	Global Terrestrial Observation System
GWP	Global Warming Potential
HFC	Hydrofluorcarbon
ICAO	International Civil Aviation Organization
ICH	International Centre for Hydropower
ICIMOD	International Centre for Integrated Mountain Development
ICOS	Integrated Carbon Observation System
ICSU	International Council for Science
IEA	International Energy Agency
IEF	Implied Emission Factor
IGBP	International Geosphere-Biosphere Programme
IIASA	International Institute for Applied Systems Analysis

IMO	International Maritime Organisation
IISD	International Institute for Sustainable Development
IMR	The Institute of Marine Research
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
IRENA	International Renewable Energy Agency
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
ITL	International Transaction Log
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
JI	Joint Implementation
JPI	Joint Programming Initiatives
KP	Kyoto Protocol
LDC	Least Developed Countries
LDCF	Least Developed Country Fund
LPG	Liquefied Petroleum Gas
LULUCF	Land Use and Land Use Change and Forestry
MW	Megawatt
NC	National Communication
NCCS	Norwegian Centre for Climate Services
NE	Not Estimated
NCS	Norwegian Continental Shelf
NEFCO	Nordic Environment Finance Corporation
NFI	National Forest Inventory
NGO	Non-Governmental Organisation
NIBIO	Norwegian Institute of Bioeconomy Research
NICFI	Norway's International Climate and Forest Initiative
NFLI	Norwegian Forest and Landscape Institute

NGL	Natural Gas Liquids
NIBIO	Norwegian Institute of Bioeconomy Research
NIFU	Nordic Institute for Studies in Innovation, Research and Education
NILU	Norwegian Institute for Air Research
NIR	National Inventory Report
NIVA	Norwegian Institute for Water Research
NMVOC	Non-methane Volatile Organic Compound
NOK	Norwegian Kroner
NORAD	Norwegian Agency for Development Cooperation
NorClim	Climate of Norway and the Arctic in the 21st Century
NorESM	Norwegian Earth System Model
NORKLIMA	Climate Change and Impacts in Norway
NOU	Official Norwegian Report
NRPA	National Public Road Administration
NPI	The Norwegian Polar Institute
NVE	Norwegian Water Resources and Energy Directorate
NSDS	National Strategy for Sustainable Development
NTP	National Transport Plan
ODA	Official Development Assistance
OfD	Oil for Development
OECD	Organisation for Economic Cooperation and Development
PAGE	UN Partnership for Action on the Green Economy
PaM	Policies and Measures
PCF	Prototype Carbon Fund
PDO	Plans for Development and Operation
PFAN	Private Finance Advisory Network
PFC	Perfluorcarbon
PIO	Plan for installation and operation of facilities for transport and utilisation of petroleum

PHEV	Plug-in Hybrid Vehicles
PPCR	Pilot Program for Climate Resilience
QA/QC	Quality Assurance/Quality Control
R&D	Research and Development
RCN	Research Council of Norway
REDD+	Reducing emissions from deforestation and forest degradation
RegClim	Regional Climate Development under Global Warming
RMU	Removal Unit
RMU	Removal Unit
SAR	Search and Rescue
SCCF	Special Climate Change Fund
SD	Sustainable Development
SDG	Sustainable Development Goals
SEF	Standard Electronic Format
SET-plan	Strategic Energy Technology Plan
SIOS	Svalbard Integrated Arctic Earth Observing System
SPF	Specific Fan Power
SWDS	Solid Waste Disposal Sites
SWIPA	Snow, Water, Ice and Permafrost in the Arctic
TCM	Technology Centre Mongstad
TEK	Technical building regulation code
TWh	Terawatt hour
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change

UNIS	The University Centre in Svalbard
USD	US Dollar
VAT	Value Added Tax
VRU	Vapour Recovery Unit
WCRP	World Climate Research Programme
WMO	World Meteorological Organization
WRI	World Resources Institute