Status report as of January 2014

Norway's Sixth National Communication

Under the Framework Convention on Climate Change

NORWEGIAN MINISTRY OF
CLIMATE AND ENVIRONMENT

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Contents

1 Executive summary

This report is Norway's sixth 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 and 2010 respectively. The latest National Inventory Report (NIR) for greenhouse gases was submitted in April 2013. 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.

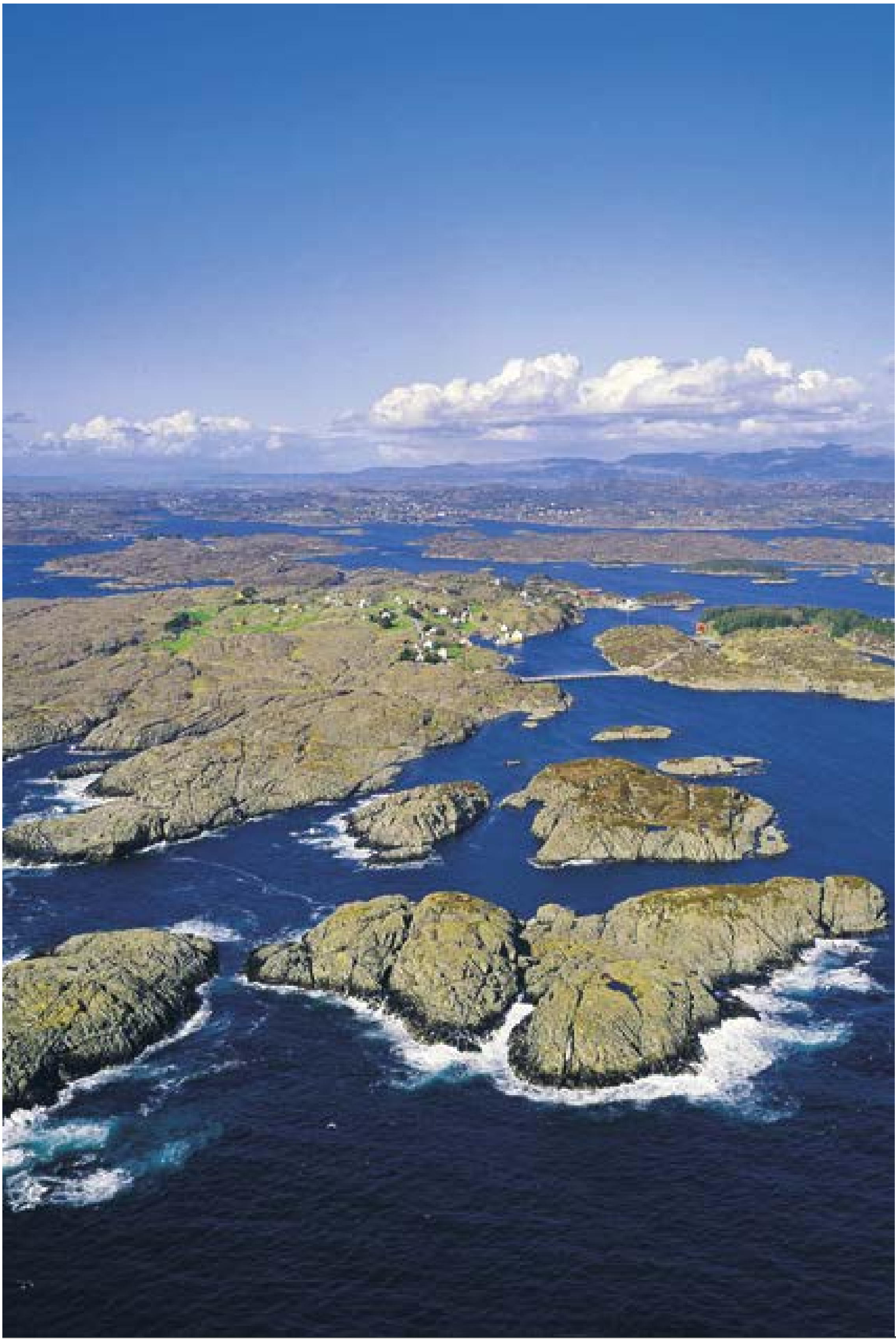
1.1 National circumstances

Norway is a constitutional monarchy with a democratic parliamentary system of governance. The current Government is a minority coalition of Høyre (the Conservative Party) and Fremskrittspartiet (the Progress 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 1900-2012, the annual mean temperature in Norway has increased by about 0.9°C.

Norway is a small, open economy. More than 40 per cent of Gross Domestic Product (GDP) is exported. Production of crude oil and natural gas and foreign shipping account for 25 per cent of GDP in Norway. Activity in the Norwegian non-oil economy has held up relatively well despite weak economic development internationally. Strong demand from the petroleum industry and growth in private consumption have contributed to sustained growth.

Norway accounts for around 0.1 per cent of global greenhouse gas emissions. With emissions at 53.4 million tonnes of CO_2 equivalents in 2011 and a population of around 5 million, emissions per capita is 10.5 tonnes CO_2 equivalents, when the LULUCF sector is excluded. Despite strong economic growth and immigration, Norway's greenhouse gas emissions have de-



The island Hiskjo in Bømlo, Hordaland. Connected to the rest of the municipality by bridge. Foto: Jan Rabben, Samfoto/ NTB scanpix creased in recent years. Greenhouse gas emissions relative to GDP normally decline as scarce resources are utilised more efficiently. Higher energy costs, for example as a result of taxes or quotas on emissions, reinforce this trend.

Norway's largest source of emissions comes from the petroleum activities. In 2011, the greenhouse gas emissions from the sector were 13.6 million tonnes CO_2 equivalents, about 29 per cent of total emissions.

Norway is in a unique position since nearly all of its electricity production is based on hydropower. The proportion of energy use accounted for by electricity is higher than in most other countries. One important reason for this is the large energy-intensive industry in Norway. In addition, electricity is used to heat buildings and water to a greater extent than in other countries. Norwegian energy consumption per capita is higher than the OECD average.

Emissions from industrial processes were 7.8 million tonnes in 2011, accounting for about 15 per cent of total emissions. Metal production and chemicals are the largest contributors.

About 28 per cent of the total Norwegian greenhouse gas emissions originated from transport in 2011. Norway's decentralized settlement pattern 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 that there is a large volume of goods transport. The demand for rapid transport and more frequent deliveries of goods has also been increasing.

Agricultural areas account for only 3 per cent of the mainland, while about 37 per cent is covered by forest. Roughly 88 per cent of the forest area is privately owned, with many small properties. In 2011 there were 131 800 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 2011, the LULUCF sector contributed with net removals of 27.6 million tonnes CO_2. These removals are substantial and equal to approximately half of the total emissions from the Norwegian GHG accounting. The average annual net removals from the LULUCF sector was about 20.4 million tonnes CO_2 equivalents per year for the period 1990–2011. Forest land was responsible for the vast majority of the CO_2 removals in 2011, with 32.4 million tonnes CO_2 equivalents per year.

Agriculture is estimated to account for about 8 per cent of Norway's emissions of greenhouse gases. The area under agricultural cultivation has declined by approximately 2 per cent during the last decade. There has also been a shift from harvested land to more grazing land.

Fishing is an important basis for settlement and employment along the Norwegian coast. Emissions from the sector accounted for about 2.7 per cent of Norway's total emissions in 2011. The Norwegian fishing and aquaculture industries are among Norway's most important export industries today. Various types of pollution as well as climate change may affect the fisheries and aquaculture. With an increase in the level of CO_2 in the atmosphere, the ocean absorbs an increasing level of CO_2. This causes ocean acidification, which is a growing concern for the marine ecosystems and fisheries.

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), perfluorcarbons (PFCs), sulphur hexafluoride (SF_6) and hydrofluorcarbons (HFCs) from 1990 to 2011. 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 to the UNFCCC secretariat on 12 April 2013. The CRF tables were resubmitted to the UNFCCC on 11 November 2013.

The total emissions of greenhouse gases, measured as CO_2 equivalents, were about 53.4 million tonnes in 2011. Between 1990 and 2011 the total greenhouse gas emissions increased by almost 3 million tonnes, or by 6 per cent. Total emissions increased in the 1990s, but have since the turn of the century been more or less stable. While emissions of CO_2 from most sources have increased, emissions of other greenhouse gases have decreased. Norway has experienced strong economic growth since 1990. This partly explains the general growth in CO_2 emissions. In addition, the offshore petroleum sector has expanded significantly during the past 20 years. Both these factors have led to increased use of fossil fuels, and consequently higher CO_2 emissions. In 2011 emissions decreased by almost 2 per cent. There are indications that we are seeing the start of a reduction in emissions. Preliminary figures for 2012 show the lowest level of emissions since 1995, apart from 2009, when emissions were lower owing to the financial crisis.

1.3 Policies and measures

1.3.1 Introduction

Norway's climate policy is founded on the objective of the Framework Convention on Climate Change and the Kyoto Protocol and the scientific understanding of the greenhouse effect set out in the IPCC reports. Climate change and emissions of greenhouse gases have been a concern of Norwegian policy since the late 1980s. As of today, Norway has a comprehensive set of measures covering almost all emissions of greenhouse gases.

Norway is working towards an ambitious global climate agreement that will ensure a reduction in global greenhouse gas emissions so as to hold the increase in global average temperature below 2° C above pre-industrial levels. This is necessary in order to avoid dangerous climate change, and will require political leadership by all nations. In order to meet the 2 °C target, the fourth assessment report from the IPCC implies that global emissions will have to be reduced by 50-85 per cent by 2050 compared with 2000, most likely closer to 85 per cent. As seen from the 5th assessment report, limiting the warming caused by anthropogenic CO_2 emissions to less than 2°C , with a probability of more than 2/3, entails that cumulative CO_2 emissions in the atmosphere, from all anthropogenic sources, should not exceed 1000 GtC. An amount of 531 GtC had already been emitted in 2011. In June 2012, a broad agreement on climate policy was made in the Storting, cf. Innst. 390 S (2011-2012). The Storting made a decision based on this agreement, adopting the policies and measures in the agreement.

The agreement is based on the latest White paper on Norwegian climate policy, Meld. St. 21 (2011-2012)[1], which includes proposals to reinforce the domestic policy framework to meet the Norwegian emission targets. Moreover, the agreement saw a strengthening of the policy in certain areas.

During the period up to 2020, Norway will commit to cutting global emissions of greenhouse gases equivalent to 30 per cent of Norway's emissions in 1990. Norway has made a commitment under the second commitment period of the Kyoto Protocol (KP 2). Under KP 2, Norway is committed to an emission reduction correspondings to average annual emissions over the period 2013-2020 at 84 per cent of the 1990 emission level. The commitment under KP 2 is consistent with the Norwegian target of 30 per cent reduction of emissions by 2020, compared to 1990. Through the broad political agreement on climate of 2012, the Storting calls for the Government to strengthen Norway's climate goals equivalent to a 40 per cent cut in emissions by 2020 compared with the level in 1990, if this can contribute to consensus on an ambitious climate agreement whereby the countries with the largest emissions agree to specific emission commitments.

Furthermore, the political agreement on climate aims that Norway will be carbon-neutral in 2050. As part of an ambitious global climate agreement where other developed nations also undertake ambitious commitments, Norway will adopt a binding goal of carbon neutrality no later than in 2030. This means that Norway will commit to achieving emission reductions abroad equivalent to Norwegian emissions in 2030. It is also a long-term objective for Norway to become a low-emission society by 2050.

The political agreement on climate of 2012, outlines cross-sectoral and sectoral measures for reaching the emission targets.

In the political platform of the current government, it is stated that the Government will strengthen the political agreement on climate made in 2012. It is stated that the Government will undertake an ambitious domestic climate policy with a long term transition to a low-emission society by 2050.

The Ministry of Climate and Environment has the overarching cross-sectoral responsibility for co-ordination and implementation of the Norwegian climate policy. The other Ministries are responsible for implementation in their respective sectors. 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 accordance with the broad political agreement on climate of 2012 (Innst. 390 S (2011-2012), Norway will particularly focus on measures that are cost-effective in the light of expectations of rising carbon prices over the lifetime of the investments, and which are not necessarily triggered by current policy instruments. This applies

1. The Norwegian Parliament

particularly to measures that promote to technologicaly development and to measures that mobilize the population to earlier changes in consumer patterns that yield lower emissions.

Norway has strived to follow a comprehensive approach to climate change mitigation from the start of policy development around 1990, addressing all sources including sinks. As regards emissions of greenhouse gases, the costs of externalities are met through levies and by including activities in the European Emissions Trading Scheme (EU ETS). These instruments place a charge on emissions of greenhouse gases. Norway believes that putting a global price on emissions is the most efficient way of ensuring cost-effectiveness of mitigation actions between different countries and regions, and of securinge equal treatment of all emitters and all countries. This will help minimize adverse impacts of mitigation.

1.3.2 Cross-sectoral policies and measures

CO_2 taxes were introduced in 1991 as a step towards a cost-effective policy to limit emissions of greenhouse gases. The main structure of the tax has remained relatively stable, with some exceptions. The CO_2 tax is now levied on about 60 per cent of total greenhouse gas emissions. The tax rate differs between different energy products, and usages. High rates apply to petrol and petroleum activities, and lower rates apply to the use of mineral oils.

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 in February 2009 to also include 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. Altogether, over 80 per cent of the domestic emissions will be subject to mandatory allowances or a CO_2 tax, or both.

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.

The growth trend 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 used 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.

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.

Norway strongly believes that broad deployment of carbon capture and storage (CCS) is needed in order to mitigate climate change. Norway is committed to further developing and contributing to widespread dissemination of carbon capture and storage technologies. Owing to costs and uncertainties, the development of large scale CO_2 capture at Mongstad was discontinued in 2013. The Technology Centre Mongstad, which is one of the world's largest and most advanced, will however be continued. Through the broad agreement on climate, the Storting has called for an ambition of realizing at least one full scale carbon capture pilot plant by 2020.

1.3.3 Sector specific policies and measures

Petroleum activities

A CO_2 offshore tax regime was introduced in 1991, which includes burning of natural gas, oil and venting for CO_2 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, the sector is subject to a CO_2 tax.

The CO_2 tax on petroleum activities has so far been the most important instrument for reducing emissions in the petroleum sector, and has had a significant impact. The CO_2 tax and regulations under the Pollution Control Act have resulted in improvements in technology and emission-reducing measures, since the introduction of the CO_2 tax in 1991. Several energy conservation measures have been carried out. Other important mitigation actions are the CO_2 storage projects at Sleipner and Snøhvit, and the replacement of gas turbines with electricity from the onshore power grid. Power supply from the mainland gives lower emissions compared with using offshore gas turbines.

Energy and transformation industries

Electricity generation in Norway is almost exclusively renewable as over 95 per cent is hydro-power. 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, but is meant also to reduce electricity consumption. Since the majority of the stationary energy consumption in Norway is based on electricity generated from hydropower, emissions from energy consumption are low in Norway compared to 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. This target is the highest in Europe and represents an increase of around 9.5 percentage points from 2005. 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 a CO_2 tax. Through the broad political agreement on climate of 2012, the Storting has asked for a ban on the use of fossil oils in households and for base load in other buildings from 2020.

The Energy Fund is a government fund owned by the Ministry of Petroleum and Energy. The state enterprise Enova manages the Energy Fund and has been in full operation since 1 January 2002. Enova's obligations are specified in an agreement between the Ministry and Enova. The objective of the fund is to ensure a long-term, predictable and stable source of finance to promote an environmentally friendly change in the consumption and production of energy, and the development of energy and climate technologies. Energy Fund is financed by means of a levy on the electricity grid tariff, as well as through the annual returns from the Fund for Climate Mitigation Measures, Renewable Energy, and Energy Transition. The initiative to promote energy- and climate technologies was introduced of 2012, and represents a strengthening of national climate policies. As part of the broad political agreement in 2012, it was decided that principal capital in the Fund for Climate Mitigation Measures, Renewable Energy, and Energy Transition should be increased from NOK 25 billion in 2012 to NOK 50 billion by 2016 after the extension of the responsibilities of the fund.

The Norwegian technical building regulation code (TEK) under the Planning and Building Act contains specific energy demand requirements for all new buildings. The ten-year Low-energy Programme (Lavenergiprogrammet) was established in 2007. It is a collaboration programme between government agencies and the building and construction industry which aims at increasing competence on energy efficient buildings and the use of renewable energy in buildings. The programme has completed a number of courses, information campaigns and projects.

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 that meets the sustainability criteria is subject to a reduced road usage tax, corresponding to half of the rate for auto diesel. In order to increase the use of biofuels, there is also a mandatory biofuels turnover in Norway. A blending obligation was introduced in 2009, committing the economic operators to sell at least 2.5 per cent biofuels. Since April 2010, 3.5 volume per cent of the total yearly amount of fuel sold for road transport has to be biofuels. As of 1 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 lead to reduced emissions from new cars. The White Paper on Climate Policy (Report no. 21 (2011-2012)) to the Storting 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 Parliament took note of this goal.

In 2009, the subsidy programme Transnova was established to subsidise demonstration projects and market introduction of climate friendly transport technologies. Transnova started as a 3 year project, but is now a permanent body.

The reward scheme for the largest cities was established in 2004 to make grants available to those local governments that achieve positive results increasing shares of public transport at the same time as managing traffic with private cars by including a goal of zero growth during a period of 4 years. Since 2004, the scheme has grown both in the number of cities included and with respect to the total grant. The broad agreement on climate of 2012 set as a goal to absorb the growth in passenger transport in major urban areas through public transportation, bicycling and walking. This means a modal shift from private cars to more environmentally friendly transport.

The broad agreement on climate 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 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 is expected to be expanded in 2014. 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 gas fuelled ferries through public procurement and 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.

Within the ICAO, Norway has as an observer in the Civil Aviation Environment Programme (CAEP) and, as part of the European Civil Aviation Conference (ECAC), participated actively with a view to limiting greenhouse gas emissions from international aviation. For international aviation Norway is pursuing the introduction of targets for emission reductions and use of market-based measures for achievinge such targets. In October 2013 ICAOs General Assembly decided on development of a global market-based measure. It is intended that the design of the scheme will be decided by the Assembly in 2016, while implementation of the scheme is mintended to begin 2020. Norway will actively support this process. Norway participates in the EU ETS for aviation.

Industry

This sector includes emissions from industrial processes. 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. From 2013, emissions from processes in the manufacturing industries are to a large extent covered by the EU ETS.

Norway has established a new 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 (F-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.

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 CO_2 taxation. The emissions also derive from many small sources, which makes it difficult to include them in an emission trading system. However, Norway has implemented measures that affect the emissions from agriculture, through legislation and economic incentives as well as information.

Forestry

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 Storting 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. However, the measures implemented will also influence CO_2 flux and the forest carbon stocks. The Forestry Act applies to all categories of ownership.

Waste Management

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 most important measures are: regulations under the Pollution Control Act, tax on the final disposal of waste and extended producer responsibility for specific waste fractions.

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 remain relatively stable during the period until 2020, before declining somewhat by 2030. Projected emissions excluding LULUCF in 2020 and 2030 are 54.4 and 52.2 million tonnes CO_2 equivalents, respectively. Even though CO_2 sequestration is expected to decline in the decades to come, net CO_2 sequestration in the LULUCF sector in 2030 is projected to be equivalent to about two fifths of greenhouse gas emissions in other sectors. Including LULUCF, emissions in 2020 and 2030 are projected at 32.2 and 32.3 million tonnes CO_2 equivalents, respectively as compared with 35.0 million tonnes in 1990 and 25.8 million tonnes in 2011.

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 12.6-15.2 million tonnes CO_2 of equivalents higher than observed, if these policies and measures had not been implemented. This is about 25 per cent of actual emissions this year. It is estimated that GHG emissions would be 17.1-20.1 million tonnes of CO_2 equivalents higher than in the baseline in 2020 and 17.8-20.5 million tonnes higher in 2030.

Norway's assigned amount under the Kyoto Protocol's first commitment period (2008-2012) of 1 per cent above the 1990-level, equals an annual average of about 50.1 million tonnes of CO_2 equivalents. Average annual emissions excluding the LULUCF sector were about 53.4 million tonnes. Norway does not expect issuance of Removal Units (RMUs) pertaining to Article 3.3 (afforestation, reforestation and deforestation), but expects to issue 1.47 million RMUs under Article 3.4 owing to forest management calculated as an annual average. Further, in line with what was stated in Norway's Initial Report in 2006, these units will not be used for compliance with the commitment under Article 3.1. If these units had been used for compliance, the need for net acquisition of Kyoto units to comply with the commitment would have been 1.7 million tonnes per year. In sum, Norway will overachieve the commitment for 2008-2012 by 6.6 million tonnes annually, and already has a sufficient amount of units in its registry to do so.

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. The policies and measures needed to comply with this new commitment are, to a large extent, in place and represent a continuation of an established system, which is well integrated into Norwegian climate policy. The programme for the procurement of Kyoto units will continue also during the period 2013-2020. The programme will only acquire UN-approved credits and contribute to the development of a global carbon market.

2. 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

1.5 Vulnerability assessment, climate change impacts and adaptation measures

The Norwegian economy, environment and society are all vulnerable to climate change. Projections[2] 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) °C 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 will 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 are 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 is expected to have a major impact on terrestrial, marine and fresh water ecosystems and increase 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.

Regarding effects on society, Norway is in a good position to adapt to 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 sanitation, are particularly vulnerable to climate change in Norway.

Climate change is a shared responsibility. Individuals, businesses and industry and NGOs as well as local, regional and national authorities are required to integrate climate change considerations in their work. The authorities are responsible for creating the necessary framework for others to adapt to a changed climate. This includes providing national statutes, regulations and guidelines. 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 Norway's 5th National Communication to UNFCCC, the knowledge base and the policy framework related to adaptation to climate change have been substantially improved through the Official Norwegian Report on Norway's vulnerability and adaptive needs and on the white paper (Meld St. 33 (2012-2013)) on climate change adaptation in Norway and accompanying assessments. Furthermore, the extensive research and practical experience gained by sharing knowledge and competence among municipalities and other actors in planning for a changing climate have contributed to an increase in knowledge and capacity in climate change adaptation.

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.

The budget for climate change mitigation and adaptation assistance has increased strongly over the past 5-6 years. In 2006 the share of bilateral climate finance in the overall Official Development Assistance (ODA) budget was around 3 per cent, which by 2012 had increased to 18 per cent. During the same period, the total ODA budget also increased from an already high level.

The main priorities for Norwegian climate finance in recent years have been on reducing emissions from deforestation and forest degradation and promoting renewable energy and energy conservation and efficiency. Adaptation to climate change is another priority, with particular focus on food security and disaster risk reduction.

Norwegian bilateral finance directed at climate change covers a wide variety of areas and sectors. 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 developing countries achievement of the 2 °C 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.

Finally, Norway places great emphasis on the transfer of technology and know-how in order to promote development, availability and efficiency of energy. This constitutes an important element of Norwegian Official Development Assistance (ODA) and has significant environmental co-benefits that are consistent with the objectives of the UNFCCC. In addition Norway supports a wide range of other technology transfer and capacity building efforts related to climate change.

1.7 Research and systematic observation

Global challenges in the areas of the environment, climate change, oceans, food safety and energy are among the strategic objectives in Norwegian research policy.

Norwegian public funding of research was 24.2 billion NOK in 2012. Nearly one third of this was channelled through the Research Council of Norway, with a budget of approximately NOK 7.4 billion in 2012. As regards climate related sciences, the Research Council covers all disciplines and the 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. In the latter category, high priority is given to research on the development of technology to reduce greenhouse gas emissions and the development of new renewable or alternative energy sources. The total funding through the Research Council related to Climate Change, including carbon capture and storage (but excluding renewable energy technology), was approximately NOK 520 million in 2012, as compared with NOK 380 million in 2008. In addition, approximately the same amount of climate research was performed with basic funding at universities and research institutes.

Norwegian climate researchers are active in international research co-operation, e.g. under the Nordic framework, EU Framework Programmes, initiatives and programmes related to ERA (European Research Area) and the new Future Earth initiative. Norwegian scientists take part in the EU 7th Framework Programme projects and participate in one third of all EU projects under "Environment (including Climate Change)". They are also preparing for the programme Horizon 2020. As for ERA, Norway participates in all ten JPIs (Joint Programming Initiatives) and the SET-plan (Strategic Energy Technology Plan). International collaboration outside these established frameworks is also important, and bottom-up international cooperation within research projects is common.

In Norway, the number of research articles on climate research being published is increasing more rapidly than in any other research field. In addition, the number of Norwegian researchers serving as authors for the Intergovernmental Panel on Climate Change (IPCC) working group reports is high.

The programme NORKLIMA, Climate change and its impacts in Norway, was launched in 2004 and ended in 2013. In October 2013, a new climate research programme, called KLIMAFORSK (2014 – 2023), was launched. This programme will be both a successor to and an expansion of NORKLIMA, aimed at providing new, future-oriented knowledge of national and international significance.

The Policy for Norwegian polar research 2010-2013 was formulated on the basis of key challenges and opportunities for Norwegian polar research, new trends in the polar regions, and Norway's overall interests in this context. A new policy for polar research 2014 – 2023 is underway, and it was launched in November 2013. The Research Council of Norway established the program on Polar Research (POLARFORSKNING) in 2011. This programme will help to safeguard Norway's special responsibility for the research based knowledge necessary for exercising policy, management and business activity in the polar regions. ENERGIX is the name for the successor to the program Clean Energy for the Future (RENERGI). The new programme started in 2013 and will span a 10-year period. It encompasses technological, natural and social sciences as well as humanities-related research and development activities. CLIMIT is Norway's public programme to accelerate the commercialisation of carbon capture and storage. The programme provides funding for research, development and demonstration of technologies for carbon capture and storage.

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. Norway takes part in the UN Decade for Education for Sustainable Development (2005 – 2014), and cooperates with the other Nordic countries.

The Norwegian Ministry of Climate and Environment launched the public awareness campaign on climate change Klimaløftet in March 2007. It was initiated as a supplementary measure to reduce emissions in a long-term perspective. The purpose is to spread information on scientific research into climate issues.

The Environmental Information Act entered into force on 1 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. CICERO (Centre for International Climate and Environmental Research – Oslo) is an independent research institute with a specific focus on climate change, and plays a key role in providing information about climate change and climate policy. CICERO is a private non-profit organisation founded by the University of Oslo.

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 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. Following the change of government in October 2013, the current Government consists of a minority coalition of Høyre (the Conservative Party) and Fremskrittspartiet (the Progress Party). 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.

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 323 802 km^2. In addition, the Norwegian Sea area is 2 201 599 km^2. The mainland coastline is 2 650 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 2.2). 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 are -51.4°C and +35.6°C.

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 inside the coast of western Norway get most precipitation (see Figure 2.3). 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 south-eastern Norway and on the Finnmark Plateau have normal annual precipitation less than 300 mm.

The figures on annual and seasonal precipitation (Figures 2.9 to 2.13), 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 2.4-2.12 show area-weighted variations in temperature and precipitation for the Norwegian mainland. Both annual as well as spring, summer and autumn temperatures have increased since the 1970s. The annual precipitation has also increased since the 1970s, particularly for the spring season.

During the period 1900-2012, the annual mean temperature in Norway increased about 0.9°C. Depending on geographical region, the increase in annual temperature varies from 0.5 to 1.2°C. The annual precipitation increased by about 20 per cent during 1900-2012. The largest increase is observed during spring and the smallest during summer.

In Svalbard, observations from the last hundred years tend to show positive trends in temperature and precipitation. A composite series of temperature measurements at Svalbard Airport homogenised series based on the period September 1898–December 2012 (for summer 1912-2012), shows a linear trend in annual mean of 2.6°C per century. The largest trend is in spring, at 3.9°C per century.[1]

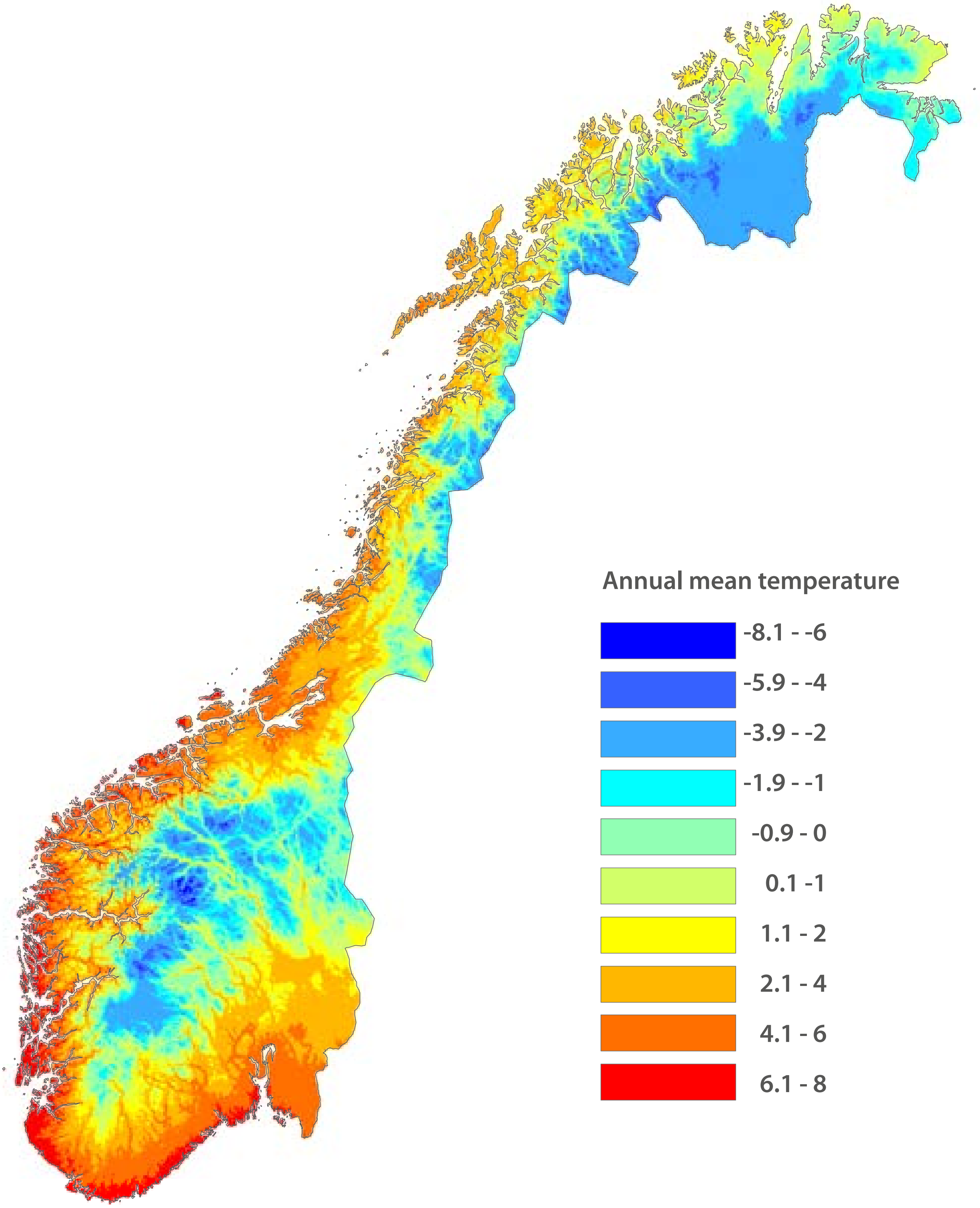
The long and narrow shape of Norway results in wide variations in climate, geology and topography. This gives large variation in conditions for land use. About 30 per cent of the area lies 0–299 meters above sea level, and this is where most people live and where agricultural production is most intensive. 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 47 per cent of the land is above the tree line. Currently, almost 8 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 5.1 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 of the population lives in urban settlements. Around 1900, 35 per cent of the population lived in densely populated areas. In 2012, more than 79 per cent of Nor-

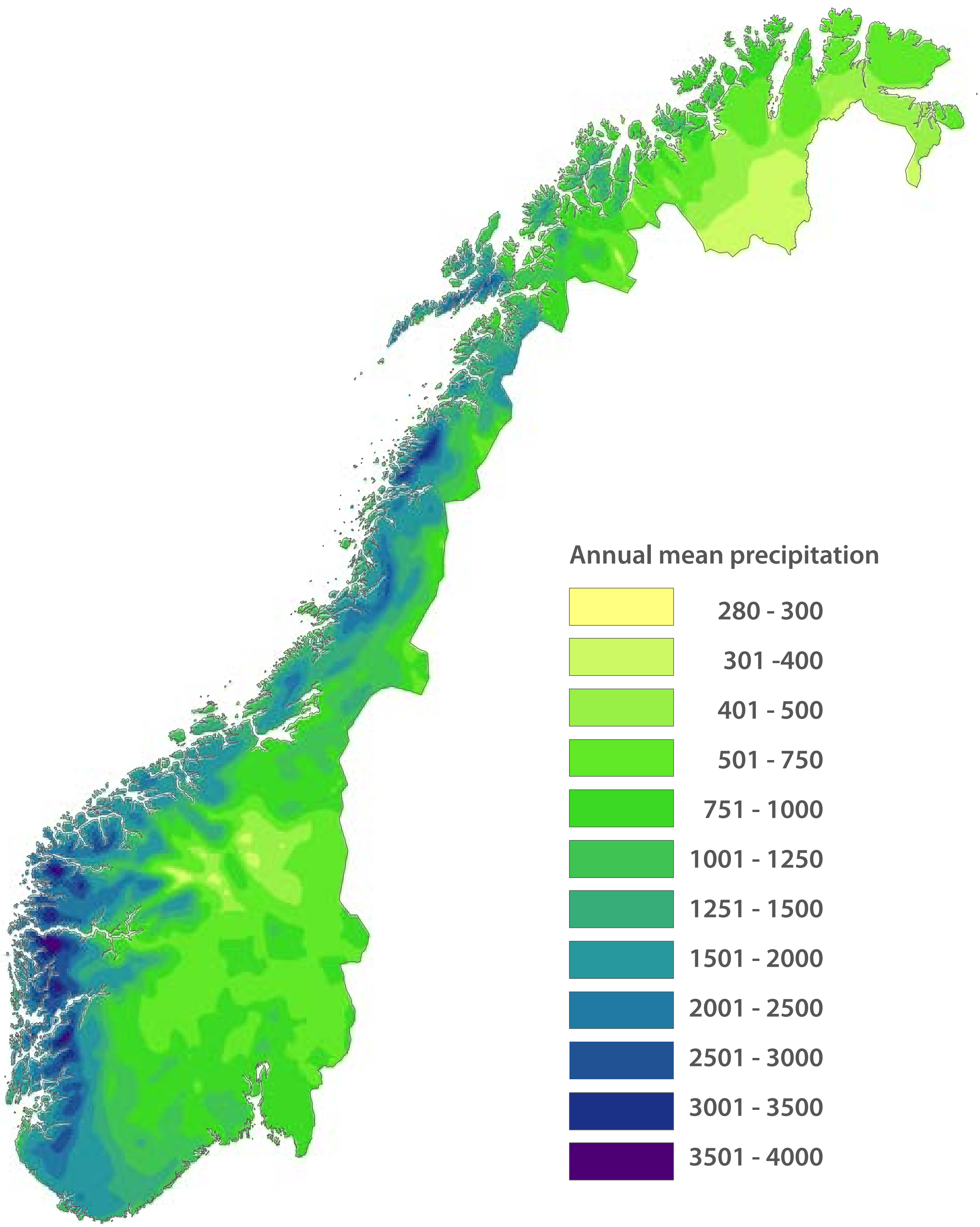
1. Nordli, Ø. et al., accepted by Polar Research, 2013

2.1 ANNUAL MEAN TEMPERATURE IN NORWAY 1961-1990, °C



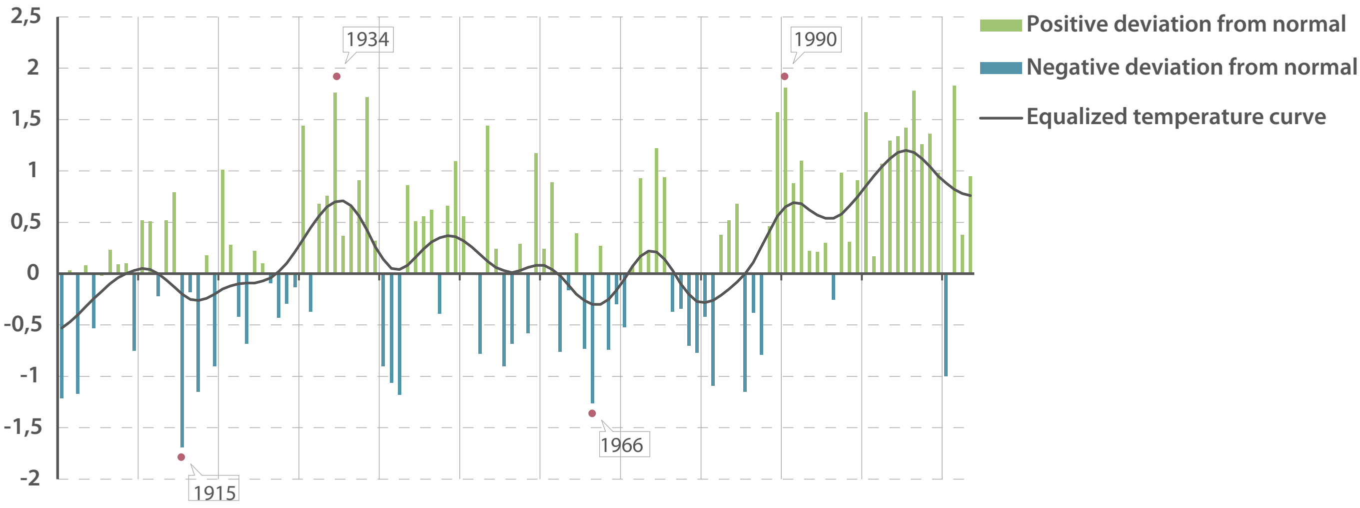
SOURCE: Norwegian Meteorological Institute

2.2 ANNUAL MEAN PRECIPITATION IN NORWAY 1961-1990, mm



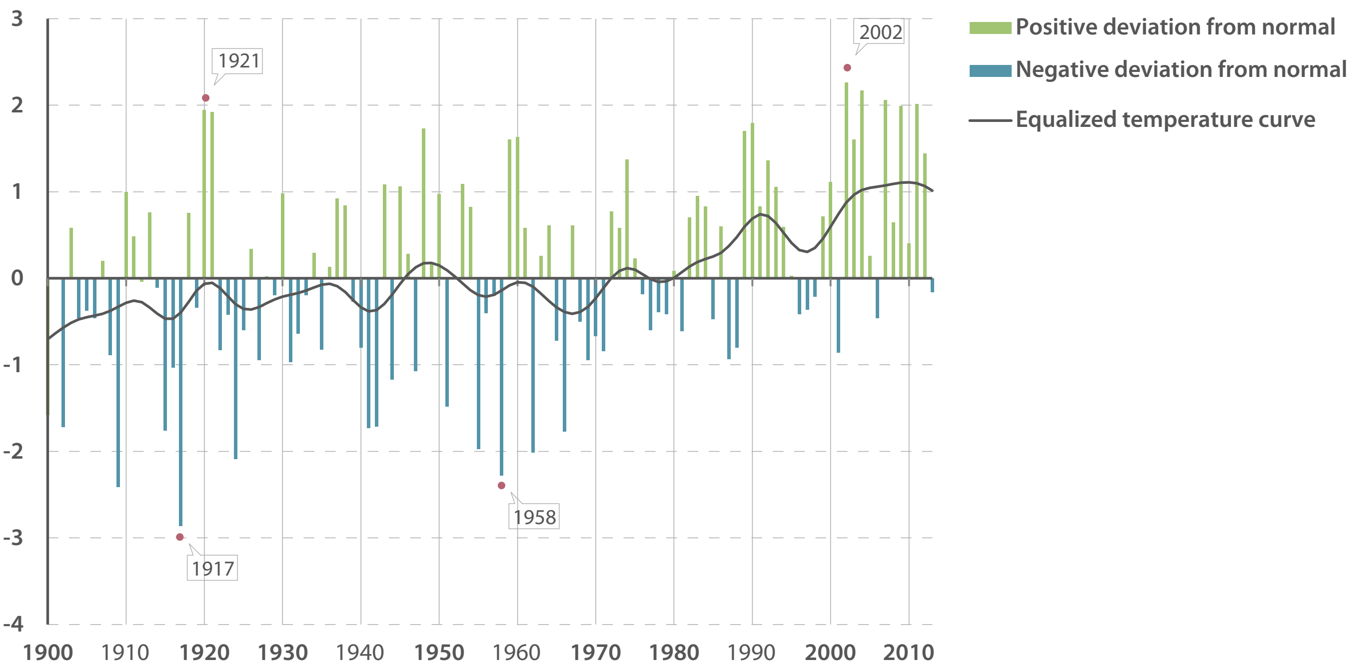
SOURCE: Norwegian Meteorological Institute

2.3 ANNUAL TEMPERATURES IN NORWAY FROM 1900-2012, DEVIATION FROM THE 1961-1990 NORMAL



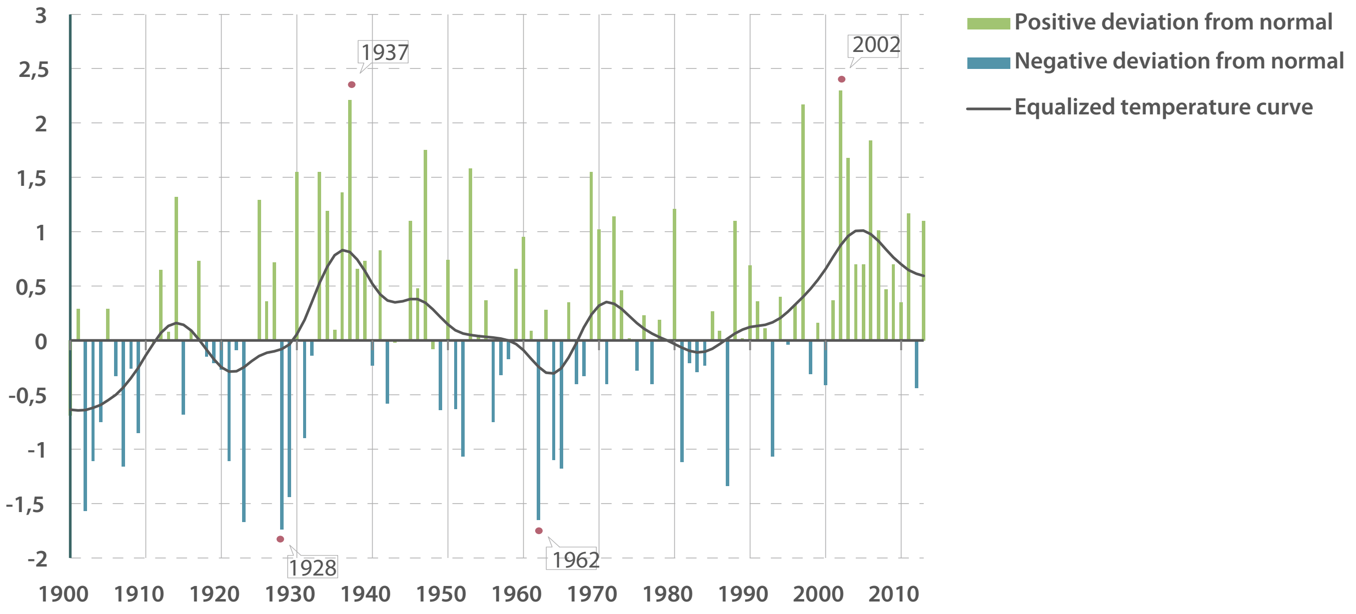
SOURCE: eKlima.no

2.4 SPRING TEMPERATURES IN NORWAY 1900-2012, DEVIATION FROM THE 1961-1990 NORMAL



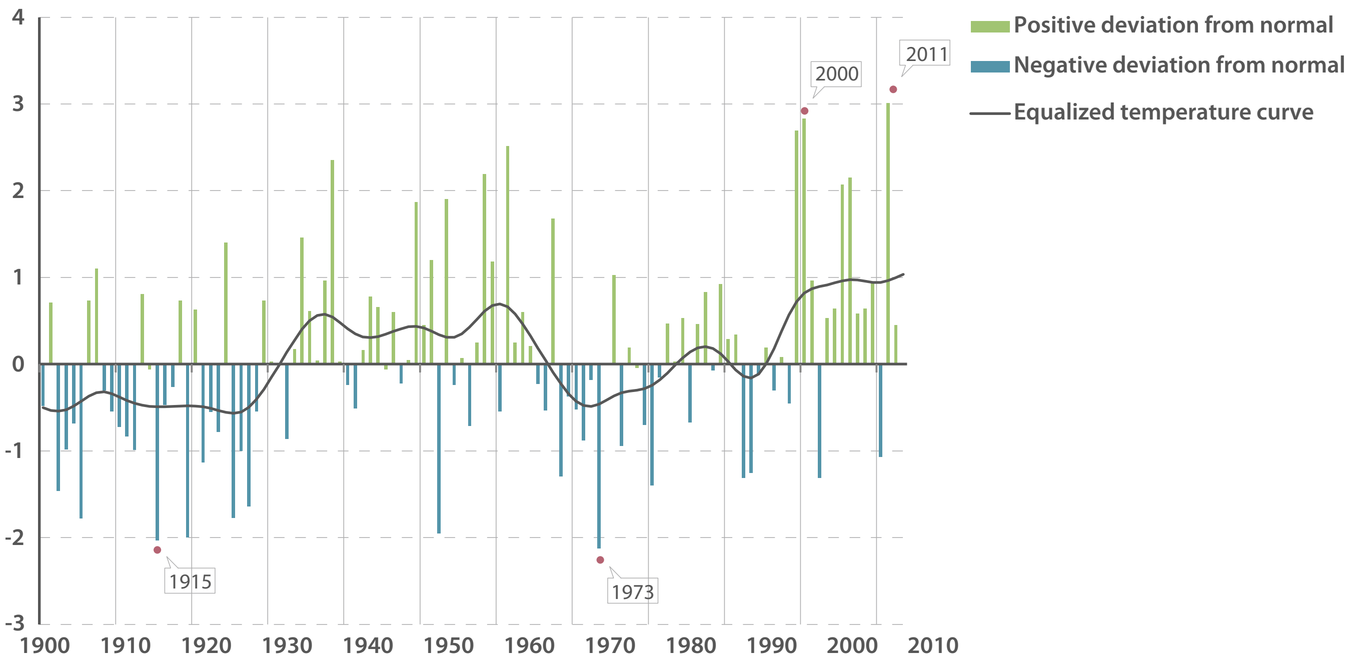
SOURCE: eKlima.no

2.5 SUMMER TEMPERATURES IN NORWAY 1900-2012, DEVIATION FROM THE 1961-1990 NORMAL



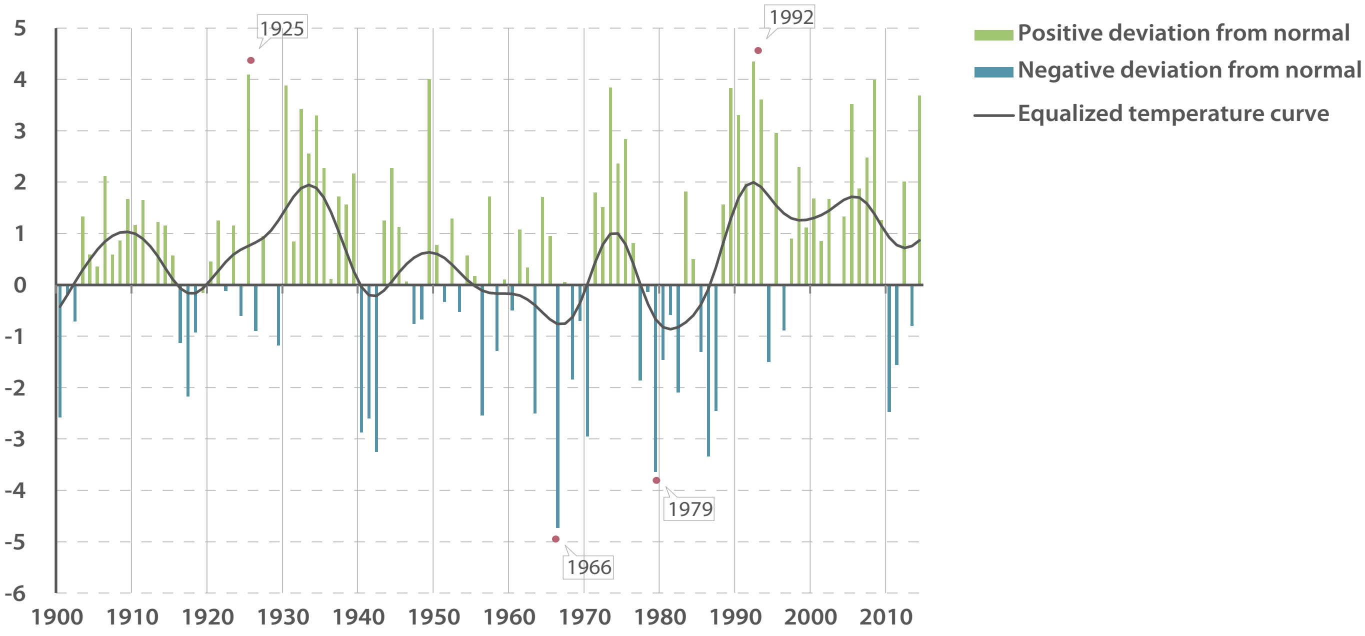
SOURCE: eKlima.no

2.6 AUTUMN TEMPERATURES IN NORWAY 1900-2012, DEVIATION FROM THE 1961-1990 NORMAL



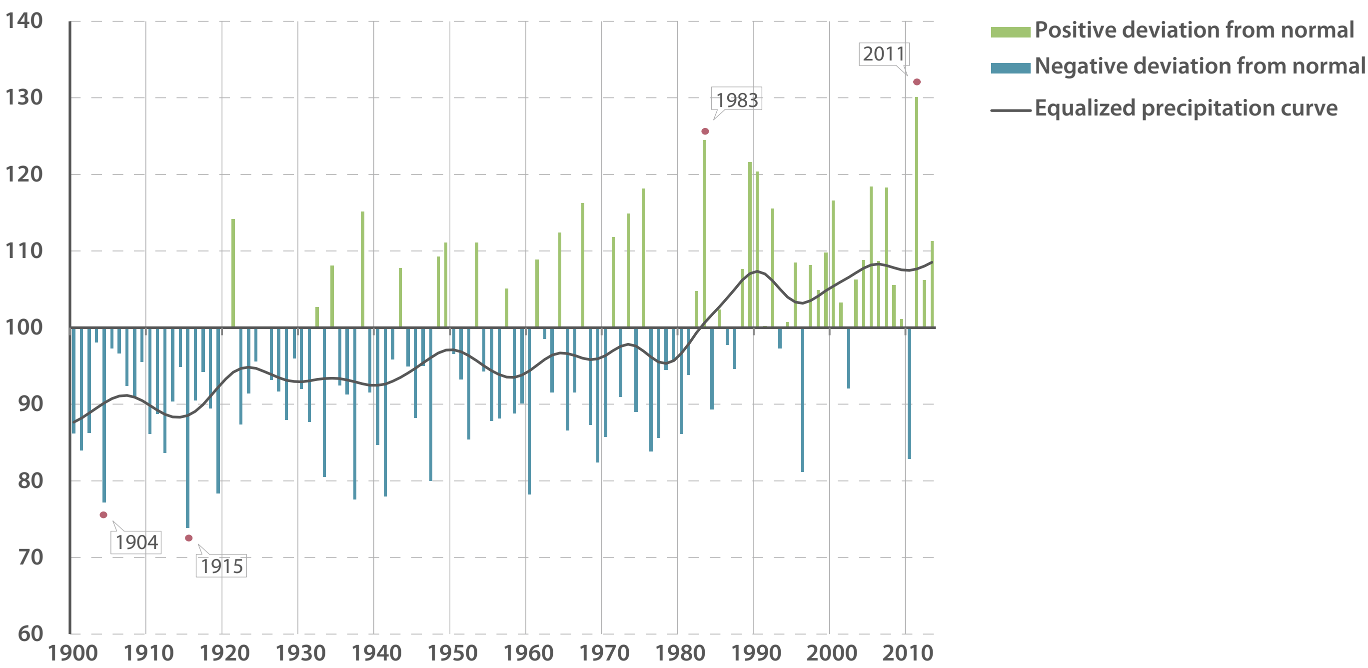
SOURCE: eKlima.no

2.7 WINTER TEMPERATURES IN NORWAY 1900-2012, DEVIATION FROM THE 1961-1990 NORMAL



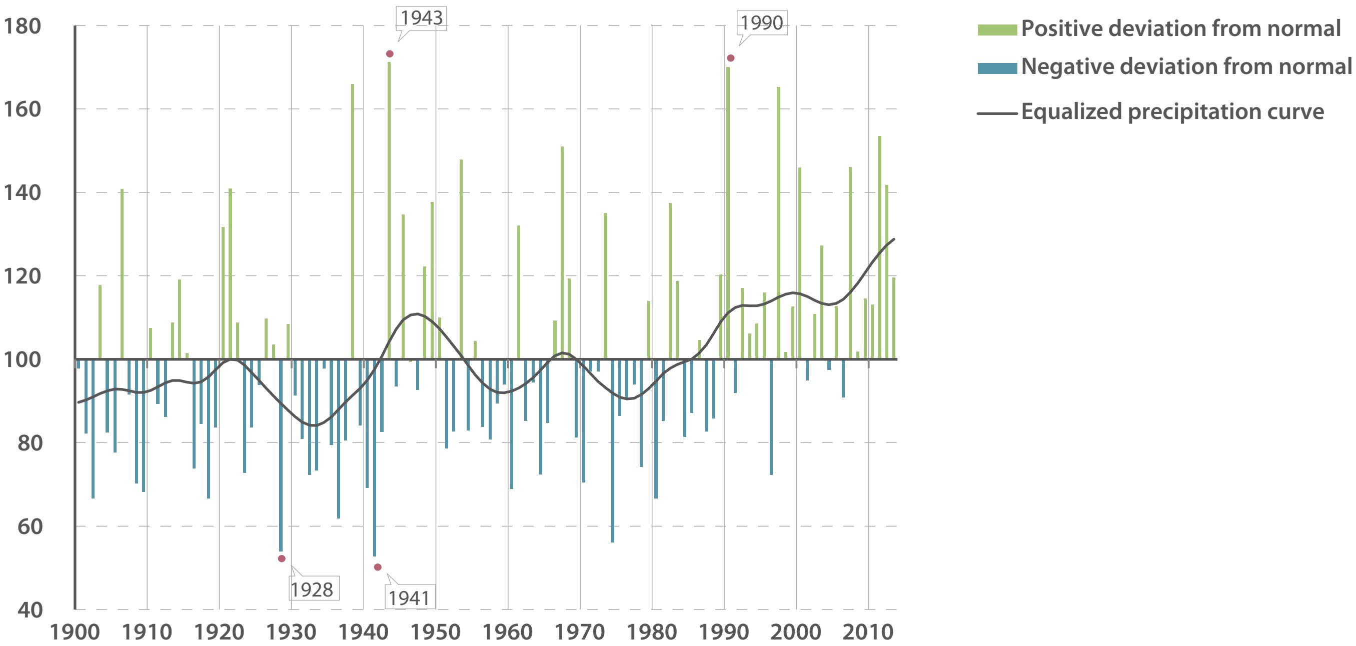
SOURCE: eKlima.no

2.8 ANNUAL PRECIPITATION IN NORWAY 1900-2012, PERCENT OF THE 1961-1990 NORMAL



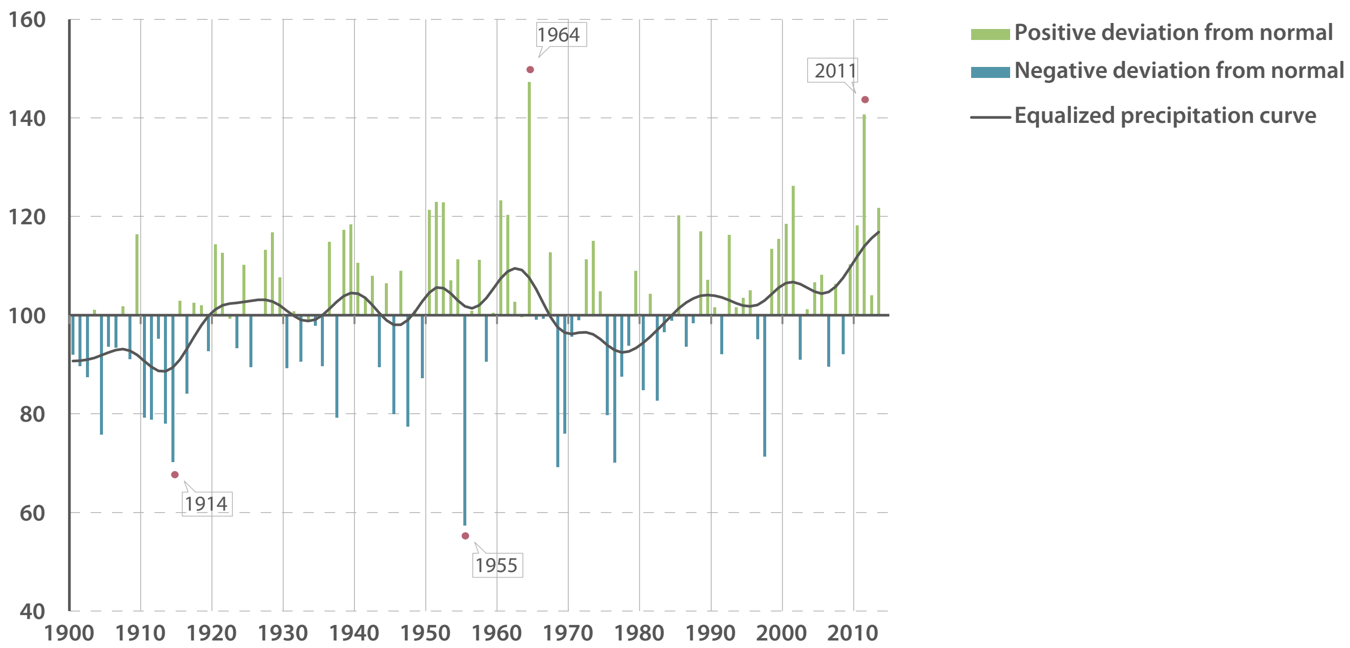
SOURCE: eKlima.no

2.9 SPRING PRECIPITATION IN NORWAY 1900-2012, PERCENT OF THE 1961-1990 NORMAL



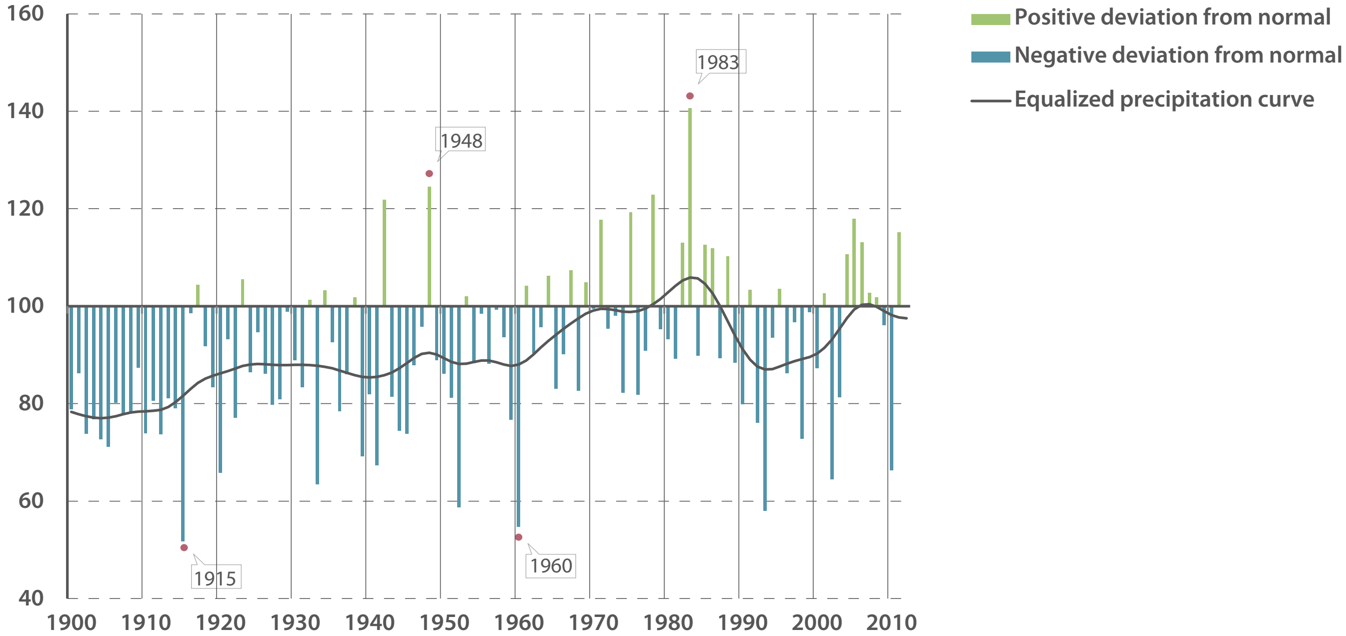
SOURCE: eKlima.no

2.10 SUMMER PRECIPITATION IN NORWAY 1900-2012, PERCENT OF THE 1961-1990 NORMAL



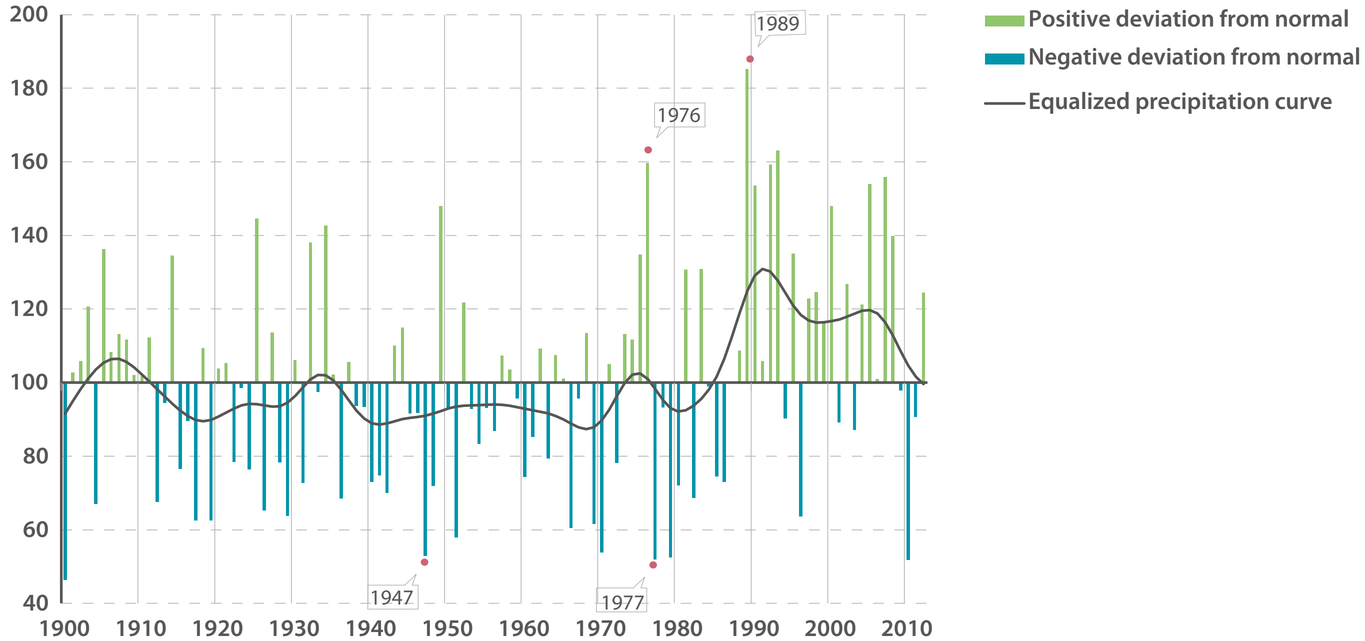
SOURCE: eKlima.no

2.11 AUTUMN PRECIPITATION IN NORWAY 1900-2012, PERCENT OF THE 1961-1990 NORMAL



SOURCE: eKlima.no

2.12 WINTER PRECIPITATION IN NORWAY 1900-2012, PERCENT OF THE 1961-1990 NORMAL



SOURCE: eKlima.no

way's population lived in urban settlements. The number of large urban settlements is small – only 21 had more than 20 000 residents. Only six areas – Oslo, Bergen, Stavanger/Sandnes, Trondheim, Fredrikstad/Sarpsborg and Drammen – have more than 100 000 residents. In 2012, 35 per cent of Norway's population lives in the six largest city areas.

2.4 Economic profile and industry

Norway is a small, open economy. Exports constitute about 40 per cent of GDP. Together with foreign shipping, the production of crude oil and natural gas and account for 25 per cent of GDP in Norway, but only a small proportion of employment, see Table 2.1. While the industrial sector is relatively small compared with that of many other countries, the service sector (private and public) accounts for more than half of GDP and over 75 per cent of employment. Some 30 per cent are employed in the public sector.

Norway has benefited much from the division of labour made possible by international trade. Owing to Norway's resource base and industrial structure it has to some degree been affected differently by the development of emerging economies than most other OECD countries. Since the late 1990s, rapidly growing demand, particularly from emerging economies in Asia, has raised the prices of important Norwegian export products. At the same time, imports have increasingly become focused on cheaper consumer goods from those countries. Accordingly, Norway's terms of trade improved by about 40 per cent from 2000 to 2013 (and by about 7 per cent if oil and gas exports are excluded). Hence, Norway's real disposable income has grown fast and resulted in high revenues for the state and companies and strong growth in real household earnings.

High growth also in mainland GDP has been supported by a marked increase in immigration to Norway following the

2.1 GDP AND EMPLOYMENT BY SECTOR IN 2013

	GDP NOK millions	Proportion	Employed 1000 persons	Proportion
Total	2,678,601	1.00	2,722	1.00
Primary industries	40,606	0.02	66	0.02
Offshore activity and foreign shipping	669,168	0.25	109	0.04
Manufacturing and mining	202,371	0.08	256	0.09
Electricity and water supply	69,788	0.03	28	0.01
Building and construction	167,368	0.06	209	0.08
Service activities	1,049,113	0.39	1,235	0.45
General government	480,188	0.18	817	0.30

Source: Statistics Norway.

expansion of the European Economic Area (EEA) in 2004. Since 2004, the population has grown by about 10 per cent and immigrants have accounted for two thirds of employment growth. Although this has helped to reduce imbalances in the labour market, it has also increased pressure on existing infrastructure. Along with low interest rates, immigration has contributed to high growth in demand for housing and the resulting rise in house prices. The enlargement of the EU has also increased uncertainty about future population trends.

The situation in the Norwegian economy differs from the situations of many of Norway's trade partners. Mainland Norway GDP recovered quickly after the financial crisis in 2008 and 2009, and in 2012 economic growth in the mainland economy clearly exceeded the average for the last 40 years. Despite weak international development, strong demand from the petroleum industry and higher private consumption have contributed to sustained growth. Employment levels are higher than before the financial crisis, and unemployment is low.

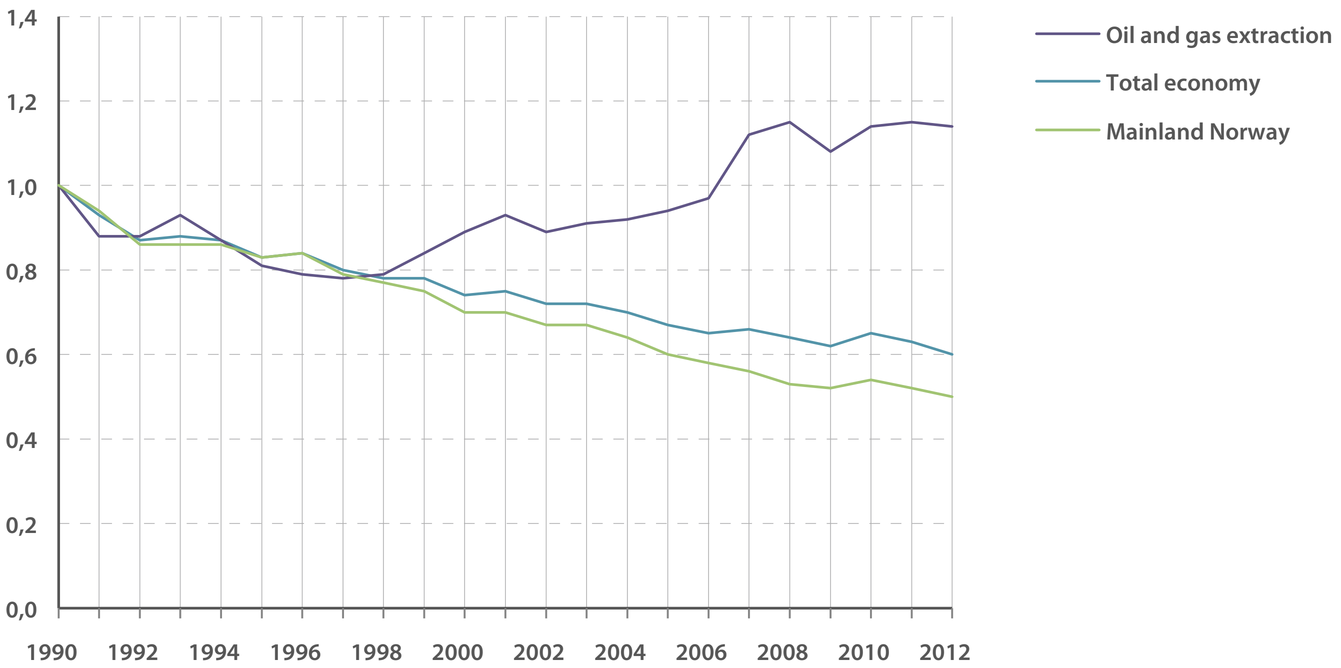
Demand from export markets has been weak since the financial crisis. Combined with high wage costs this has caused considerable difficulties for many businesses in industries traditionally exposed to foreign competition. Value creation by traditional industrial export businesses has declined markedly since 2008, and the tendency towards a bisected economy in terms of petroleum-related and other industries has grown. Exports of services have outperformed traditional goods exports in recent years.

Growth in mainland GDP abated towards the end of 2012 and at the beginning of 2013. The growth rate in mainland GDP increased by 2 per cent in 2013, a clear slowdown from 2012. A decline in hydropower generation, which represents the main source of electricity in Norway, dampened mainland GDP growth by 0.2 percentage points. The unemployment rate increased somewhat, from 3.2 per cent in 2012 to 3.5 per cent in 2013. In the amendments to the State budget 2014, mainland GDP growth is expected to be 2.5 per cent in 2014 and it is estimated that unemployment will remain stable at around 3.5 per cent of the labour force, ½ percentage point lower than the average for the last 25 years.

Norway accounts for around 0.1 per cent of global greenhouse gas emissions. Despite strong economic growth and immigration, Norway's greenhouse gas emissions have decreased in recent years. Norway's emissions totalled 53.4 million tonnes of CO_2 equivalents in 2011, excluding LULUCF. With the exception of 2009, when emissions fell as a result of low economic activity, emissions have not been so low since 1997.

Emission intensity fell by 2.3 per cent annually from 1990 to 2012 (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. Higher energy costs, for example as a result of taxes or quotas on emissions, reinforce this trend. Norway introduced a CO_2 tax as early as 1991. This tax has subsequently been supplemented by the participation of Norwegian businesses 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

2.14 EMISSION INTENSITY, INDEX 1990=1



SOURCES: Statistics Norway/Norwegian Environment Agency

instruments has contributed to the significant decline in emission intensity.

2.5 The petroleum sector

Petroleum activities have been crucial for Norway's financial growth, and in financing the Norwegian welfare state. Over more than 40 years, petroleum production on the shelf has added more than NOK 9,000 billion to the country's GDP. In 2013, the petroleum sector (not including services) represented more than 22 per cent of the country's total value creation.

Currently, 76 fields are in production on the Norwegian continental shelf. In 2012, these fields produced about 1.9 million barrels of oil (including Natural Gas Liquids (NGL) and condensate) per day, and about 115 billion standard cubic metres (Sm^3) of gas, giving Norway a marketable petroleum production totalling 226 million Sm^3 of oil equivalents (o.e.). Norway was ranked as the seventh largest oil exporter and the fourteenth largest oil producer in the world in 2011.

Since the start of the petroleum activities on the Norwegian continental shelf, vast amounts have been invested in exploration, field development, transport infrastructure and onshore facilities. The investments in 2012 amounted to nearly 29 per cent of the country's total fixed capital investments.

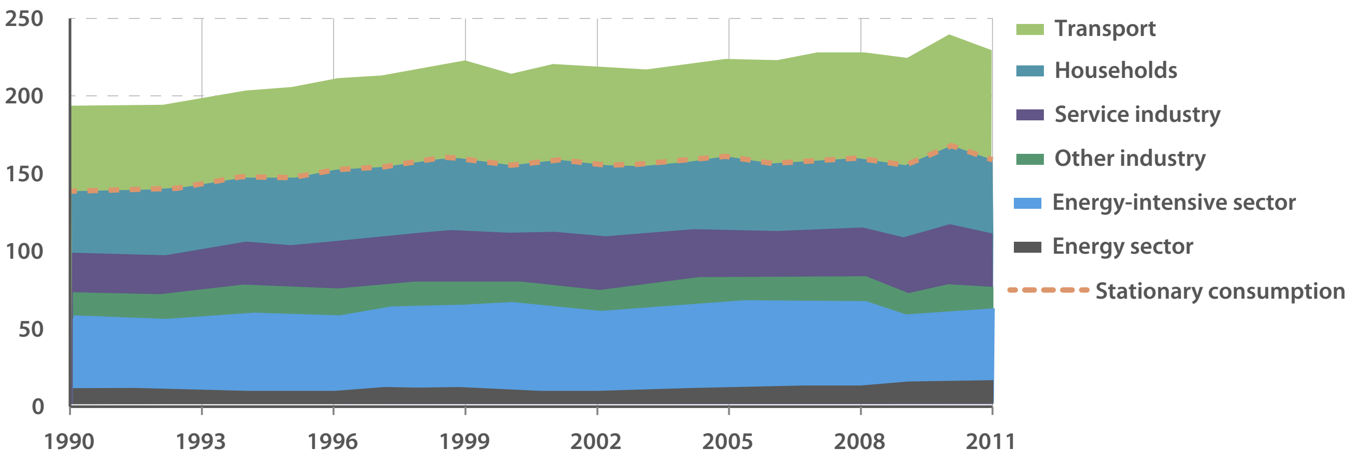
Following several years of decline in total petroleum production, it is expected that production will increase slightly in the coming years, before ebbing off again in a more long-term perspective. The relative proportion between production of gas and oil, including NGL and condensate, is expected to remain stable in the future. Over the longer term, the number of new discoveries and their size will be decisive for the production level. So far, about 44 per cent of the estimated total recoverable resources on the Norwegian continental shelf have been produced. The remaining recoverable resources on the shelf constitute a significant potential for value creation for years to come.

Environmental and climate considerations have always been an integral part of the Norwegian petroleum activities. A comprehensive policy instrument scheme safeguards environmental and climate considerations in all phases of the petroleum activities, from licensing rounds to exploration, development, operation and cessation. Emissions to air from the petroleum sector are generally exhaust gases from combustion of natural gas in turbines, flaring of natural gas and combustion of diesel. The flue gas contains e.g. CO_2 and NOx. Other emissions include nmVOC, methane (CH_4) and sulphur dioxide (SO_2).

Nationally, the petroleum activities accounted for about 29 per cent of CO_2 emissions in 2011, which corresponds to 13.0 million tonnes CO_2 equivalents[2]. Updated information on production and emissions in the petroleum sector indicates that emissions from the petroleum sector are estimated to increase until about 2017, and then gradually decrease. The development must be seen in context with the expected production of oil and gas on the Norwegian shelf. Recent developments on the Norwegian continental shelf have headed towards more mature fields and longer distances for gas transport. Processing and transport of produced gas is more energy-intensive than production and transport of liquids. Gas production has accounted for an increasing share of emissions on the Norwegian continental shelf. In addition, the gas fields' reservoir pressure is decreasing. Several major

2. Preliminary numbers for 2012 estimates emissions form petroleum activity to 13.7 million tonnes CO_2 equivalents.

2.15 ENERGY CONSUMPTION BY CONSUMER GROUPS, Twh



SOURCE: Statistics Norway/Norwegian Water Resources and Energy Directorate oil fields have been discovered in recent years and have been scheduled for development.

The petroleum sector was the main source of nmVOC emissions in Norway up to 2009 when the solvent industry became the primary source. The emissions of nmVOCs from the petroleum activities are mainly from storage and loading of crude oil offshore. Minor emissions also occur at the gas terminals. In 2012 the nmVOC emissions from the sector was 29,500 tonnes. The emissions of nmVOC from the petroleum sector have been substantially reduced since 2001 and the projections indicate a continued low level in the years ahead. Measures for limiting emissions resulted in a decline in excess of 92 per cent from 2001 to 2011, which is the main reason why the Norwegian nmVOC emissions are well below the targets in the Gothenburg Protocol. The primary cause of the emission reductions is the implementation of emission reducing technologies.

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 hydropower, and the proportion of energy use accounted for by electricity is considerable higher than in most other countries. Norwegian energy consumption per capita is somewhat higher than the OECD average. From 1990 to 2011, CO_2 emissions from energy use and electricity production increased by 8.4 per cent. However, emissions did not increase at the same rate as economic growth in Norway.

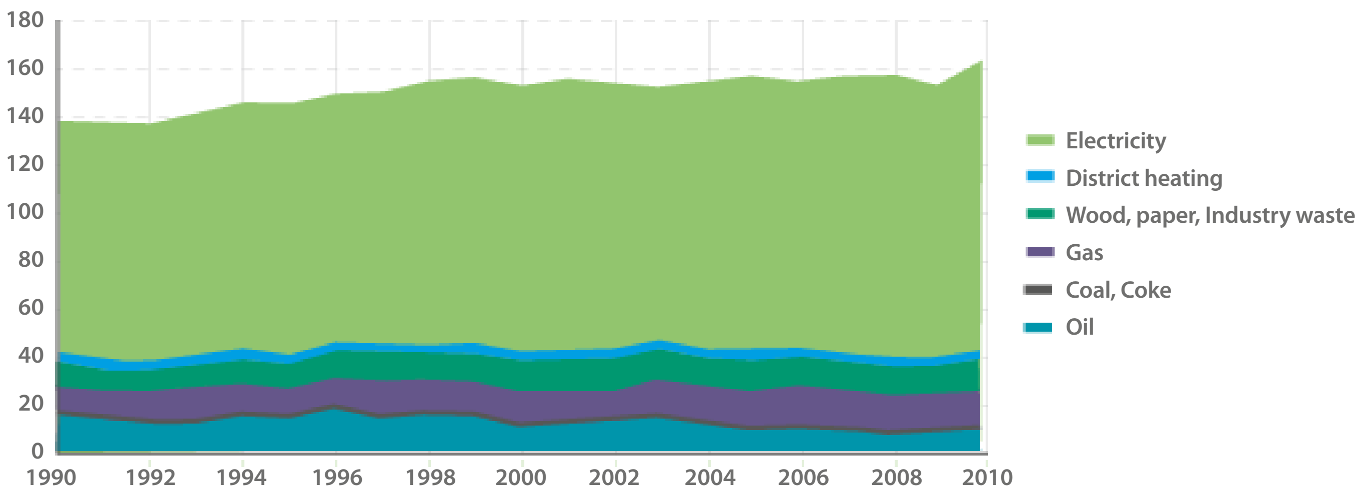
From 1990 to 1998, stationary energy consumption[4] increased by 10 per cent. Consumption has since remained relatively stable. In 2011, stationary energy consumption in Norway amounted to slightly more than 150 TWh.

Electricity accounts for the largest share of stationary energy consumption, around 70 per cent, a significantly higher share

3. Excluding the petroleum sector

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

2.16 STATIONARY ENERGY CONSUMPTION BY ENERGY CARRIER 1990 - 2010, Twh



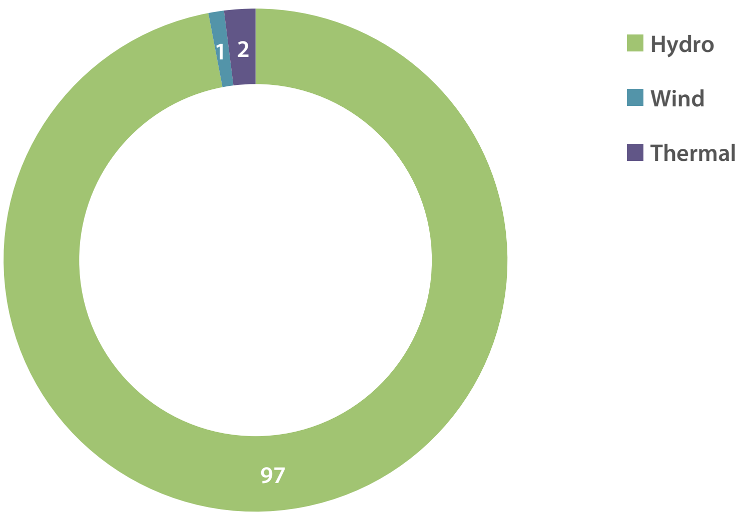
SOURCE: Statistics Norway

than in other countries. An important reason for the high percentage of electricity in overall energy consumption is the large energy-intensive industry in Norway. In addition, electricity is used to heat buildings and water to a greater extent than in other countries.

The share of oil products used in stationary energy consumption has decreased since the 1990s. The consumption of coal and coke has gradually declined in recent years, while consumption of biomass, gas, and district heating has increased.

District heating has been established or is under development in most major cities in Norway. In many cases, district heating plants are constructed as a result of access to a heat source such as heat from waste combustion or other heat which would otherwise be wasted. Waste is the most important energy source in district heating production, but bioenergy, heat pumps, electricity, natural gas and oil are also used.

2.17 ELECTRICITY PRODUCTION IN NORWAY BY SOURCE IN 2012



SOURCE: Statistics Norway

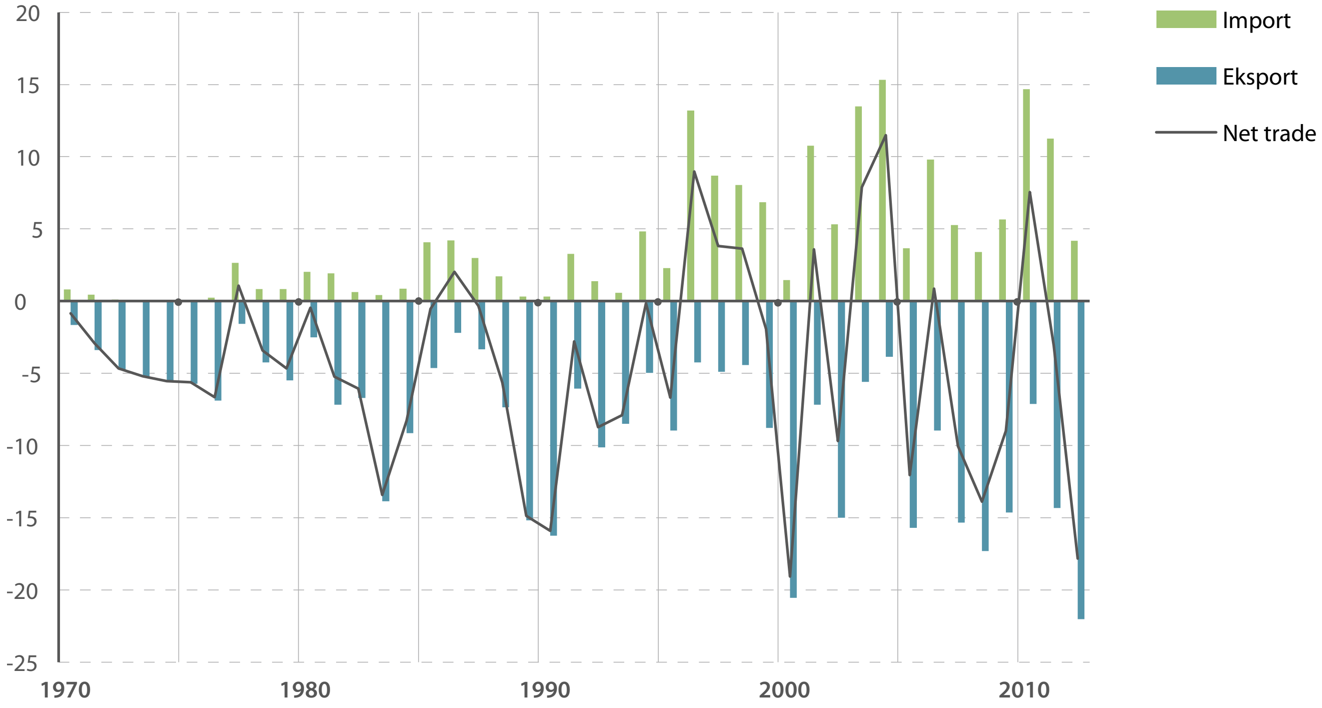
Of production of district heating in 2012, 53 per cent was based on heat from waste combustion (about half of this was bio-based waste), 23 per cent from biomass, 13.5 per cent electricity, 2.7 per cent oil, 4.8 per cent natural gas, and 3 per cent was based on waste heat.

Consumption of district heating in 2012 totalled 4.2 TWh. Since the year 2000, the consumption of district heating has increased by almost 3 TWh. District heating accounts for about 3 per cent of energy consumption in stationary energy consumption. In 2012, 67 per cent of district heating was used within the service sector, while households accounted for about 22 per cent and industry 11 per cent.

The total installed electricity production capacity in Norway was 31,814 MW in 2012. Of this, installed capacity in hydropower plants was 30,172 MW, wind farms 512 MW and gas-fired and other thermal power plants 1,130 MW. Norway also has two backup gas-fired power plants with an installed capacity totalling 300 MW. These plants can only be used in special situations and require permits from the Norwegian authorities.

The water inflow available for hydropower production will vary from year to year, and therefore affect the total electricity production. At the start of 2012, Norwegian hydropower production in a normal year was calculated at 130 TWh. This was calculated on the basis of installed capacity and expected annual inflow in a year with normal precipitation. Over the last 20 years, the annual inflow to the Norwegian hydropower plants has varied by about 60 TWh. In 2003, which was a dry year with low inflow, hydropower production amounted to 106 TWh, which was the lowest hydropower production since 1996.

2.18 ANNUAL IMPORT AND EXPORT OF POWER AND NET POWER TRADE, 1970-2012, TWh



SOURCE: Statistics Norway

In 2012, which was a year with relatively high water inflow, Norwegian electricity production totalled 148 TWh in 2012. Of this, approximately 143 TWh was produced in hydro power plants, 1.5 TWh in wind-power plants and 3.4 TWh in gas-fired power plants and other thermal power plants.

The electricity production from thermal power plants in Norway also varies from year to year. Market conditions will determine the production from gas-fired power plants. Some of the thermal power plants are closely linked to other industrial facilities. The production from these plants will therefore depend on the activity of these facilities.

Norway is a part of the Nordic power market, and has transmission interconnectors to Sweden, Denmark, Finland, Russia and the Netherlands. The total trading capacity on these interconnectors is currently about 5,400 MW. The power exchange between Norway and other countries is determined by the generation and consumption conditions in each country. The figure below shows that Norway has been a net exporter of power for most years, but has been a net importer in certain years, such as in 2010. The power normally flows in both directions over the course of a year/month/week/day.

2.7 Transport

Norway's decentralised settlement pattern 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.

About 28 per cent of the total Norwegian greenhouse gas emissions originated from transport in 2011. Road traffic was responsible for most of these emissions (19 per cent of total emissions in Norway in 2011), while domestic civil aviation navigation, railways and other means of transport[5] were responsible for the rest. In the period from 1990 to 2011, greenhouse gas emissions from road transport increased by almost 30 per cent, domestic aviation by 77 per cent and domestic maritime transport by 22 per cent. Since 2007, emissions from the transport sector have been stable. Strong measures to curb emissions have contributed to a flattening out of emission growth.

2.8 Manufacturing industries and construction

Emissions from the manufacturing industries and construction sector include industrial emissions originating to a large extent in the production of raw materials and semi-manufactured goods. The sector includes several sub-sectors e.g. iron and steel, non-ferrous metals, chemicals, fertilisers, pulp and paper, mineral industries, food processing industries, building and construction industry. The major emissions from this sector are related to fuel combustion, that is, emissions from use of oil, gas and coal for heating purposes.

Emissions from fuel combustion from this sector contributed 6.3 per cent to the total greenhouse gas emissions in 2011. Emissions from the sector decreased by 6.5 per cent from 1990 to 2011.

2.9 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 37 per cent of the land area is forested. The area under agricultural cultivation has declined by approximately 2 per cent during the last decade. There has also been a shift from harvested land to grazing land.

Agriculture

Agriculture is estimated to account for about 8 per cent of Norway's emissions of greenhouse gases. This includes agricultur-related emissions of CO_2 from the use of fossil fuels, but is particularly associated with methane and nitrogen oxide from animal husbandry, fertilisation and soil management. The agricultural emissions have been reduced by approximately 10 per cent the last decade.

Forestry

Forest and wooded land cover about 12 million hectares and constitute 37.4 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).

5. Includes CRF key categories 1 A4 (stationary combustion in agriculture, forestry, fishing commercial and institutional sectors and households, motorised equipment and snow scooters in agriculture and forestry, and ships and boats in fishing and fuel used in stationary and mobile military activities)

Norway has long traditions in forestry and forest management, and for using wood in construction and as a source of energy. Sawn wood and round wood have been important export articles for more than 500 years.

Roughly 88 per cent of the forest area is privately owned, with many small properties. In 2011 there were 131,800 forest holdings in Norway with more than 2.5 hectares of productive forest land. The majority of the forest holdings are farm and family forests. Owing to the ownership structure and specific terrain conditions, Norwegian forestry is diversified and characterised by small-scale activity. The average size of clear-cuttings is estimated to be 1.4 hectares. During the last 80 years the annual harvest level has been quite stable around 10 mill m3 (8-13 mill m3) per year. This is considerably lower than the annual increment, resulting in both growing stock and an annual increment exceeding twice the level documented by the first National Forest Inventory in the 1930's. The annual increment in Norway is now approximately 25 million m3.

2.10 Fisheries and aquaculture

In 2011, emissions from fishing activities amounted to 1.5 million tonnes of CO_2 equivalents, an increase of 5 per cent since 1990.

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, the consumption of seafood worldwide has been set 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 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, optimising feed use and feed composition play an important part in reducing the climate impact of salmon aquaculture products.

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 1990-2011 was submitted to the UNFCCC Secretariat 12 April 2013. The CRF tables were resubmitted to the UNFCCC on the 11 November 2013 and the summary tables in Annex 1 (which are also the Biennial Report's Common Tabular Format (CTF) table 1) are from the resubmitted CRF tables. Text, tables and figures from the NIR are highlighted in this chapter and there are therefore some minor differences compared with the numbers in the resubmitted CRF tables.

The NIR covers emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorcarbons (PFCs), sulphur hexafluoride (SF_6) and hydrofluorcarbons (HFCs) from 1990 to 2011.

Table 3.1 presents emission figures for all greenhouse gases, expressed in absolute emission figures and total CO_2 equivalents. The total emissions of greenhouse gases, measured as CO_2 equivalents, were about 53.4 million tonnes in 2011. 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 million tonnes in 2007. Between 1990 and 2011 the total greenhouse gas emissions increased by almost 3 million tonnes, or by 6 per cent.[1]

The net greenhouse gas emissions including all sources and sinks amounted to 25.8 million tonnes in 2011. The total contribution from different sources from 1990 to 2011 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 mainly 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 2011 the net greenhouse gas removals in the LULUCF sector was 27.6 million CO_2 equivalents, which would offset around half of the total greenhouse gas emissions in Norway that year. The average annual net removals from the LULUCF sector was about 20.4 million tonnes of CO_2 equivalents for the period 1990-2011. The calculated changes in carbon stocks

1. Unless specified, all figures and tables are without the LULUCF sector.

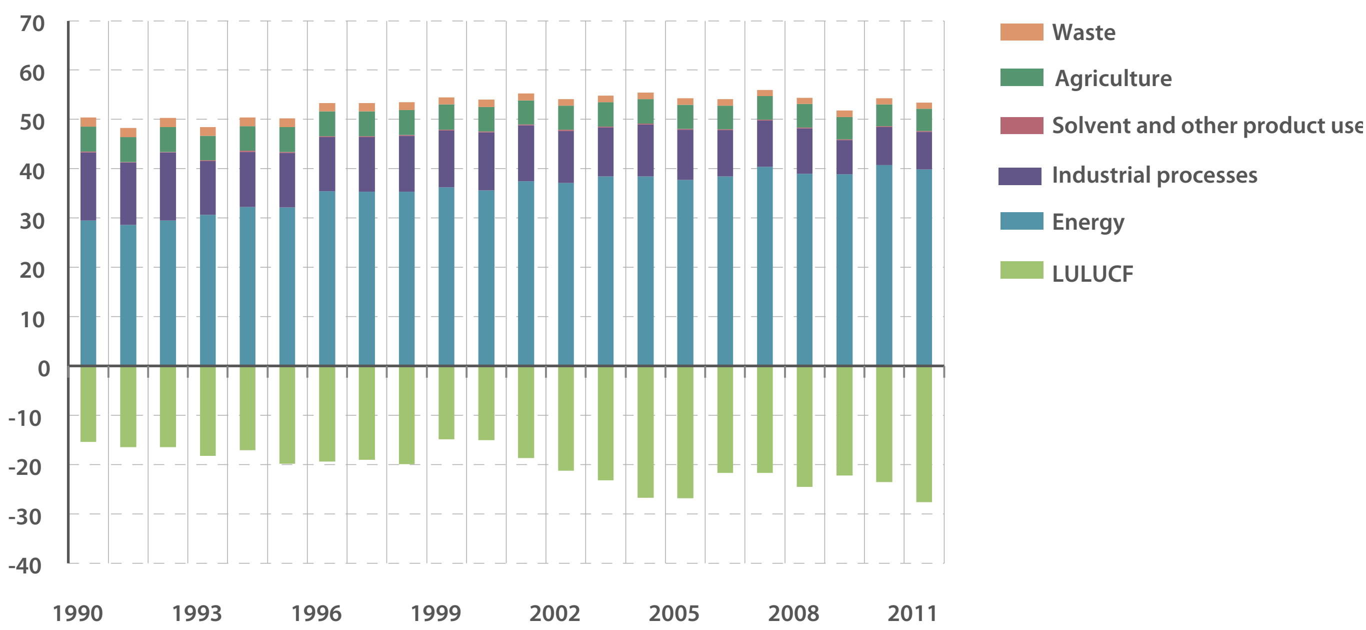
depend upon several factors such as growing conditions, harvest levels, age-class effects and land use changes. In particular, variations in annual harvest will in the short term directly influence the variations in changes in carbon stocks and dead organic matter. For more information on the annual variation in CO_2 removals on forested land, please see 7.1.1 of the Norwegian National Inventory Report 2013.

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 CO_2 from most sources have increased, emissions of other greenhouse gases have decreased, (cf. Figure 3.3.) Norway has experienced strong economic growth since 1990. This partly explains the general growth in CO_2 emissions. In addition, the offshore petroleum sector has expanded significantly during the past 20 years. Both these factors have led to increased use of fossil fuels, and consequently higher CO_2 emissions. In 2011 emissions decreased by almost 2 per cent, but were still 6 per cent above the 1990-level. There are indications that we are seeing the start of a reduction in emissions. Preliminary figures for 2012 show the lowest level of emissions since 1995, apart from 2009, when emissions were lower owing to the financial crisis. The emissions in 2011 by gases are illustrated in Figure 3.4.

3.1.2 Emissions of CO_2

The emissions of CO_2 in 2011 were amounted to 44.7 million tonnes. These emissions originated from the source categories energy (86 per cent), industrial processes (almost 14 per cent) and solvents (0.3 per

3.1 TOTAL EMISSIONS AND REMOVALS BY UNFCCC SOURCE CATEGORIES, MTONNES CO2 EQUIVALENTS



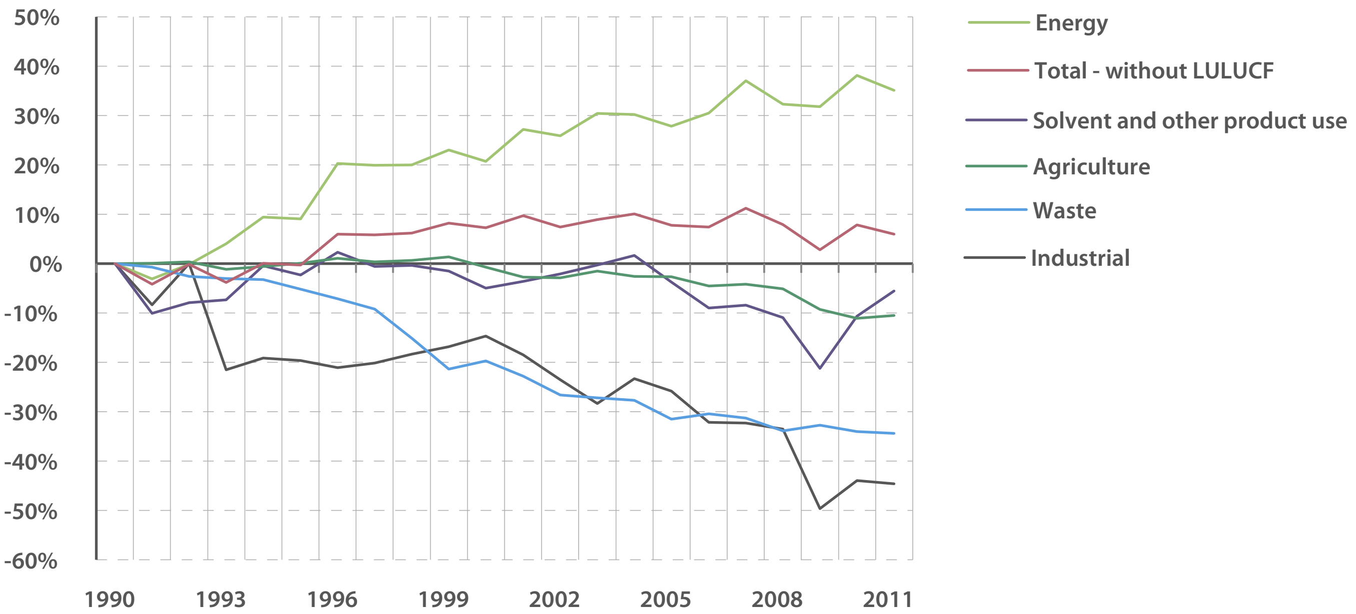
SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

3.1 EMISSIONS OF GREENHOUSE GASES IN NORWAY DURING THE PERIOD 1990-2011. UNITS: CO_2 AND CO_2 EQ. IN MTONNES (MT), CH_4 AND N_2O IN KTONNES (KT) AND OTHER GASES IN TONNES (T)

	CO_2	CH_4	N_2O	PFC			SF_6	HFC									Total without LULUCF
				CF_4	C_2F_6	218		23	32	125	134	134a	143	143a	152a	227ea	Mt CO_2 eq.
Year	Mtonnes	ktonnes	ktonnes	tonnes			tonnes	tonnes									
1990	34.8	239.5	15.9	467.4	36.2	0.0	92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	50.4
1991	33.4	240.4	15.4	416.5	31.0	0.0	87.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.6	0.0	48.3
1992	34.2	244.2	13.6	321.6	21.4	0.0	29.5	0.0	0.1	0.1	0.0	13.6	0.0	0.0	0.8	0.0	46.5
1993	35.8	246.7	14.2	324.3	20.6	0.0	30.9	0.0	0.2	0.2	0.0	21.3	0.0	0.0	0.8	0.0	48.4
1994	37.7	250.2	14.5	286.9	18.3	0.0	36.7	0.0	0.3	1.4	0.0	28.9	0.0	0.6	0.9	0.0	50.4
1995	37.8	247.6	14.6	283.3	18.1	0.0	25.4	0.0	0.4	5.2	0.0	38.4	0.0	4.1	1.3	0.0	50.2
1996	41.0	249.0	14.7	258.5	16.2	0.0	24.0	0.0	0.6	9.0	0.0	46.2	0.0	6.8	1.4	0.1	53.4
1997	41.1	249.2	14.7	229.9	15.1	0.0	24.3	0.1	0.8	15.5	0.1	57.4	0.0	11.7	3.5	0.2	53.3
1998	41.4	242.2	14.8	209.8	13.3	0.0	30.4	0.1	1.1	20.6	0.1	70.1	0.0	15.4	6.1	0.2	53.5
1999	42.1	238.4	15.6	196.2	12.3	0.0	36.6	0.1	1.5	27.2	0.1	82.1	0.0	22.3	6.6	0.2	54.5
2000	41.8	240.8	14.8	186.4	11.6	0.0	39.1	0.1	2.0	34.8	0.1	90.3	0.0	28.7	8.3	0.2	54.0
2001	43.2	241.4	14.5	187.5	11.9	0.0	33.1	0.1	2.6	44.0	0.1	99.7	0.0	38.2	10.6	0.4	55.3
2002	42.3	235.1	15.2	201.3	14.0	0.0	10.0	0.1	3.3	54.8	0.1	115.9	0.0	47.2	10.6	1.4	54.1
2003	43.6	238.8	14.7	125.6	10.1	0.0	9.5	0.1	4.2	51.6	0.1	122.2	0.0	43.2	10.8	1.0	54.8
2004	44.1	237.0	15.2	122.1	9.4	0.0	11.6	0.1	5.1	55.0	0.1	128.7	1.1	46.0	23.1	1.1	55.4
2005	43.1	226.8	15.4	116.7	7.6	0.0	13.1	0.1	6.0	57.0	0.1	139.3	0.8	44.6	30.7	1.0	54.3
2006	43.5	221.5	14.4	102.1	8.6	0.0	8.9	0.1	7.9	63.0	0.1	158.5	0.8	47.9	34.3	0.9	54.1
2007	45.5	225.7	13.8	111.7	10.3	0.0	3.2	0.1	10.0	64.0	0.1	184.8	0.7	46.2	36.2	1.1	56.0
2008	44.4	219.1	12.3	104.7	10.0	0.0	2.7	0.1	12.4	68.6	0.1	218.4	2.8	51.7	35.3	0.8	54.3
2009	42.9	214.6	10.3	49.8	5.8	0.0	2.6	0.1	15.9	73.6	0.1	245.0	2.2	50.1	35.6	0.9	51.8
2010	45.5	215.3	9.8	27.3	3.0	0.0	3.2	0.1	19.6	94.1	0.1	280.1	1.9	69.2	40.0	0.7	54.3
2011	44.7	209.4	9.9	29.9	3.4	0.0	2.5	0.2	22.4	98.8	0.2	305.8	1.8	64.7	40.5	2.1	53.4

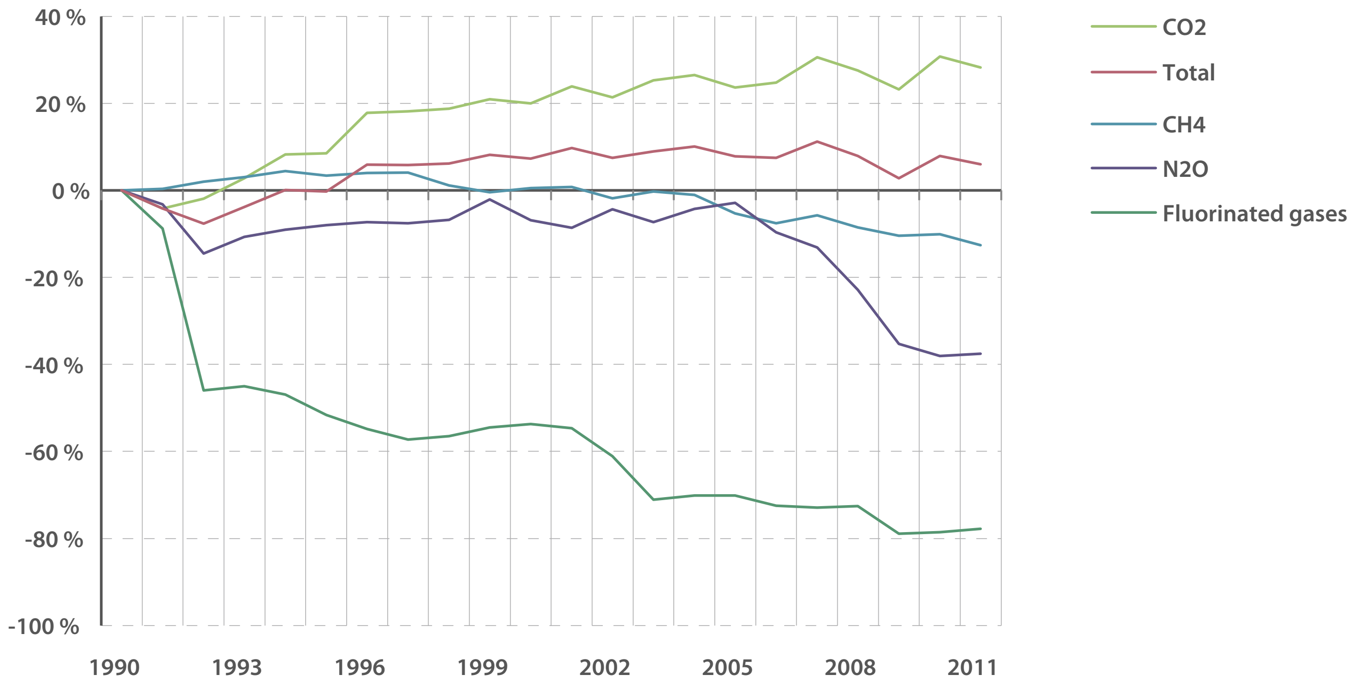
Source: Statistics Norway/ Norwegian Environment Agency

3.2 CHANGES IN TOTAL GREENHOUSE GAS EMISSIONS DURING THE PERIOD 1990-2011



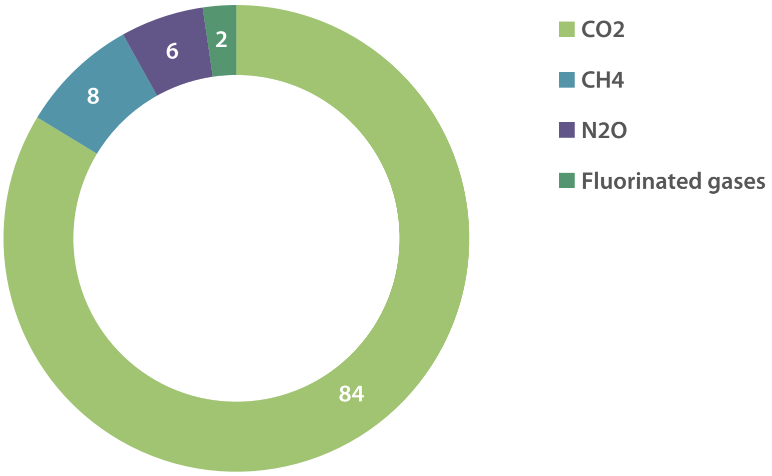
SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

3.3 CHANGES IN EMISSIONS OF GREENHOUSE GASES BY GAS IN NORWAY 1990-2011



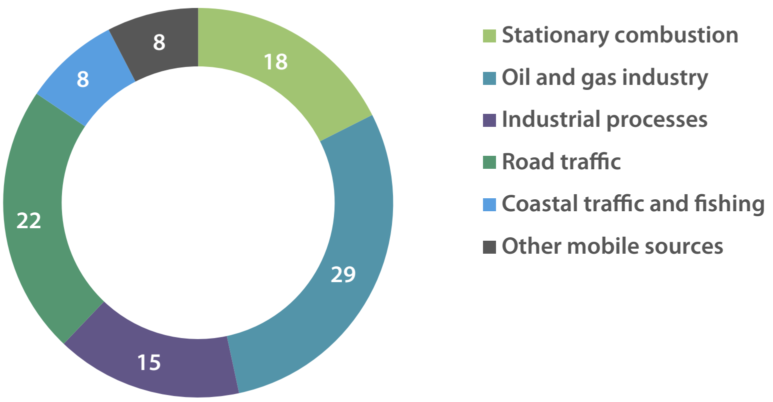
SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

3.4 DISTRIBUTION OF EMISSIONS OF GREENHOUSE GASES IN NORWAY BY GAS IN 2011



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

3.5 DISTRIBUTION OF CO2 EMISSIONS IN NORWAY BY SUB-CATEGORIES IN 2011



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

cent). The source category energy includes sub-categories such as oil and gas extraction, transport and stationary combustion. During the period from 1990 to 2011 the total emissions of CO_2 increased by 28 per cent, or by 9.8 million tonnes. This is mainly due to increases in emissions from oil and gas extraction and from transport, particularly from road traffic, civil aviation and coastal traffic and fishing. On the other hand, emissions from stationary combustion have decreased by 0.3 million tonnes CO_2 from 1990. The CO_2 emissions from the category industrial processes were stable during the period 1990-2011 since there was only a small increase of 0.1 million tonnes of CO_2.

Generation of electricity is almost exclusively based on hydropower which causes no emissions.

About 38 per cent of the total Norwegian CO_2 emissions originate from transport[2]. Of this, about 59 per cent originate from road transport. Since 1990 CO_2 emissions from this source have increased substantially. The growth has, however, stopped in recent years.

The petroleum sector emitted 13 million tonnes CO_2 in 2011 which was 29 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. In 2011 this accounted for 73 per cent. Other CO_2 emissions originate from onshore oil and gas terminals and indirectly from NMVOC emissions (process emissions). Total CO_2 emissions from the

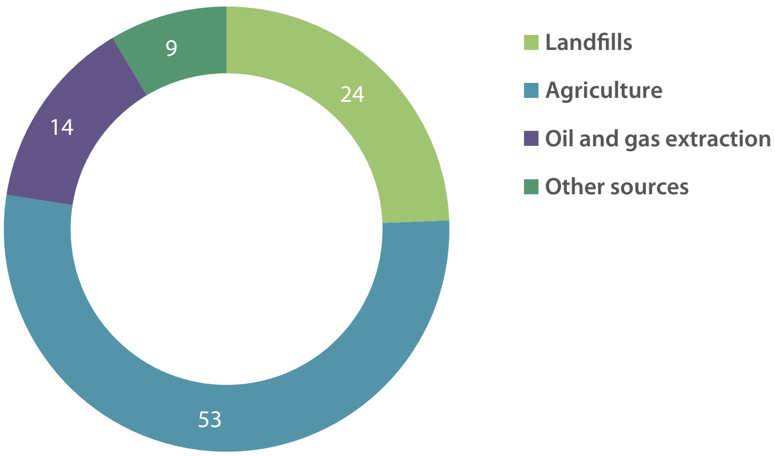
2. The transport sector includes road transport, civil aviation, navigation and fishing, railway and off road vehicles and other machinery.

3.2 CO_2 EMISSIONS FROM DIFFERENT SOURCE CATEGORIES FOR THE PERIOD 1990-2011. EMISSIONS IN MILLION TONNES OF CO_2.

Year	Stationary combustion	Oil and gas industry	Industrial processes	Road traffic	Coastal traffic and fishing	Other mobile sources	Total
1990	7.5	7.4	6.8	7.6	3.2	2.3	**34.8**
1991	7.0	7.3	6.2	7.6	3.0	2.2	**33.4**
1992	6.9	7.8	6.4	7.7	3.1	2.2	**34.2**
1993	7.1	8.2	6.9	8.2	3.2	2.1	**35.8**
1994	7.9	8.9	7.3	7.9	3.1	2.5	**37.7**
1995	7.4	9.1	7.4	8.1	3.2	2.6	**37.8**
1996	9.0	10.0	7.5	8.3	3.4	2.8	**41.0**
1997	8.3	10.4	7.6	8.3	3.7	2.8	**41.1**
1998	8.5	10.0	7.8	8.6	3.9	2.5	**41.4**
1999	8.1	10.6	7.8	8.5	4.1	3.0	**42.1**
2000	7.2	11.9	8.2	8.4	3.7	2.5	**41.8**
2001	7.5	12.8	7.8	8.9	3.5	2.7	**43.2**
2002	7.4	12.6	7.2	8.9	3.4	2.7	**42.3**
2003	8.2	12.9	7.4	9.1	3.4	2.5	**43.6**
2004	7.4	13.1	7.8	9.4	3.5	2.8	**44.1**
2005	6.9	13.2	7.4	9.6	3.4	2.6	**43.1**
2006	7.5	12.9	7.1	9.9	3.4	2.8	**43.5**
2007	7.3	14.2	7.2	10.1	3.5	3.1	**45.5**
2008	7.0	14.0	7.3	10.0	3.2	3.0	**44.4**
2009	7.7	13.0	6.0	9.8	3.5	2.9	**42.9**
2010	8.7	13.2	6.9	10.0	3.6	3.2	**45.5**
2011	7.8	13.0	6.9	10.0	3.5	3.4	**44.7**

Source: Statistics Norway/ Norwegian Environment Agency

3.6	DISTRIBUTION OF NORWEGIAN CH4 EMISSIONS IN 2011



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

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. Since 2007 emissions have fallen.

CO_2 emissions from industry were 11.1 million tonnes in 2011, a decrease of 0.2 million tonnes since 1990. This includes emissions from processes and stationary combustion, accounting for 24.8 per cent of total CO_2 emissions in 2011.

About 39 per cent of the CO_2 emissions from industry 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. Hydropower is used as the main energy source, causing virtually no direct CO_2 emissions from energy use.

Manufacturing of chemicals is the second largest emission source in manufacturing industries accounting for about 19 per cent of the CO_2 emissions from industry. Mineral production accounts for almost 16 per cent.

CO_2 emissions from stationary combustion derive from combustion in onshore industry, energy production and heating in buildings. These emissions constituted about 18 per cent of the total CO_2 emissions in 2011, an increase of 4 per cent compared with 1990. While emissions from use of oil for heating have been reduced in the period, emissions from electricity production and district heating have increased, resulting in a relatively stable emission trend in total.

3.1.3 Emissions of methane (CH_4)

The total emissions of methane (CH_4) were 209,402 tonnes (4.4 million tonnes of CO_2 equivalents) in 2011. About 77 per cent of the emissions in 2011 derived from landfills and agriculture, primarily releases from enteric fermentation (Figure 3.6). Combustion and evaporation/leakage related to oil- and gas extraction accounted for 14 per cent of the total emissions in 2011. Other sources include emissions from petrol cars, domestic heating, coal mining and oil refineries.

Agricultural emissions are relatively stable from year to year and are insignificantly affected by short-term economic cycles. Methane emissions from the agricultural sector were estimated at about 111,200 tonnes in 2011, and constituted about 53 per cent of total Norwegian methane emissions. The emissions were reduced by 11 per cent from 1990 to 2011.

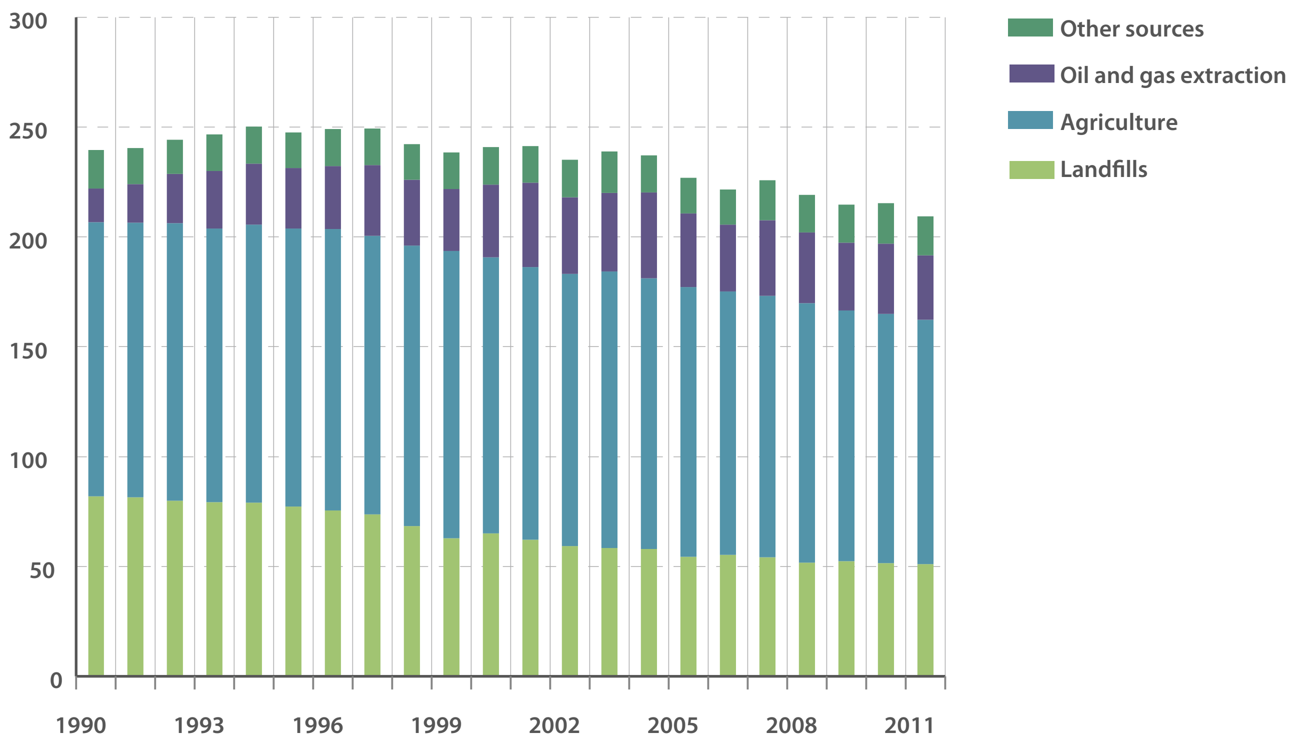
During the period 1990-2011, total CH_4 emissions decreased by 12.6 per cent. Figure 3.7 shows that this was primarily caused by decreased emissions from landfills, which more than compensated for the growth in emissions from the oil- and gas industry. The waste volumes increased during the period (1990-2011), but this effect was more than offset by increased recycling and incineration of waste and increased burning of methane from landfills. In 2011 the methane emissions from landfills were approximately 51,000 tonnes, corresponding to 24 per cent of the total CH_4 emissions in Norway. The landfill gas emissions were reduced by approximately 38 per cent from 1990 to 2011.

Methane emissions in the oil and gas industry accounted for 29,300 tonnes in 2011. These emissions are largely caused by landing and loading of crude oil offshore. Methane emissions from the oil and gas industry have increased since 1990 owing to higher production.

3.1.4 Emissions of N_2O

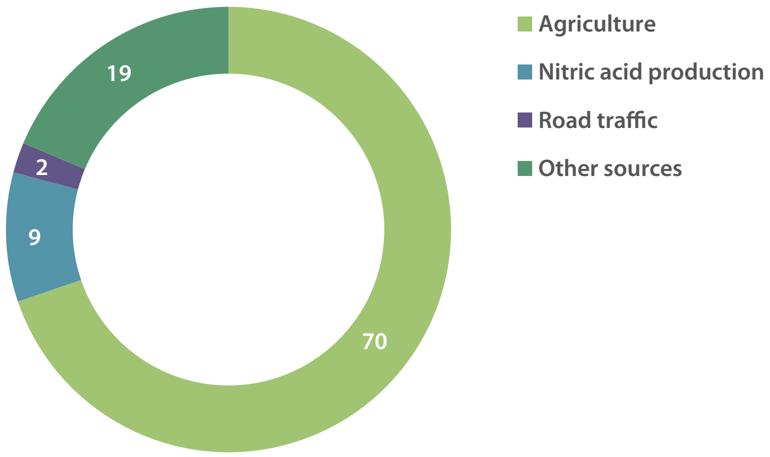
The total emissions of N_2O amounted to 9.9 ktonnes (3.1 million tonnes of CO_2 equivalents) in 2011. Figure 3.8 shows that 70 per cent of Norwegian emissions of N_2O are of agricultural origin, with agricultural soils as the most prominent contributor. Production of nitric acid takes place at two plants, and is one of the steps in the production of fertiliser. This production accounts for 9 per cent of the total N_2O emissions. The contribution from road traffic amounted to 2 per cent in 2011, with emissions originating from the use of catalytic converters in mobile sources. "Other sources" include emissions from e.g. fuel combustion, manure management and wastewater handling.

3.7 CH4 EMISSIONS IN NORWAY BETWEEN 1990 AND 2011, KILO TONNES



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

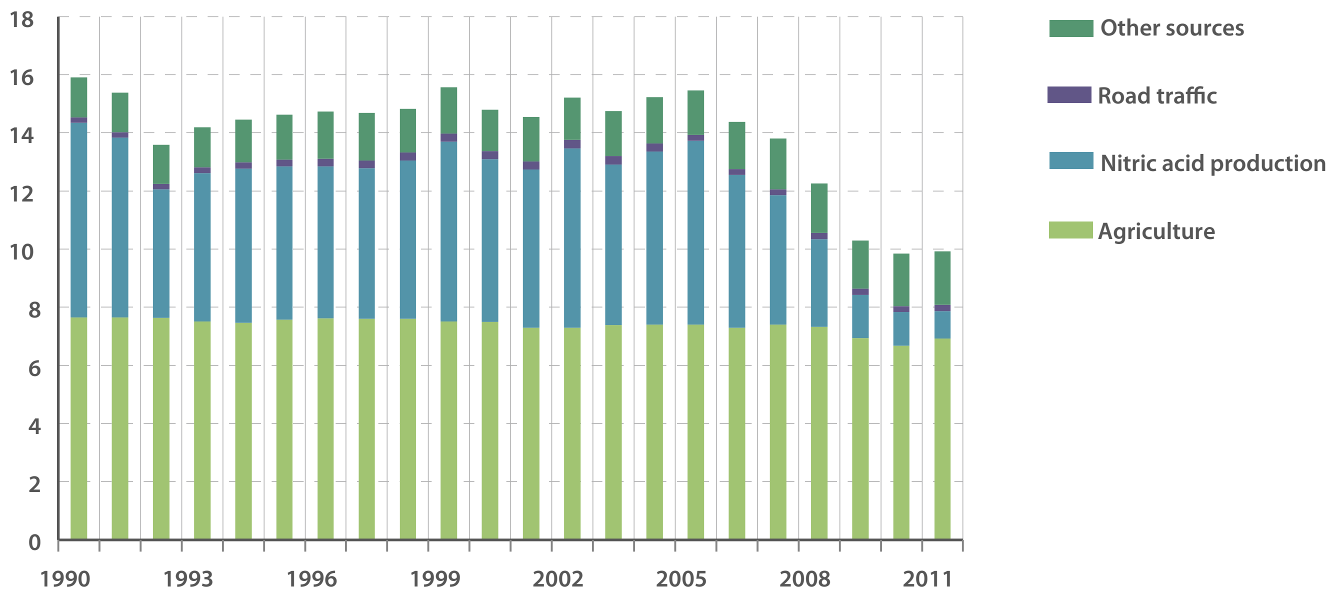
3.8 DISTRIBUTION OF NORWEGIAN N2O EMISSIONS BY MAJOR SOURCES IN 2011



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

The emissions of N_2O were reduced by 38 per cent from 1990 to 2011. 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 86 per cent from 1990 to 2011. 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, and even further down from 2008 to 2010. Emissions of N_2O from production of nitric acid decreased by 19 per cent from 2010 to 2011.In spite of this, there was an increase in total N_2O emissions from 2010 to 2011 by approximately

3.9 CHANGES IN N2O EMISSIONS FOR MAJOR NORWEGIAN SOURCES 1990 - 2011, KILO TONNES



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

1 per cent, which is notably due to higher emissions from road transport and agriculture soils.

The increasing use of catalytic converters in light vehicles increased the emissions of N_2O from road traffic during the period from 1990 to the early 2004. Later emissions decreased owing to lower sulphur content in petrol.

3.1.5 Emissions of PFCs

The emissions of the perfluorcarbons tetrafluoromethane (CF_4) and hexafluoroethane (C_2F_6) from Norwegian aluminium plants in 2011 were reported at 30 and 3 tonnes respectively, corresponding to a total of 0.2 million tonnes of CO_2 equivalents.

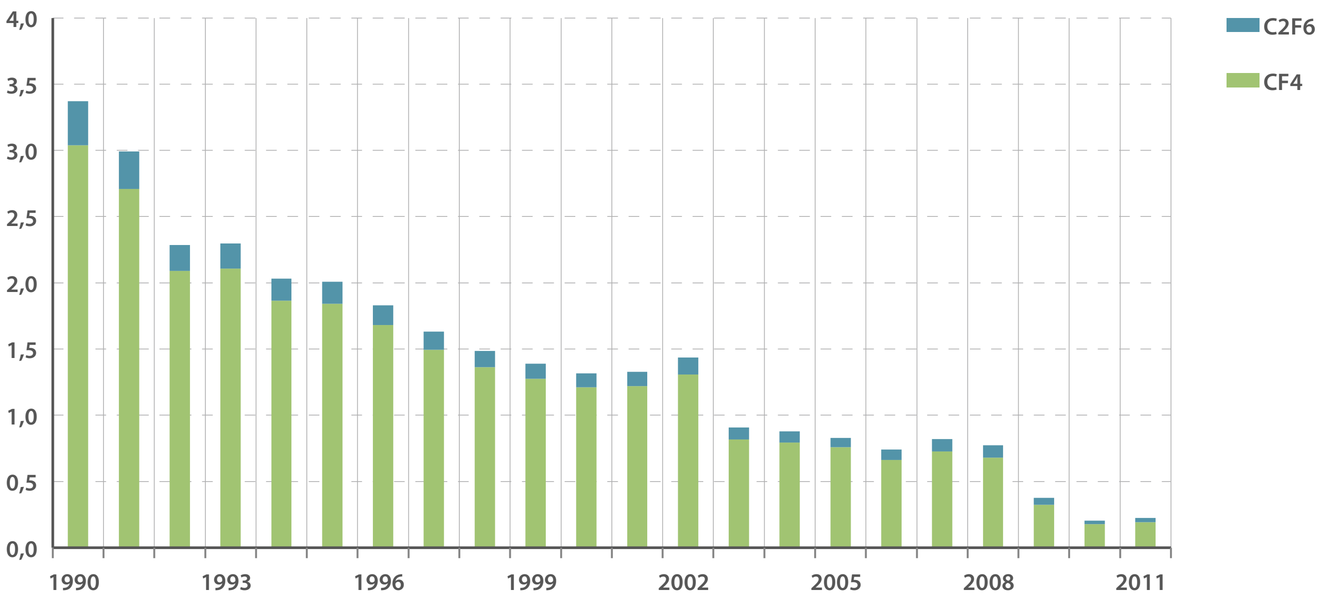
The total emissions of PFCs decreased by 93 per cent during the period 1990-2011 following a steady downward trend as illustrated in Figure 3.10. The decline can be explained by improved technology, process control and the conversion to Prebake technology, which has contributed to a considerable reduction of the PFC emissions per tonne of aluminium produced. Since the implementation of a tax on import and production of PFCs was in 2003 the introduction of PFCs in new or modified applications has fallen to an insignificant level.

3.1.6 Emissions of SF_6

The emissions of SF_6 in 2011 amounted to 2.5 tonnes (0.06 Mtonnes of CO_2 equivalents), which is 97 per cent lower than in 1990. This trend is illustrated in Figure 3.11.

Until 2006, the largest source of SF_6 emissions in Norway was magnesium production. The consumption of SF_6 was reduced through the 1990s owing to improvements in technology and process

3.10 EMISSIONS OF PFCs IN NORWAY 1990-2011, MTONNES CO2 EQUIVALENTS



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

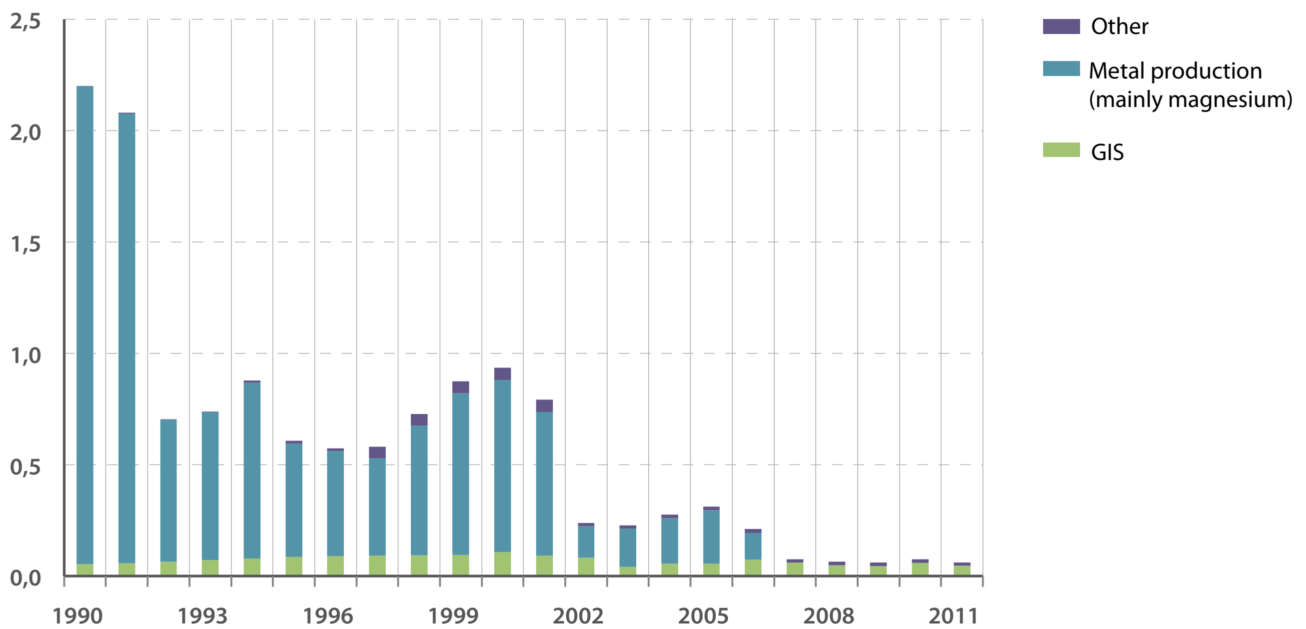
management and reduced production. Fluctuations from 1992 to 2001 are mainly influenced by production volumes. Primary production stopped in 2002, resulting in a drop in emissions to about one quarter of the previous level. The production of re-melting magnesium stopped in 2006 and there were no emissions from this source in 2007. Similar use of SF_6 in the aluminium industry in the early 1990s has also ceased.

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 this sector have decreased, and were about 43 per cent lower in 2011 than in 2002.

3.1.7 Emissions of HFCs

Emissions of HFCs amounted to 0.95 Mtonnes of CO_2 equivalents in 2011, corresponding to about 1.8 per cent of total emissions of greenhouse gases in Norway. The emissions in 1990 were insignificant. These emissions gained significance in the mid-1990s, when HFCs were introduced as substitutes for ozone-depleting substances. The application category refrigeration and air conditioning contribute by far the largest part of HFCs emissions. A trend of exponential growth was slowed after a tax on import and production of HFCs and PFCs was introduced in 2003. HFC-134a, HFC-125 and HFC-143a are the most important gases (see Figure 3.12).

3.11 EMISSIONS OF SF6 IN NORWAY 1990-2011, MTONNES CO2 EQUIVALENTS



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

3.1.8 International bunkers

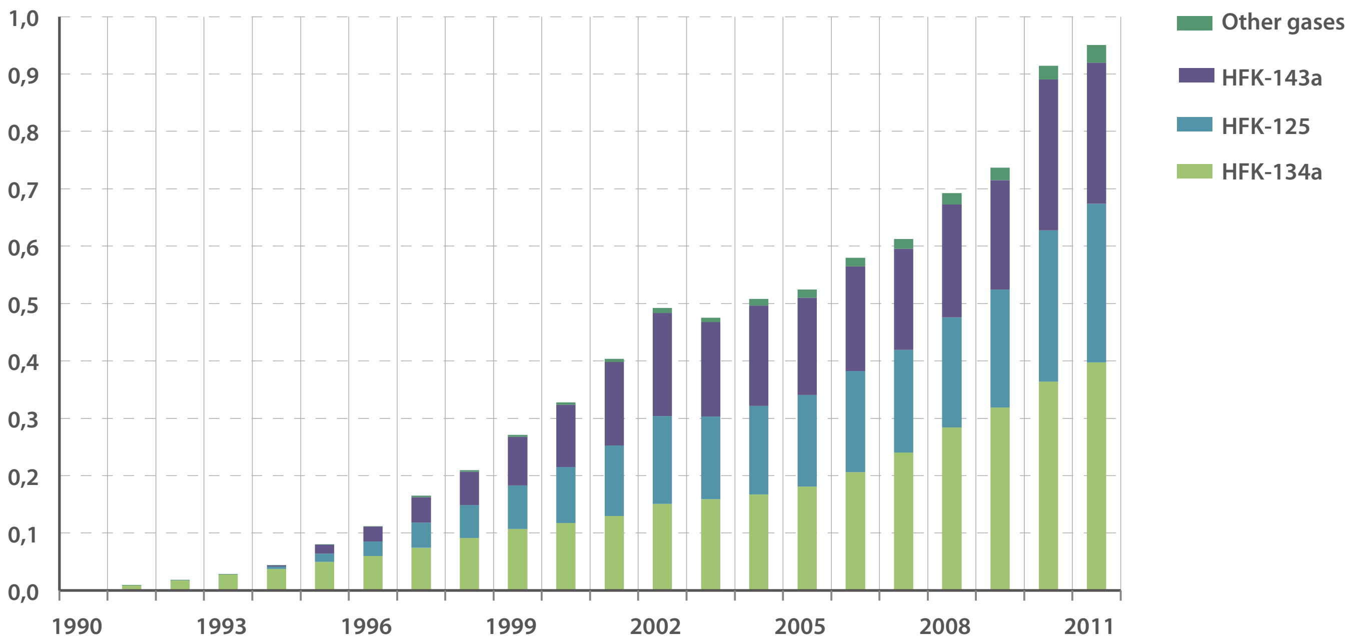
Norway reports emissions from international marine and aviation bunker fuels, but these emissions are not included in the national total, in accordance with the UNFCCC reporting guidelines. They are therefore reported separately as memo items in the NIR and in the CRF.

The estimated emission figures are presented in Figure 3.13. In 2011, the total emissions from ships and aircraft in international traffic bunkered in Norway amounted to a total of 2.7 million tonnes of CO_2 equivalents. 56 per cent of these emissions were from international marine bunker fuels.

The emissions from bunkers increased by about 27 per cent from 1990 to 2011. During the period 1990-2011, the emissions from marine bunkers increased by 0.2 per cent. The emissions varied greatly during this period and reached a peak in 1997. Thereafter there has been a descending trend in emissions, and these emissions decreased by 51 per cent during the period 1997-2011.

The emissions from international air traffic bunkered in Norway were 1.2 million tonnes of CO_2 equivalents in 2011. These emissions were at their highest level from 2006-2011 when the emissions were more than double the level of 1990. However, owing to improvements in the fuel efficiency of aircraft engines, international air traffic has in fact increased more than the emissions.

3.12 ACTUAL EMISSIONS OF HFCs IN NORWAY 1990-2011, MTONNES CO2 EQUIVALENTS



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

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

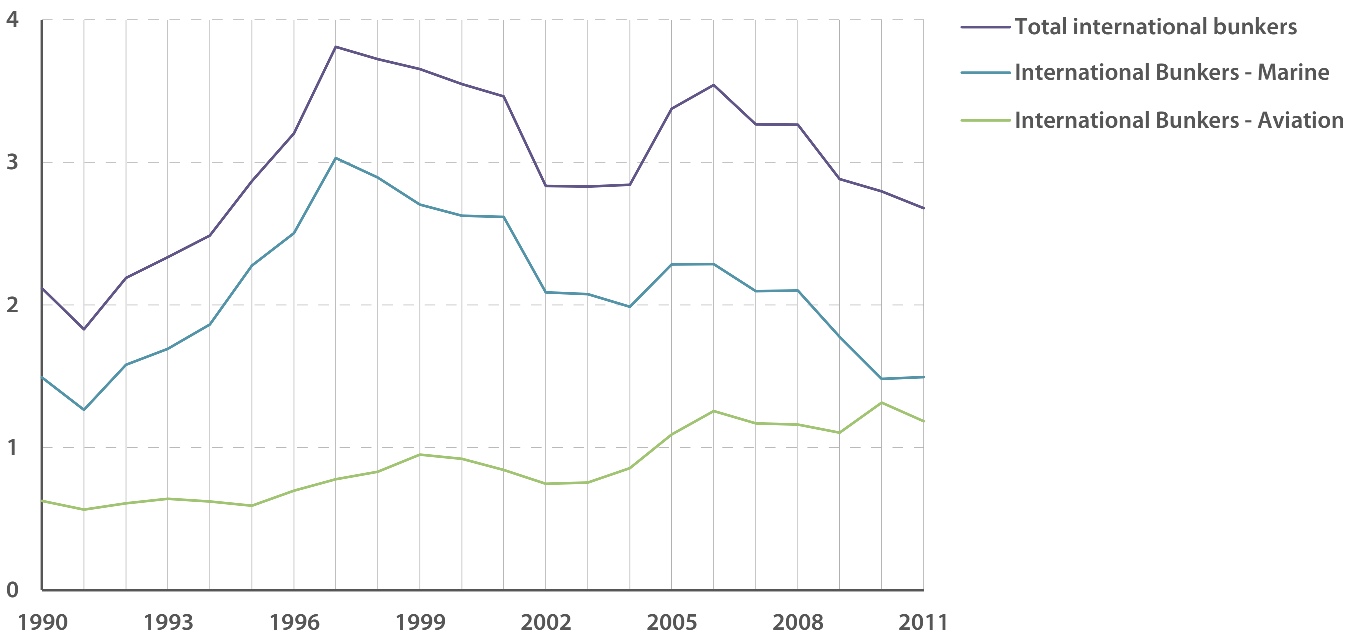
The Norwegian national system for greenhouse gas inventories is based on close co-operation between the Norwegian Environment Agency[3], Statistics Norway and the Norwegian Forest and Landscape Institute. Statistics Norway is responsible for the official statistics on emissions to air. The Norwegian Forest and Landscape Institute 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. 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 the Norwegian Forest and Landscape Institute 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.

3. Former names are "Climate and Pollution Agency" and "Norwegian Pollution Control Authority".

3.13 EMISSIONS FROM INTERNATIONAL BUNKERS, MTONNES CO2 EQUIVALENTS



SOURCE: Statistics Norway/Norwegian Environment Agency, 2014

Details of the methods and framework for the production of the emission inventory are given in the report "The Norwegian Emission Inventory 2013. Documentation of methodologies for estimating emissions of greenhouse gases and long-range transboundary air pollutants". This report is updated annually in conjunction with important methodological changes and is used as a basis for the National Inventory Report. Information on the methods and framework for the production of data for the LULUCF sector are mainly given in the report "Emissions and removals of greenhouse gases from land use, land-use change and forestry in Norway" (NIJOS 2005) and in the National Inventory Report.

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.

The Norwegian Forest and Landscape Institute 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 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 primarily identified by means of a tier 2 method. 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 2013 been recalculated for the entire time series 1990-2011 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

3.3.1 Introduction

The Norwegian Environment Agency is the responsible entity for the administration of the national emissions trading registry. The Norwegian registry is part of the Consolidated System of European Union Registries (CSEUR). Directive 2009/29/EC adopted in 2009, which was incorporated in the EEA agreement in July 2012, provides for the centralisation of the EU ETS operations into a single European Union Registry (hereinafter Union Registry) operated by the European Commission. Both the EU ETS operations and the Kyoto registry are technically consolidated in the CSEUR, while remaining compliant with all relevant decisions applicable to the establishment of Party registries - in particular Decision 13/CMP.1 and decision 24/CP.8. Norway, Iceland and Liechtenstein, along with the EU Member States who are also Parties to the Kyoto Protocol agreed to this consolidation with a view to increasing efficiency in the operations of their respective national registries.

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

3.3.2 Registry administrators – contact information

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3.3.3 Technical description

All registries reside on a consolidated IT platform sharing the same infrastructure technologies. The European Commission is the owner of the Union Registry and is responsible for day-to-day operation, the hosting and the administration of the registry. The chosen architecture implements modalities to ensure that the consolidated national registries are uniquely identifiable, protected and distinguishable from each other, notably:

- As regards data exchange, each national registry connects to the ITL directly and establishes a distinct and secure communication link through a consolidated communication channel (VPN tunnel);
- 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;
- As regards data storage, the consolidated platform continues to guarantee that data is kept confidential and protected against unauthorised manipulation;
- The data storage architecture also ensures that the data pertaining to a national registry are distinguishable and uniquely identifiable from the data held in other consolidated national registries;
- In addition, each consolidated national registry keeps a distinct user access entry point (URL) and a distinct set of authorization and configuration rules.

3.3.4 Conformance to DES and procedures to minimise discrepancies

The European Commission, together with Registry Administrators have drawn up technical specifications ensuring that the Union Registry is compatible with the UNFCCC DES where applicable. The overall change to a Consolidated System of EU Registries triggered changes the registry software and required further testing to test conformity with the data exchange standards (DES) for registry systems under the Kyoto Protocol. During certification, the consolidated registry was notably subject to connectivity testing, connectivity reliability testing, distinctness testing and interoperability testing to demonstrate capacity and conformance to the DES. All tests were executed successfully resulting in successful certification on 1 June 2012.

The change to a Consolidated System of EU Registries also triggered changes to discrepancies procedures, as reflected in an updated manual intervention document and the operational plan.

Transactions involving the Norwegian registry, ITL and EUTL will not be finalised until the transaction has passed all ITL and EUTL checks and been registered on servers of all systems. The proposed transaction will be rejected if it does not pass all checks. The registry administrator will undertake manual corrections if directed by the ITL and/or central administrator (European Commission). Detailed administrative and technical procedures are implemented and will be executed in the event of any discrepancies occurring. The Norwegian registry was not involved in any discrepant transactions during the period 2008-2012.

The Union Registry supports two types of reconciliations:

- One for Kyoto activities, involving the Union Registry, the ITL and the EUTL
- Another for ETS activities, involving the Union Registry and the EUTL only

Both follow the same protocol (defined in the UNFCCC DES) and are initiated respectively by the ITL and the EUTL. Norway's Registry Administrator is in charge of handling any failed reconciliations.

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 Regulation and change and incident management procedures for the Union Registry.

3.3.5 Security measures

The overall change to a Consolidated System of EU Registries also triggered changes to security, and this was reflected in an updated security plan. There are security measures on both the network and physical level. Servers are physically sited in a restricted area only accessible to authorised personnel. The European Commission is responsible for the global security environment and a local security officer monitors the correct implementation of internal security rules.

The security level has increased compared with the previous Norwegian Registry, both through new functionality in the registry itself and through new rules for account opening. Users of the registry are authenticated by a two-factor authentication: password and sms code. Authentication is carried out via the European Commission Authentication Service (ECAS). Documentation requirements for account opening are more comprehensive than before the implementation of the Union Registry, in line with the Registry Regulation (Commission Regulation (EU) No 1193/2011). Among others, account applicants must submit policerecords for all account representatives.

3.3.6 Measures for safeguarding, maintaining and recovering data

The EU Registry logs all relevant data for the entire CSEUR in its database. The consolidated platform continues to guarantee that data is kept confidential and protected against unauthorized manipulation. The data storage architecture also ensures that the data held in a national registry are uniquely identifiable and distinguishable from the data held in other consolidated national registries. It is considered that each Registry Administrator is the owner of his registry data. The European Commission is in charge of back-up of all relevant data. The overall change to a Consolidated System of EU Registries also triggered changes to data integrity measures, as reflected in an updated disaster recovery plan.

3.3.7 Testing of the registry

On 2 October 2012 a new software release (called V4) including functionalities enabling the auctioning of phase 3 and aviation allowances, a new EU ETS account type (trading account) and a trusted account list went into production. The trusted account list adds to the set of security measures available in the CSEUR. This measure prevents any transfer from a holding account to an account that is not trusted. The October 2012 release affected only ETS functionality and had no impact on Kyoto functions. Both regression testing and tests on the new functionality were successfully carried out prior to release of the version to Production. The site acceptance test was carried out by quality assurance consultants on behalf of and assisted by the European Commission.

3.3.8 Publicly available information

Reports with information from the Norwegian registry can be downloaded from the registry's own website. These include the following reports:

- Account information (list of accounts)
- List of legal entities authorised to hold an account
- Standard Electronic Format report
    - Information on amongst others. Kyoto units issued, units acquired from external registries, units transferred to external registries, units cancelled and unit holdings at aggregate level per account type.

Some information, namely contact information of account representatives, holdings of each account, unique account ID, is considered confidential according to article 78 of Commission Regulation (EU) No 920/2010, and is therefore not available on the public website.

More information on the accounts in the Norwegian registry, and the users 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

Information on the amount of allowances and credits surrendered by stationary operators and aircraft operators covered by the EU ETS in Norway can be found on the pages of the European Commission (see file "cumulative compliance data 2008-2012" under Reports:
http://ec.europa.eu/clima/policies/ets/registry/documentation_en.htm

3.3.9 Internet address

The new internet address of the Norwegian registry is:
https://ets-registry.webgate.ec.europa.eu/euregistry/norway/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. The website contains updated information on registry issues in both Norwegian and English.
Both Norwegian and foreign individuals and organisations may apply for an account. The online pages to apply for an account are in Norwegian. English speaking organisations and individuals can apply for an account by submitting a complete account application form to the Norwegian Environment Agency.

4 Policies and measures

4.1 Policymaking process

4.1.1 Overview

Norway's climate policy is founded on the objective of the Convention on Climate Change and the Kyoto Protocol and the scientific understanding of the greenhouse effect set out in the reports from IPCC. 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 been a concern of Norwegian policy since the late 1980s. Today, Norway has a comprehensive set of measures covering almost all emissions of greenhouse gases.

Norway is working towards an ambitious global climate agreement that will ensure a maximum global mean temperature rise of 2° C compared with the pre-industrial level. This is necessary in order to avoid dangerous climate change that threatens life on earth, and will require political leadership by all nations.

In order to meet the 2 ° C target, the fourth assessment report from the IPCC implies that global emissions will have to be reduced by 50-85 per cent by 2050, compared to 2000, most likely closer to 85 per cent. As seen from the fifth assessment report, limiting the warming caused by anthropogenic CO_2 emissions to less than 2°C, with a probability of more than 2/3, entails that cumulative CO_2 emissions in the atmosphere, from all anthropogenic sources, should not exceed 1000 GtC. 531 GtC had already been emitted in 2011.

Broad political agreement on Climate policy/ National emission targets

In June 2012, a broad agreement on climate policy was made between the majority of the political parties in the Storting,[1] see Innst.390 S (2011-2012). The Storting made a decision based on this agreement, adopting the policies and measures in the agreement. In the following, this decision is referred to as the political agreement on climate. The agreement is based on the latest white paper on Norwegian climate policy, Meld.St. 21 (2011-2012) which includes proposals to reinforce the domestic policy framework in order to meet the Norwegian emission targets. Moreover, the agreement saw a strengthening of the policy in certain areas.

The political agreement on climate of 2012 states the following emission targets:

- Norway will over achieve the Kyoto commitment within the first Kyoto Protocol commitment period by 10 percentage points.
- During the period up to 2020, Norway will commit to cutting global emissions of greenhouse gases equivalent to 30 per cent of Norway's emissions in 1990.

1. The Norwegian Parliament

Since signing of the politicial agreement on climate, Norway has made a commitment for the second commitment period of the Kyoto Protocol (KP 2). Under KP 2, Norway is committed to an emission reduction corresponding to average annual emissions during the period 2013-2020 at 84 per cent of the 1990 emission level. The commitment under KP 2 is consistent with the Norwegian target of 30 per cent reduction of emissions by 2020, compared with 1990.

- Norway will be carbon-neutral in 2050.
- As part of an ambitious global climate agreement where other developed nations also undertake ambitious commitments, Norway will adopt a binding goal of carbon neutrality no later than in 2030. This means that Norway will commit to achieving emission reductions abroad equivalent to Norwegian emissions in 2030.

It is also a long-term objective for Norway to become a low-emission society by 2050.

Through the political agreement on climate, the Storting calls for the Government to strengthen Norway's climate goals equivalent to a 40 per cent cut in emissions by 2020 compared with the level in 1990, if this can help in reaching a consensus on an ambitious climate agreement where the countries with the largest emissions agree to specific emission commitments.

The challenge of climate change can only be solved through broad international cooperation. Nevertheless, most of the concrete policy is determined at a national level. Each individual country is responsible for pursuing an active domestic policy aimed at reducing greenhouse gas emissions. There has been broad political agreement in Norway that we must assume such a responsibility. Therefore, Norway has for many years been among the countries using the strongest climate policy instruments.

Based on the Norwegian Pollution Control Authority's (now the Environment Agency) analysis of measures, the sector-by-sector climate action plans as well as current policy instruments, the previous White Paper on Climate policy from 2007 proposed that a realistic goal would be to reduce emissions in Norway by 13-16 million tonnes of CO_2 equivalents relative to the reference scenario presented in the National Budget for 2007, when CO_2 uptake by forests is included. If realized, this would entail that around half to two-thirds of Norway's total emission reductions would be accomplished domestically. The Storting's consideration of the white paper on Climate Change entailed a further strengthening of measures through the broad political agreement from January 2008. Based on a discretionary assessment, it was assumed that the new measures in this agreement would make it realistic to assume additional emission reductions in Norway, and that the interval for emission reductions could be increased to 15-17 million tonnes of CO_2 equivalents compared to the reference scenario as presented in the National Budget for 2007, when CO_2 uptake by forests is included.

Less progress in development of climate friendly technology, higher costs associated with domestic climate measures, higher immigration and economic growth and larger emissions from the oil sector will partly determine when our climate goals are reached. Nevertheless, these factors do not change the ambition to reduce domestic emissions.

In the political platform of the current government, it is stated that the Government will strengthen the political agreement on climate reached in 2012. It is stated that the Government will undertake an ambitious domestic climate policy with a long term transition to a low-emission society by 2050. The Goverment will increase the efforts on research and green technology. It is the Government's view that an ambitious domestic policy must be conductive to global emissions reductions. Thus, the consequences of the EU Emissions Trading System (EU ETS), the risk of carbon leakage and the industry's competitiveness will all be taken into account.

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 effort, 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. For example, development of new technology in Norway, might help bring about a faster transition to use of more climate friendly technologies.

In accordance with the broad political agreement on climate of 2012, Norway will particularly focus on measures that are cost-effective in the light of expectations of rising carbon prices over the lifetime of the investments, and which are not necessarily triggered by current policy instruments. This applies particularly to measures that promote technologicaly development and to measures that mobilise earlier adoption by the populationof 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 should provide complementary support where markets do not provide the solutions.

In 2010, "Klimakur 2020" ("Climate Cure 2020") presented a thorough cross sectoral analysis of tools and measures for reducing emissions in Norway. "Klimakur" was chaired by the Norwegian Pollution Control Authority (now the Norwegian Environment Agency) which also included the Public Roads administration, the Norwegian Petroleum Directorate, the Norwegian Water Resources and Energy Directorate and Statistics Norway. The analysis from "Klimakur 2020" was used as input for the assessment of policies and measures in the white paper on Norwegian climate policy, Meld. St. 21 (2011-2012).

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. The other ministries are responsible for implementation 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 September 2009, new guidelines were introduced for climate and energy planning in the municipalities.

On 1 July 2013, the Climate and Pollution Agency (formerly Pollution Control Authority) merged with the Norwegian Directorate for Nature Management and became the Norwegian Environment Agency. This is a government agency that reports to 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: http://www.nve.no/en

4.1.4 Budget reports – effect of climate policy

In connection with the ordinary budgetary processes, information is reported in order to evaluate the effects of climate policy on greenhouse gas emissions, present trends in emissions and progress in the implementation of climate policy. Since 2009, the Ministry of Climate and Environment has published such information in the budget propositions.

4.1.5 Sustainable development

The first National Strategy for Sustainable Development (NSDS) was adopted in 2002 and implemented as a National Plan for Sustainable Development (SD) in 2004.

The NSDS covers the economic, environmental and social dimension of SD. A set of SD indicators was developed in 2005. The set, now consisting of 17 indicators, is used to monitor the development. Statistics Norway has a key role in the monitoring process through an annual report on development in the indicators and presents an analysis of underlying factors behind changes. The Ministry of Finance is responsible for coordinating the work on sustainable development.

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

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. One of the concerns behind this policy is to minimise adverse effects of climate policies and measures

In the environmental, as well as the economic and energy policy development, Norway strives to base 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. Norway believes that the best way to reduce emissions on a global scale, in line with the two degree target, is to put a global price on carbon. Putting a global price on carbon is 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.

Norway has given priority to development of carbon capture and storage (CCS) as a mitigation option. The national CCS projects in operation are in the petroleum sector, and Norway strives to disseminate information and lessons learned, 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).[2] This initiative aims 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.

2. http://www.norad.no/en/thematic-areas/energy/oil-for-development

Furthermore, Norway is involved in several initiatives fostering technology transfer and capacity building in developing countries in shifting the energy mix away from fossil fuels to more renewable energy systems, including the Clean Energy for Development Initiative and the International Energy and Climate Initiative ("Energy+"), see more information about this in chapter 7.

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.

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 for reducing greenhouse gas emissions in Norway. For several of these policies and measures the effects on greenhouse gas emissions have been calculated, and are given in the summary tables under each sector, see below. The total aggregated effects of the policies and measures are summed up in chapter 5.3.

4.3.2 Cross-sectoral 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 the policy will be based on the responsibility to help safeguard the planet and on the precautionary principle.

The effectiveness of policy instruments is measured by how reliably they lead to the achievement of policy targets. How reliably a policy instrument leads to a target depends on the authorities' possibility to predict and control the effects of a measure. Since calculating the emission reduction of a policy instrument may be difficult, there may be considerable uncertainty consernging both ex-post and the ex-ante effect of a measure. Moreover, there is uncertainty conserning how external conditions, such as population and economic growth, develop. What weight is put on the predictability of the effect of a measure will typically depend on the severity of the problem. In cases where even small amounts of pollution can cause severe damage it will be of importance to control the emissions and a prohibition could be an accepted solution. Predictable policy instruments can help ensure the implementation of new technologies. Regulatory measures, such as prohibi-

4.1 CLIMATE MEASURE BY INDUSTRY

tions, may give a higher degree of predictability regarding effects of the measures. On the other hand, flexibility in meeting targets reduces costs.

Supply-side policies (e.g. research and development measures) to promote further development and innovation of climate technologies may also be coordinated with demand led policies in order to encourage both invention and adaption of climate technologies.

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[3].

Climate policy instruments can be made cost-effective by giving decision-makers in all sectors of society the same incentive to reduce greenhouse gas emissions. A cross-sectoral environmental tax or an emissions trading scheme is in principle a cost-effective policy instrument. Adding other policies might reduce the cost-effectiveness of one policy measure. In some cases, several policy measures might be used. For example, the petroleum sector is included in the emission trading scheme but is also subject to CO_2 taxation. Figure 4.1 shows climate measures by industry.

In the "Klimakur 2020" report from 2010, assessments of the social costs of emission reductions were made, see section 4.1. The costs were estimated using the guidelines for cost-benefit analyses given by the Ministry of Finance (2005). "Klimakur" combined a bottom-up cost analysis and a top-down macroeconomic model based approach. "Klimakur 2020" estimated the net costs for different measures based on expected investment costs, costs related to lost/delayed production, changes in consumers' surplus, and external costs (e.g. pollution, accidents etc.). Approximately 160 non-overlapping measures based on known and largely available technology were analysed. The emission reduction potential was also estimated. The bottom-up analysis indicated that if all measures with a cost of up to NOK 1100 per tonnes of CO_2 equivalents were triggered, the reduction in emissions could be estimated at approximately 12 million tonnes of CO_2 equivalents by 2020. In the macroeconomic analysis Statistics Norway's model MSG-TECH was used to estimate the necessary charge on emissions that could lead to a reduction of 12 million tonnes CO_2 equivalents by 2020 in Norway. The macroeconomic analysis indicated that a charge of NOK 1500 per tonnes of CO_2

3. One interesting result from "Klimakur 2020" was that there were cases were costs may occur in one sector, while the emission reduction may occur in another sector.

equivalents on all sources could reduce emissions by 12 million tonnes by 2020. If companies in the sectors covered by the emissions trading scheme are exempted, calculations show that the remaining sectors in the Norwegian economy must be subject to a charge of NOK 3400 per tonne of CO_2. The costs were compared with the emission reductions the measure was expected to have in 2020. In the National Budget for 2011 it was estimated that the overall economic costs in 2020 will be higher than indicated by Klimakur, in part as a consequence of transition costs.

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 goods that produce CO_2 emissions and have a climate motivation. Others may be implemented for other reasons, but will often have an indirect impact on the greenhouse gas emissions. Table 4.1 gives an overview of the green taxes in Norway in 2013.

4.3.2.3 The Norwegian CO_2 tax scheme

CO_2 taxes were introduced in 1991 as a step towards a cost-effective policy to limit emissions of greenhouse gases. The main structure of the tax has remained relatively stable with some exceptions. In the first years of operation, there was some adjustments of coverage. In addition there were some extensions of the coverage in 1999 and an abolition of the tax on the marginal usage on coal and coke for energy purposes in 2003.

In 2006, the CO_2 taxation of mineral oil usage in domestic aviation, domestic shipping of goods and for the supply fleet was raised from the reduced tax rate to the general tax level. In 2008 the tax rate of mineral oil usage in domestic aviation was raised even further to a level of NOK 0.10 per litre above the general tax rate.

From 1 September 2010 the CO_2 tax was expanded to include natural gas and LPG. The manufacturing industry is subject to reduced rates corresponding to the minimum rates of the Energy Tax Directive (2003/96/EC). Some sectors are exempt from the CO_2 tax on gas, including inter alia commercial greenhouses and freight and passenger transport within domestic shipping.

In 2008 pricing of emissions through the EU ETS (see 4.3.1.4) replaced CO_2 taxes on use of mineral oil in mainland manufacturing industry, which is included in the EU ETS. Since 1 January 2008, petroleum activities were subject to both a CO_2 tax and the EU ETS. The CO_2 tax for the petroleum sector was however, reduced in order to keep the overall CO_2 pricing in this sector approximately unchanged, on the basis of an expected allowance charge of 160 NOK per tonne of CO_2. In accordance with the broad political agreement on climate of 2012, the CO_2 tax for petroleum activities was however increased by NOK 200 per tonne of CO_2 effective on 1 January 2013.

Domestic aviation was included in the EU ETS from 1 January 2012. The CO_2 tax for domestic aviation covered by the EU ETS was from the same date reduced by an amount corresponding to the expected price of emission allowances in 2012.

In 2013 the exemption for mineral oil used for fishing and catching in inshore waters was abolished and replaced by a low rate of NOK 0.13 per litre. From 2014 the

4.1 NORWEGIAN GREEN TAXES. 2014

Tax	Tax rate	Introduced
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	4.87	
Low sulphur	4.91	
Road usage tax on auto diesel, NOK/litre		1993
Sulphur-free	3.82	
Low sulphur	3.87	
Biodiesel[1]	1.91	
Lubricating oil tax, NOK/litre	1.94	1988
CO_2 tax	varies, see table 4.2	1991
Sulphur tax, NOK/litre per 0.25 weight per cent sulphur content above 0.05 weight per cent	0.079	1970
Tax on final disposal of waste, NOK/tonne		1999
Biodegradable waste for landfills	488	
Other waste	294	
Tax on health- and environmentally damaging chemicals		2000
Trichloroethene, NOK/kg	66.65	
Tetrachloroethene, NOK/kg	66.65	
Tax on HFC and PFC, NOK/tonne CO_2-equivalents	330.00	2003
Tax on emissions of NO_x, NOK/kg	17.33	2007
Environmental tax on pesticides	varies	1998
Environmental tax on beverage packaging[2]		1973
Carton and cardboard, NOK/unit	1.32	
Plastics, NOK/unit	3.22	
Metals, NOK/unit	5.34	
Glass, NOK/unit	5.34	
Electricity tax		1951
Ordinary rate, NOK/kWh	0.1239	
Low rate (manufacturing, etc.), NOK/kWh	0.0045	
Base-tax on mineral oils, etc.		2000
Ordinary rate, NOK/litre	1.557	
Low rate (pulp and paper, dyes and pigments industry), NOK/litre	0.126	
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 that meets the sustainability criteria. Other biodiesel is subject to the same tax rate as sulphur-free auto diesel.

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

general tax level on mainland CO_2 emissions was increased by about NOK 100 to about NOK 330 per tonne of CO_2. However, diesel fuel subject to the road usage tax was exempted from the tax increase. The tax rates for domestic aviation increased by about NOK 50 per tonne of CO_2. The CO_2 tax level differs across energy products and usages. The CO_2 tax is now levied on about 60 per cent of total greenhouse gas emissions.

All current CO_2 taxes and rates are shown in Table 4.1 and 4.2. Below follows a description of the effect on mainland emissions. The CO_2 tax on petroleum activities and its effects on emissions off shore is further described in 4.3.2

Effect on national emissions (mainland)

Together with the basic tax on mineral oil, the CO_2 tax on mineral oil constitutes a significant proportion – approximately 25 per cent – of the consumer price of heating oils to households. Emissions from heating purposes in households 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.

For some goods such as petrol, other tax elements (road usage tax, VAT) constitute a larger proportion of the price than the CO_2 tax. For example, in 2014 the road usage tax on sulphur free petrol is NOK 4.87 per litre, whereas the CO_2 tax is NOK 0.93 per litre. There is also a sulphur tax on mineral oil with a sulphur content above 0.05 weight per cent. Thus, the total tax on such goods must be taken into account when comparing tax levels with other countries. However, 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.

In recent years the Government has skewed vehicle purchase tax towards green taxes.

In the Fourth National Communication estimates of the effects of the CO_2 tax in other sectors than the offshore petroleum industry were presented. The effect was estimated at 0.8 million tonnes. On average, emissions in the sectors studied were reduced by 3-4 per cent. Since January 2006, domestic aviation, domestic shipping and supply ships have been subject to the same CO_2 tax rate as other users of mineral oil. The removal of the tax rebate is estimated to reduce emissions by around 0.05 million tonnes. The tax rate for domestic aviation was increased further in 2008; however domestic aviation covered by the EU ETS is now subject to a lower tax rate.

The expansion of the CO_2 tax to include natural gas and LPG from 1 September 2010 and fishing and catching from 1 January 2013, is estimated to reduce CO_2 emissions by 0-0.05 million tonnes by 2020 and 2030.

As of 1 January 2014 the general CO_2 tax rates on mineral oil and gas are increased by about NOK 100 to about NOK 330 per tonne of CO_2 from 1 January 2014. Auto diesel subject to the road usage tax on fuel is exempt from the tax increase, while the rates for domestic aviation are increased by about NOK 50 per tonne of CO_2. The tax rate for mineral oil used for fishing and catching in inshore waters is increased to NOK 98 per tonne of CO_2. These changes have however not been included in the projections.

Table 4.2 provides an overview of the CO_2 tax in Norway in 2014.

4.3.2.4 Emissions trading

Coverage

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.

4.2 NORWEGIAN CO_2 TAXES 2014.

	Tax rate NOK/litre, NOK/kg or NOK/Sm³	Tax rate NOK/tonne CO_2
Petrol	0.93	402
Mineral oil		
General tax rate	0.88	
Light fuel oil, diesel		330
Heavy fuel oil		281
Low tax rate (pulp and paper industry and fishmeal industry)	0.31	
Light fuel oil, diesel		116
Heavy fuel oil		99
Jet kerosene		
Domestic aviation included in the EU ETS	0.56	219
Other domestic aviation	0.84	329
Auto diesel subject to road usage tax	0.62	233
Mineral oil used for fishing and catching in inshore waters	0.26	98
Gas		
Natural gas	0.66	332
LPG	0.99	330
Reduced rate natural gas (manufacturing industry etc.)	0.05	25
Petroleum activities on the continental shelf	0.98	
Light fuel oil, diesel		368
Heavy fuel oil		313
Natural gas		419

Sources: Ministry of Finance and Statistics Norway

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. In addition to the sectors included in the EU 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 EU ETS. From 2013, phase III (2013-2020), the coverage of the EU 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 EU ETS.

Cap

Norway participates in the EU ETS, and the Norwegian emissions covered by the scheme are part of the EU-wide emission cap. The aggregated future emissions covered by the scheme are pre-defined by the EU-wide cap, and are set 21 per cent lower in 2020 compared with the emissions in 2005 from the covered sectors.

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 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

During the period 2005-2007, allowances were allocated to the installations free of charge. The general rule was allocation equal to 95 per cent of average emissions during the period 1998-2001. The average amount of emissions covered by the national ETS in phase I was 6 million tonnes of CO_2 per year.

In phase II (2008-2012), the general rule for free allocation was that 97 per cent of average historical process emissions and 87 per cent of average historical combustion emissions where given to the operators free of charge. The Norwegian offshore petroleum sector, however, did not receive any allocation free of charge. In addition, there was no general reserve for new entrants, but a separate reserve was set aside for highly efficient combined heat and power plants. For this reason, total free allocation in phase II represented only about 35 per cent of the total emissions. The average amount of national emissions covered by the EU ETS in phase II was 19.1 million tonnes of CO_2 eqivalents per year.

For phase III (2013-2020), the allocation methodology is harmonised 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. This allocation will gradually decrease towards the end of phase III, and in 2020 free allocation are planned to be 14 per cent lower than in 2013.

Compliance and reporting requirements

Operators included within the scope of the emissions trading scheme must report their emissions occurring during the previous year to the Norwegian Environment Agency by 1 March each 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 this, 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.

Effect on national emissions

Emission trading is an instrument that in the outset allows for cost-efficient reduction of greenhouse gas emissions across wide ranges of sectors and countries. All participants in the scheme are subject to the same emission cap, which the aggregated emissions from these participants must not exceed. In the absence of other regulations, emission reductions due to a cap below BAU, will be made by the participants in the scheme having the lowest abatement cost.[4] This ensures that emission reductions set by the cap are achieved in a cost-efficient way, regardless of where the reductions takes place.

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 the industry located in other countries covered by the scheme, and relative to the carbon price. For this reason, in contrast to the EU- wide effect, the scheme's effect at the national level is difficult to assess and quantify.

The Norwegian Environment Agency has therefore initiated a project to examine the effect of the emissions trading scheme at the national level and on the various industry sectors covered by the scheme. The first results of this work are due in early 2014. 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 Emission Trading Scheme for the 2013-2020 trading period through the EEA Agreement. The participation of the EFTA/EEA countries in this scheme is conductive to a tighter scheme, than if Norway were not to take part. This is because the expected demand for allowances increases substantially more – about 11 million tonnes annually – than the increase in the total quantity of allowances in the scheme, owing to the paticipation of Norway. The increased demand due to Norwegian participation will result in additional emission reductions within the scheme. These re-

4. Additional emission regulation applied to certain installations in an ETS could cause emission reductions in these installations with higher abatement cost than the allowance price. As long as the long term cap is not reduced, the total emissions within the system will not be reduced.

ductions may take place anywhere in the EU/EEA area.

4.3.2.5 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 included in the discharge permit which for instance industrial installations are obliged to obtain pursuant to the Pollution Control Act.

Hence, pursuant to the Pollution Control Act technological requirements relevant to emissions can be formed as conditions laid down 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 all 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 coercive fines 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 emissions trading scheme 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. 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 4.3.8.

4.3.2.6 Tax and reimbursement scheme of HFC

The growth trend in HFC and PFC emissions from product use was slowed following introduction of a tax on import and production of HFCs and PFCs in 2003. From 2005 increased use due to regulation of ozone-depleting substances has once again led to increased emissions. From 1 january 2014, the tax increased by about 100 NOK to NOK 330 (approximately EUR 40) per tonne CO_2 equivalents of gas imported or produced as of 2014. This approximately equals the CO_2 tax rate on mineral oil. In 2004, this tax was supplemented with a refund scheme, which prescribes a similar refund when gas is destroyed. Combined and over time, these two schemes amount to a proxy tax on emissions of HFC.

The tax and reimbursement scheme has resulted in better maintenance and improved routines during discharge of old equipment. It also provides a strong incentive for choosing HFCs with the lowest GWP possible and has resulted in increased use of natural cooling agents and alternative processes (for example indirect systems) in new installations.

The tax has significantly reduced growth in emissions compared with pre-tax scenarios, which forecast very strong growth due to substitution of CFCs and HCFCs with HFCs. However, an annual growth in HFC emissions is still observed. Estimates show that the tax has reduced the emissions in 2005, 2010 and 2011 by 0.3, 0.6 and 0.7 million tonnes of CO_2 equivalents, respectively.

The tax increase of about NOK 100 to NOK 330 from 1 January 2014 has not been included in the projections.

4.3.2.7 Agreements and voluntary measures

There have been several agreements and voluntary measures in the Norwegian climate policy. These are mainly found within the industry sector and are described in 4.3.5 under industry.

4.3.2.8 The environmental technology scheme – Innovation Norway

The environmental technology scheme was established in 2010. The overall target of the environmental technology scheme is to encourage the Norwegian industry to bring the results from more projects on environmental technology to the market. The scheme aims to promote Norwegian environmental technology in national and international markets and strengthen the competitiveness of Norwegian industry.

4.3 SUMMARY OF POLICIES AND MEASURES, CROSS-SECTORAL POLICIES AND MEASURES

Name of policy or measure	Objective and/or activity affected	GHG affected
CO_2 tax (except CO_2 tax off shore)*	Cost-effective reductions of emissions	CO_2
Emissions trading (2008-2012) *	Reduce emissions	CO_2, N_2O
Emissions trading (2013-2020) *	Reduce emissions	CO_2, N_2O, PFCs
Regulation by the Pollution Control Act	Reduce emissions	All six gases or groups of gases
Tax and recycling schemes on HFCs *	Reduce HFCs emissions	HFCs

* The policy and measure is included in the 'with measures' projection.

[1] The calculations by Statistics Norway did not cover 2030. For this reporting, the effect in 2030 is set equal to 2020.

The definition of environmental technology for the current scheme 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 offer grants and other support for development and investments in pilot and demonstration projects for new Norwegian environmental technology.

It is a nationwide scheme and all Norwegian companies can apply. The companies are applying 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, the environmental effect and the level of innovation.

During the period of 2010 – 2013 a total support of NOK 809 million was provided to 176 projects. Total investments in these projects (including the companies' own funds) are NOK 3 552 millions. The projects are based across a range of different technologies, including metallurgic industry, bio-refinery, renewable energy, water treatment, maritime sector and aquaculture.

4.3.2.9 Carbon capture and storage

The Norwegian Government strongly believes that broad deployment of carbon capture and storage is needed in order to mitigate climate change. It is committed to further developing and contributing to widespread dissemination of carbon capture and storage technologies (see 4.3.2 for

Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
			1995	2000	2005	2010	2011	2020	2030
Economic	Implemented 1991	Ministry of Finance		0.8	0.8	0.85	0.85	0.9	0.9
Economic	Implemented 2008	Norwegian Environment Agency	-	-	-	0-0.3	0-0.3	0-0.3	0-0.3 [1]
Economic	Implemented 2013	Norwegian Environment Agency	-	-	-	-	-	NE	NE
Regulatory	Implemented	Norwegian Environment Agency	NE	NE	NE	NE	NE	NE	NE
Economic	Implemented 2003 and 2004	Directorate of Customs and Excise, Norwegian Environment Agency	-	-	0.3	0.6	0.7	0.7	0.5

more information on the two CCS-projects operating in the petroleum sector). Norway will contribute to technology development, broad deployment and dissemination of the CCS technology and in addition knowledge-sharing in order to make CCS a cost-effective tool for reducing CO_2 emissions globally.

Owing to costs and uncertainties, the development of large scale CO_2 capture at Mongstad was discontinued in 2013. The Technology Centre Mongstad, which is one of the world's largest and most advanced, will however be continued (see chapter 7). Also CLIMIT, the national programme for research, development, piloting and demonstration of CO_2 capture and storage technologies for power generation and other industrial sources, is to be continued (see chapter 8 for more information on this programme). Norway will continue to invest on a broad basis in developing cost-effective technology for carbon capture and storage. Through the broad political agreement on climate, the Storting has called for an ambition of realising at least one full scale carbon capture pilot plant by 2020.

4.3.3 Petroleum activity

4.3.3.1 Introduction

The emissions from this sector stems mainly from energy consumption and fugitives in oil and gas production off shore and gas terminals on shore. More than 90 per cent of the emissions from the sector is covered by the ETS, see 4.3.2.4.

4.3.3.2 General policy instruments

On 1 January 1991 the Norwegian government introduced a CO_2 offshore tax regime which includes burning of natural gas, oil and venting for CO_2 in the production phase on the Norwegian Continental Shelf. In line with the broad political agreement on climate of 2012, the CO_2 tax for the petroleum activities has been increased with NOK 200 per tonne of CO_2 effective from 1 January 2013. As of 1 January 2014 the CO_2 tax is NOK 0.98 per litre of oil and per standard cubic metre of natural gas (equivalent to about NOK 420 per tonne of CO_2 for natural gas). The CO_2 tax has been the most important instrument for reducing emissions in the petroleum sector and has had a significant impact. General improvements in technology and emission-reducing measures is a result of the introduction of the CO_2 tax in 1991. Other important mitigation actions are the CO_2 storage projects at Sleipner and Snøhvit and the replacement of gas turbines with electricity from the mainland.

Norway participates in the EU Emissions Trading System (EU ETS). The Greenhouse Gas Emissions Trading Act established a system of tradable greenhouse gas allowances. From 2008 offshore activities were included in the emissions trading system and the sector is still subject to a CO_2 tax, although at a lower level. As of 1 January 2008, the petroleum activities are subject to both a CO_2 tax and the duty to surrender emissions allowances under the EU ETS.

With an allowance charges in the EU ETS of approximately NOK 50 per tonne of CO_2, and a CO_2 tax for the petroleum activities at a fixed price of about NOK 420, the total charge for greenhouse gas emissions in the petroleum activities will be about NOK 470 per tonne of CO_2. If the allowance charges in the EU ETS increases over time, it will provide a basis for reducing the CO_2 tax so that the overall carbon price remains at about the same level.

4.3.3.3 Conditions and permits

In addition to the general policy instruments, concrete, practical mitigation actions are applied to reduce emissions on the Norwegian Continental Shelf. Both the petroleum authorities and the oil companies have a strong commitment to research and technology development aim at reducing emissions in the sector. The petroleum authorities facilitate several research programmes. This has yielded results, and many of the solutions first applied in Norway have been exported.

Under the Petroleum Act, companies may not flare more gas than absolutely necessary to ensure normal operation. Government approvals have to be given under both the Pollution Control Act and the Petroleum Act. Burning of gas in flares necessary to ensure normal operations is permitted following approval from the Ministry of Petroleum and Energy. Flaring accounted for about 11 per cent of the CO_2 emissions from the petroleum activities in 2011. A number of emission reduction measures put Norway in the forefront in this area.

All Plans for Development and Operation of oil and gas fields (PDOs/PIOs) must include a good and efficient energy solution. Since 1996 all projects have been required to consider supply of power from onshore as part of the PDO process. The broad political agreement on climate aims to increase the use of electric power from the on shore power grid in connection with major new developments.

4.3.3.4 Energy efficiency

Several energy conservation measures have been carried out after the CO_2 tax came into effect in 1991. Energy efficiency and energy management systems are important measures for reducing emissions. This work requires continuous follow-up. The choice of measure depends for example on the facility's age, operations pattern, installed equipment and processes, as well as available execution capacity. Examples of measures include modifications to power-intensive equipment (i.e. compressors and pumps), and optimisation of processes for improved energy utilisation.

4.3.3.5 Carbon capture and storage: The Sleipner West and Snøhvit projects

Norway has experience over many years of storing CO_2 in geological formations. As a result of the CO_2 tax introduced in 1991, the Sleipner West CO_2 storage project in the North Sea was initiated in 1996. The natural gas from Sleipner West had 9 per cent CO_2 content. This is a higher CO_2 content than the specification for the sales gas. The field was developed at the same time as the CO_2 tax was introduced. The CO_2 tax was one of the motives for the companies inject and store the CO_2 in a geological formationrather than venting it. Since 1996, one million tonnes of CO_2 per year have been separated from the natural gas produced and stored in the Utsira formation; a saline aquifer located 1,000 meters below the seabed. The aquifer consists of unconsolidated sandstone and thin horizontal shale layers that spread the CO_2 laterally. The seal consists of an extensive and 800 meter thick shale layer. The Utsira formation is by no means an unusual geological formation in terms of storage potential, and represents just one of many subsurface storage possibilities.

A programme has been set up for monitoring the behaviour of the injected CO_2. The monitoring programme builds on the experience gathered in the Sleipner Project and involves several companies and a series of research institutions partly financed by the European Union (the CASTOR-project) under the 6th Framework Programme. The overall goal of the CASTOR project is to develop and validate, in public/private partnerships, all the innovative technologies needed to capture and store CO_2 in a reliable and safe manner. Regarding the storage, the objective is to obtain secure management of storage sites by improving assessment methods, defining acceptance criteria, and developing a strategy for safety-focussed, cost-effective site monitoring. The "Best Practice Manual" has been improved by adding four European cases, one of these being the Snøhvit-case. Another partly EU- financed research project, the CO2ReMoVe project, aims to develop innovative research and technology for the monitoring and verification of geological storage of CO_2. The consortium behind this project proposes a range of monitoring techniques, applied over an integrated portfolio of storage sites.

The second CO_2 storage project in Norway is in the Barents Sea. The natural gas in the Snøhvit field contains 5-6 per cent CO_2 that must be removed before the remaining sales gas can be frozen to LNG for export. The separated CO_2 has been injected in a geological formation named Tubåen. From April 2011, the CO_2 has been injected into the bottom of the Stø formation, which is a gas reservoir. The first amount of CO_2 was injected and stored from the Snøhvit field in April 2008. At full production, 700,000 tonnes of CO_2 will be separated annually and stored.

In accordance with the Pollution Control Act and the Petroleum Act, Statoil has been required to monitor the CO_2 storage in the Utsira and Tubåen reservoirs and to report the results to the Norwegian Pollution Control Authority annually. The amounts of CO_2 stored and vented are reported in Norway's NIR.

4.3.3.6 Combined cycle power

Combined cycle power is a solution in which the exhaust gas from turbines is used to produce steam, which is then used to generate electricity. Combined cycle power increases energy exploitation and is currently in use on the Oseberg, Snorre and Eldfisk fields. These facilities are unique in a global offshore perspective.

4.3.3.7 Power from the onshore electrical grid

Several fields receive all or part of their power supply from the onshore electrical grid, which results in lower emissions compared with using offshore gas turbines. It is a requirement that the companies always consider electric power from the onshore electrical grid as an energy solution for new fields, and in connection with major modifications of existing fields. For instance, the facilities on the fields Troll A, Ormen Lange and Gjøa use power from the onshore electrical grid. Valhall came on stream in January 2013 with its new production platform. The new processing facility runs on power from the onshore electrical grid via a cable from Lista. Goliat will be provided with power from the onshore electrical grid when production starts. In 2012, about 48 per cent of Norwegian gas exports stem from fields with power supply from the onshore electrical grid. The extent of the use of power from the onshore electrical grid must be viewed in the light of the fact that there are considerable differences between the facilities when it comes to technical properties, costs and the effect on other power users through connection to the general power supply. In 2010, 5.8 Twh were supplied from the onshore electrical grid to installations offshore.

4.3.3.8 Effect on national emissions

The most significant effects of the CO_2 tax have probably been in the offshore petroleum sector, given that the industry generates a substantial proportion of total emissions and that the tax introduced major economic changes in this 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 the following text we give reference to solutions that have been applied, to meet the conditions/permits and the price on CO_2 emissions. In table 4.4, these measures are attributed to the Norwegian CO_2 price facing the sector; thus either by the CO_2 tax or the ETS-system, or both. 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 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. In addition, more than 1.5 million tonnes of CO_2 is separated and stored by the two operating CCS-projects on the NCS, Sleipner and Snøhvit. 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.From 2008, the petroleum industry has been included in the EU ETS. Additional measures in Norway for a sector subject to EU ETS may reduce national emissions, but will in that case increase emissions from other installations within the scheme correspondingly, as long as the EU ETS emissions cap is not reduced

4.3.3.9 Indirect CO_2 emissions from NMVOC

NMVOC regulation offshore

Non-methane volatile organic compounds (NMVOC) are not included in the six gases in the Kyoto Protocol. Nevertheless NMVOC emissions 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.

The petroleum sector used to be the primary source of NMVOC-emissions in Norway. However, from 2009, the solvent industry has been the primary source of these emissions. In 2011, the petroleum sector accounted for around 25 per cent of the total NMVOC emissions, a decline from 67 per cent in 2001.

The 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 51 per cent since 2000.

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.

The technology has reduced emissions from loading and storage offshore by 92 per cent since 2001 when the technology was introduced. In 2011, 18 vapour recovery units (VRU) were operating on 18 vessels. Several technologies are installed. The requirement has led to substantial reduction of the NMVOC emissions and hence also indirect CO_2 emissions. In the annual report from the oil producers, NMVOC emissions with and without VRU are estimated.

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.

The absorption and the Knudsen VOC technology also reduce emissions of CH_4. The absorption technology reduces the emissions of CH_4 by combusting the methane in the boiler that is producing the steam running the installation. The basic principle of KVOC technology is to prevent generation of VOC during loading and transit by installing new drop lines, specially designed for each tanker. The reduction of CH_4 emissions in 2007-2011 was from 6 to 10 thousand tonnes CO_2 equivalents.

NMVOC regulation land oil terminals

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

4.4 SUMMARY OF POLICIES AND MEASURES, OIL AND GAS EXTRACTION

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
						1995	2000	2005	2010	2011	2020	2030
CO_2 tax offshore and EU ETS*[1]	Reduce emissions	CO_2	Economic	Implemented 1991	Ministry of Finance	0,6	3	3	>5	>5	7	7[2]
NMVOC regulation offshore *	Reduce emissions	NMVOC and CH_4, i.e. indirect CO_2 emissions	Regulatory	Implemented 2002	Norwegian Environment Agency	-	-	0.22	0.26	0.24	0.23	0.20
NMVOC regulation land terminals *	Reduce emissions	NMVOC i.e. indirect CO_2 emissions	Regulatory	Implemented 1996	Norwegian Environment Agency	-	0.01	0.02	0.02	0.02	0.02	0.02

* The policy and measure is included in the 'with measures' projection.

[1] Sum of CO2 tax and EU Emissions Trading Scheme, see 4.3.2 for an overview of included measures.

[2] The calculations do not cover 2030. For this reporting, the effect in 2030 is set equal to 2020.

4.3.4 Energy and transformation industries (mainland)

4.3.4.1 Electricity production

4.3.4.1.1 Introduction

Electricity generation in Norway is almost exclusively renewable as over 95 per cent is hydro- power. The legal framework encompasses statutes and regulation concerning public ownership to hydro-power resources, licenses for the construction and operation of installations and regulations of the power market. The legislation is intended to ensure efficient resource management. Secure supply of energy and a well-functioning power market are key considerations.

Conflicts may arise between various user and environmental interests, in connection with planning, building and operation of a generation or transmission facility for electric energy and district heating, as well as water resource management. For example, effects may be felt in a number of areas such as environment, fishing, tourism, cultural heritage and local communities. Such interests are often denominated ”public interests” in legislation. Energy and river system measures can also affect private economic interests.

One of the objectives of the regulations in place is to ensure that these different interests are heard and considered, and that the various measures are subject to government control and conditions that safeguard these interests. For more information about the legal framework, see Facts 2013 – Energy and water resources in Norway: www.regjeringen.no/en/dep/oed/documents-and-publications/Reports/2013/facts-2013---energy-and-water-resources-.html?id=712168

4.3.4.1.2 Electricity tax

A tax on electricity consumption was introduced in 1951. At present an excise duty is levied on electricity supplied in Norway whether it is produced domestically or imported. Households, agriculture, service industries and the public sector pay the ordinary rate, in 2014 NOK 0.1239 per kWh. Power- intensive 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. Pulp and paper is exempted contingent on approved energy efficiency programmes. Other manufacturing industries, mining and quarrying, and district heating pay NOK 0.0045 per kWh. The excise duty on electricity is mainly a fiscal tax, but is meant also to reduce electricity consumption. Since the majority of the stationary energy consumption in Norway is based on electricity generated from hydro power, emissions from energy consumption are low in Norway compared to other countries. Energy efficiency measures and new renewable capacity will therefore have limited effect on emissions in Norway.

4.3.4.1.3 Base tax on mineral oils etc.

The 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 taxation of electricity was raised. The base tax does not apply to use of mineral oils in the transport sector and fisheries. In 2014 the base tax is NOK 1.557 per litre, equal to NOK 585 per tonne of CO_2 from light fuel oils.

CO_2 tax is charged in addition to the base tax. Through the broad political agreement on climate of 2012, the Storting[5] has

5. Norwegian Parliament

asked for a ban on use of fuel oils for heating in households and as a base load in other buildings from 2020.

4.3.4.1.4 Renewable electricity production

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. This target is the highest in Europe and represents an increase of approximately 9.5 percentage points from 2005.

A common Norwegian-Swedish market for electricity certificates was established on 1 January 2012. The electricity certificate system is a market-based support scheme with the objective of increased renewable electricity production. Norway and Sweden have a combined goal of establishing 26.4 TWh new electricity production based on renewable energy sources in 2020. Norway and Sweden are each responsible for financing 13.2 TWh in the certificate system, regardless of the share of production that is located in each of the two countries.

Electricity producers in Norway and Sweden whose electricity production meets the requirements of the Norwegian Electricity Certificates Act and the Swedish Electricity Certificate Act receive one electricity certificate for each MWh of electricity they produce for a period of 15 years. Demand for certificates is created by the statutory duty of electricity suppliers and certain end-users to purchase certificates corresponding to a proportion of their electricity sales or electricity use. Producers that receive certificates earn an income from the sale of certificates, in addition to the income they receive from the sale of electricity. The system thus stimulates increased development of renewable electricity production. Since the majority of the stationary energy consumption in Norway is based on electricity generated from hydro power, emissions from energy consumption are low in Norway compared to other countries. Energy efficiency measures and new renewable capacity will therefore have limited effect on emissions in Norway.

The electricity certificate system is technology neutral, i.e. 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 are entitled to certificates. The Norwegian Water Resources and Energy Directorate (NVE) is the supervisory authority for the electricity certificate market in Norway. Information regarding the electricity certificate system is available from: www.nve.no/no/kraftmarked/elsertifikater

4.3.4.2 Use of renewable energy sources and energy efficiency

4.3.4.2.1 Enova SF and management of the Energy Fund

The Energy Fund is a policy instrument to ensure a long-term, predictable and stable source of finance to promote an environmentally friendly change in the consumption and production of energy, and the development of energy and climate technologies. The overall objective is enhanced security of supply and reduced emissions of greenhouse gases.

The Energy Fund is a government fund owned by the Ministry of Petroleum and Energy. The state enterprise Enova manages the Energy Fund and has been in full operation since 1 January 2002, the date when the Energy Fund was established. Enova's obligations are specified in an agreement between the Ministry and Enova. The current agreement was signed on 28 June 2012 and runs until 31 December 2015.

The Energy Fund is financed by means of a levy on the electricity grid tariff, as well as through the annual returns from the Fund for Climate Mitigation Measures, Renewable Energy, and Energy Transition. The Energy Fund also generates interest which contributes to the Energy Fund's budget. As part of the broad political agreement in 2012, it was decided that principal capital in Fund for Climate Mitigation Measures, Renewable Energy, and Energy Transition should be increased from NOK 25 billion in 2012 to NOK 50 billion by 2016 after the extension of the responsibilities of the fund, see description of the initiative to promote energy and climate technologies below.

Objectives for Enova's activities

The 4-year Agreement between the Ministry of Petroleum and Energy and Enova defines the objectives of the enterprise, the assigned tasks, requirements regarding systems and reporting requirements. According to the current Agreement, Enova is to promote environmentally friendly change in the consumption and production of energy, both in the short and the long term, and in the development of energy and climate technologies. The initiative to promote energy and climate technologies is a new policy measure which was introduced in 2012, and represents a strengthening of national climate policies. The main objectives stated in the Agreement indicate the areas in which Enova is to operate.

a. Enova's management of the assets from the Energy Fund is to foster:
b. Development and introduction of new energy and climate technologies in the market.
c. More efficient and flexible use of energy.
d. Increased use of energy carriers other than electricity, natural gas and oil for heating purposes.
e. Increased use of new energy resources, including energy recovery and bio energy.
f. More well-functioning markets for efficient energy,- and environmentally- and climate-friendly solutions.
g. Increased knowledge among the general public about the possibilities of using energy-efficient,- and environmentally- and climate-friendly solutions.

The Agreement stipulates an overall energy target expressed in energy unit TWh that Enova must meet within the agreement period. The funds managed by Enova during the period from 1 January 2012 to 31 December 2015, are to help in achieving combined energy and climate results corresponding to at least 6 ¼ TWh. Furthermore, it is stipulated that for the work related to energy and climate technology, the efforts must promote reduction in greenhouse gas emissions and support environmentally friendly changes in the consumption and production of energy in the long term, through the development and market introduction of new technologies and new solutions which can contribute to this. Enova's efforts are to be directed towards the development of new technology and support for technologies and solutions close to market introduction, among other things, Enova may offer investment aid to full-scale demonstration projects in the industrial sector.

Effect on national emissions

Enova reports results from the allocation of aid to projects in the form of contracted energy results, reported energy results or realised energy results. Many of the projects are of a size entailing that they are carried out over several years.

From 2001 to 2011, Enova contracted projects that are expected to yield 15.9 TWh/year, either in energy efficiency, conversion from fossil fuels and electricity and energy production (energy result). A total of NOK 9 billion has been granted in investment aid to these projects. By the end of 2011, projects amounting to approximately 7.2 TWh/year were completed and a final report was delivered.

The reported effect on national emissions from Enova's activities is the calculated reduction of annual CO_2 emissions as a result of the reduced oil consumption estimated from Enova's energy results. Other measures, such as taxes and regulations, also have an impact on projects supported by Enova, but are included in these estimates. In 2011, the effect on national emissions was estimated to be approximately 600 000 tonnes CO_2/year. In 2020, based on projections of existing policies and with some uncertainty, this is estimated to be approximately 1.5 million tonnes CO_2/year.

4.3.4.2.2 Energy requirements in the building code

The Norwegian technical building regulation code (TEK) under the Planning and Building Act contains specific energy demand requirements for all new buildings. The requirements are provided in relation to 13 different building types. The requirements aredefined in terms of kWh/m^2 final energy demand per year within the building envelope, taking into consideration heat recovery from the ventilation system, but without taking system losses and energy export into consideration. There are also component requirements for the building envelope and for technical installations. Furthermore, there are specific requirements for heat recovery of ventilation air in the ventilation apparatus (yearly mean heat recovery rate), SFP factor (specific fan power), and equipment for shading or other precautions to avoid the use of cooling systems. Energy demand for lighting, hot water and all technical equipment are also taken into consideration, but only standard values are applied.

It is also required that energy supply solutions ensure an environmentally friendly energy supply. Section 14-7 of the technical building regulations stipulates requirements entailing that buildings of more than 500 square metres of heated gross area (BRA) must be planned and executed so that at least 60 per cent of the net heating need can be covered by energy supplies other than direct-acting electricity or fossil fuels. For buildings of less than 500 square metres of heated BRA, 40 per cent of the net heating need applies correspondingly.

The energy requirements in the building code were substantially tightened in a revision in 2007, in terms of the requirements for both energy efficiency and energy supply in buildings. In 2010 the energy supply requirements for buildings larger than 500 m^2 were tightened (to the level described in the previous paragraph), and the efficiency requirements were also adjusted somewhat. A ban on installing oil boilers for fossil fuel as base load was also introduced.

An example of the development for some of the main properties necessary to fulfil the requirements for commercial buildings, single family houses, and apart-

4.5

Requirement	1997	2007	2010
Net energy demand (kWh/m² year)	–	Single family house: 125 + 1,600/m² heated floor area Apartment: 120 Commerciel building: 165	1991
Total area of glass/doors	20 % of the heated floor area	20 % of the heated floor area	20 % of the heated floor area
U-value: exterior wall	0.22 W/(m²K)	0.18 W/(m²K)	0.18 W/(m²K)
U-value: roof	0.15 W/(m²K)	0.13 W/(m²K)	0.13 W/(m²K)
U-value: exposed floors	0.15 W/(m²K)	0.15 W/(m²K)	0.15 W/(m²K)
U-value: glass/dors	1.6 W/(m²K)	1.2 W/(m²K)	1.2 W/(m²K)
Thermal bridges	–	Single family house: 0.03/(m²K) Other buildings: 0.06/(m²K)	Single family house: 0.03/(m²K) Other buildings: 0.06/(m²K)
Heat recovery of ventilation air	60 %	70 %	Dwellings: 70 % Commercial buildings: 80 %
Air tightness	Single family house: 4.0	Single family house: 2.5	Single family house: 2.5
(Air changes/hour by 50 PA pressure difference)	Other buildings (with more than two floors): 1.5	Other buildings (with more than two floors): 1.5	Other buildings (with more than two floors): 1.5
SFP factor	–	Dwellings: 2.5 kW/(m³/s) Commercial buildings: 2.0 kW/(m³/s)	Dwellings: 2.5 kW/(m³/s) Commercial buildings: 2.0 kW/(m³/s)
Screening factor for glass/window (gt)	–	–	0.15 (all buildings)

ment buildings can be seen in the table below. The requirements are the same for single family houses and apartments, listed in table 4.5 as dwellings.

4.3.4.2.3 The Low-energy Programme

The Low-energy Programme (Lavenergiprogrammet) was established in 2007. It is a ten-year collaboration programme 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 Programme has completed a number of courses, information campaigns and projects in the construction sector.

Investigations conducted by that the Low-energy Programme shows that both craftsmen and architects/project engineers have insufficient knowledge about energy in buildings. Through participation in the

EU project "Build Up Skills", the Low-energy Programme has prepared a status analysis and a roadmap for the construction industry, as well as an implementation plan on how to close the gap between current knowledge and the need for knowledge to achieve goals for energy efficient buildings in the future.

The energy savings effect of these measures and instruments is difficult to calculate.

4.3.4.2.4 The Norwegian State Housing Bank

The Norwegian State Housing Bank (Husbanken) grants basic loans for building new residences or improving existing residences and certain other buildings. There are more stringent energy requirements for basic loans from the State Housing Bank, than otherwise apply in connection with current building regulations. The Housing Bank also provides grants for increasing competence and disseminating knowledge on sustainable buildings, where anyone can apply for economic support for specific projects. A range of pilot projects with better energy quality than prescribed by current regulations have been granted support by from the Housing Bank. Some of the projects have also received support from Enova.

The emissions reduction and energy savings effect of these measures and instruments is difficult to determine and calculate directly.

4.3.4.2.5 Other policy instruments that affect energy consumption

Energy consumption is also influenced by energy prices and taxes. Norway has several CO_2- and energy-related taxes, (seesection 4.3.2 and 4.3.4.)

Norway is part of the Nordic power market, and is also connected to the European power market. Price increases in the European market due to carbon pricing through the European Emissions Trading Scheme (EU ETS) will therefore influence Norwegian power prices, and thereby the consumption of electricity in Norway.

Several other instruments in place also affect energy consumption. Norway has adopted EU legislation on ecodesign and energy labelling which defines minimum energy efficiency requirements and information requirements in order to help consumers choose the most energy efficient products. Technical building regulations related to energy, energy labelling of buildings and energy assessments of technical systems secure and promote energy efficiency in buildings.

The efforts in renewable energy and energy efficiency are also supported by broad efforts in research and development. Through the Norwegian Research Council, programmes fordevelopment of knowledge and technologies for renewable energy, energy efficiency and environmentally friendly transport have been strengthened.

In order to improve energy efficiency and further the transition to renewable energy, a counselling programme has been established in the greenhouse sector. The programme is partly funded by the Ministry of Agriculture and Food.

In addition to the government Energy fund described in chapter 4.3.4.2.1, the Ministry of Agriculture and Food offers funding for implementation of renewable bioenergy from the forestry and agricultural sector. The level of such funding is in the region of NOK 50 mill per year, resulting in a yearly energy amount of 42 GWh by 2011. A political agreement of 2008 also supports targeted and coordinated policy instruments for increased use of bioenergy

4.6 SUMMARY OF POLICIES AND MEASURES, ENERGY AND TRANSFORMATION INDUSTRIES

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument
Green certificates*	New renewable energy	No direct effect	Economic
Electricity tax*	Reduce electricity consumption	No direct effect	Economic
Base tax on mineral oils*	Avoid substitution	CO_2	Economic
The Norwegian energy fund, Enova*	Contribution to an environmentally friendly change in the consumption and production of energy and the development of energy and climate technologies	CO_2	Economic
Energy requirement in the building code*	Reduce use of fossil fuels and energy demand in new buildings	CO_2	Regulatory
The Low-energy programme	Increase knowledge about renewable energy and energy efficiency in buildings	CO_2	Information/education
The Norwegian State Housing Bank – grants and loans	Improve energy quality beyond regulations	No direct effect	Economic
Bioenergy programme	Replace fossil fuel use by bioenergy	CO_2	Economic
Improve incentives for the use of bio-energy derived from wood, with particular emphasis on forest residues	Implementation of up to 14 TWh new bio energy by 2020 Reduce fossil emissions	CO_2	Economic, regulatory
Measures in the greenhouse sector	Reduce use of energy and emissions	CO_2	Economic and Information
Ban use of fossil fuels for heating in households and for base load in other buildings	Phase out fossil fuel use in buildings	CO_2	Regulatory
Phase out use of fossil fuels for base load in government buildings	Phase out fossil fuel use in buildings	CO_2	Not yet decided
Tighten building regulations to passive house levels in 2015 and next to zero energy use in 2020	More energy-efficient buildings	No direct effect	Regulatory
Introduce component requirement for existing buildings	Reduce energy use in buildings	No direct effect	Regulatory

[1] The calculations do not cover 2030. For this reporting, the effect in 2030 is set equal to 2020.

Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
		1995	2000	2005	2010	2011	2020	2030
Implemented 2012	MPE	-	-	-	-	-	-	-
Implemented	Ministry of Finance	-	-	-	-	-	-	-
Implemented 2000	Ministry of Finance	-	-	-	IE	IE	IE	IE
Implemented 2002, strengthened 2012	Ministry of Finance	-	-	-	0.6	0.6	1.5	1.5[1]
Implemented 2007, strengthened 2010	Ministry of Local Government and Modernisation	-	-	-	IE	IE	IE	IE
Implemented 2007	Ministry of Local Government and Modernisation	NE	NE	NE	NE	NE	NE	NE
Implemented 1946	The Norwegian State Housing Bank	-	-	-	-	-	-	-
Implemented	Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Implemented from 2008. 2 TWh achieved by 2011-2012. Repealed from 2014.	Ministry of Petroleum and Energy, Ministry of Agriculture and Food, Ministry of Local Government and Modernisation, Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Implemented	Ministry of Agriculture	NE	NE	NE	NE	NE	NE	NE
Planned 2020	Ministry of Climate and Environment/ Ministry of Petroleum and Energy	NE	NE	NE	NE	NE	NE	NE
Planned 2018	All governmental institutions	NE	NE	NE	NE	NE	NE	NE
Planned	Ministry of Local Government and Modernisation	NE	NE	NE	NE	NE	NE	NE
Planned	Ministry of Local Government and Modernisation	NE	NE	NE	NE	NE	NE	NE

6. Norwegian Parliament

by up to 14 TWh by 2020. So far 2-3 TWh of new bioenergy has been deployed since this target was formulated in 2008. It is assumed that the expected harvest level in 2020 will be sufficient to reach the target if forest residues are included and deployed.

4.3.4.2.6 Measures for increased energy efficiency and phasing out fossil fuels in buildings

Through the broad political agreement on climate of 2012, the Storting[6] has called for several new policy instruments for increased energy efficiency and phasing out of fossil fuels in buildings.

One of these instruments involves implementing a ban on the use of fossil oil for heating in households and for base load in other buildings from 2020. The Government is investigating the consequences of a ban on the use of fossil oil for heating, especially with regard to security of supply. The Storting has signalled that the use of fossil oil for base load in state-owned buildings should be phased out by 2018. The Government which took office in October 2013 has stated that it will ensure the phasing out of fossil oil from all public buildings by 2018 and ban the use of fossile oil or heating in all buildings from 2020. The broad political agreement on climate also aims to expand the ban on installing boilers for fossil fuel for base loads to encompass all existing buildings.

Through the political agreement on climate, the Storting has requested the Government, as builder and property owner, that it be a driving force in efforts directed towards energy conversion and phasing out of the use of fossil fuels in buildings.

Another measure involves tightening of the energy requirements in the building code to passive house level by 2015 and nearly zero energy level by 2020. The Government is now working on stipulating provisions to define the passive house level and the nearly zero energy level. The decision on the level of these requirements will be made on the basis of studies of economic and health-related consequences, as well as the expertise in the building sector.

The Norwegian Building Authority (Direktoratet for byggkvalitet) is responsible for the preparation of new energy requirements, and the process of assessing different alternatives to new energy requirements has been initiated. The authority will submit a proposal for new requirements in compliance with the conditions set out in the broad political agreement on climate, including an assessment of possible energy and climate effects of the proposal. The proposal is scheduled to be submitted to the Ministry of Local Government and Modernisation in 2014, and will then be subject to public consultation.

According to the broad political agreement on climate, component requirements will be introduced for existing buildings and it will be clarified which types of building work and which components these requirements will apply to, based inter alia on evaluation of energy effects and costs.

Possible energy gains from component requirements have been studied in a report commissioned by the Ministry of Local Government and Modernisation. There is still a need for assessments regarding the legal, technical and economic possibilities and consequences of component requirements. The Norwegian Building Authority has been requested to contribute to further assessments of this. Funding for these measures is subject to decisions in the annual budget.

4.3.5 Transport

4.3.5.1 Introduction

A number of instruments affect the amount of transport and distribution of transport modes, and thus also greenhouse gas emissions. Many of these instruments are not primarily designed to reduce greenhouse gas emissions but to serve other purposes, for example, the distribution or flow of traffic. The broad political agreement on climate of 2012 states that emissions in this sector should be reduced by phasing in new, environmentally friendly vehicle technology, and by making it easier to opt for public transport, walking or cycling. The agreement states that more goods must be transported by sea and rail, and that more environmentally friendly vehicle technologies and fuels should be employed. Norway is engaged in designing instruments to promote energy and climate conscious behaviour on part of transport users. An important measure to reduce emissions in the transport sector is to continue the changes in taxing vehicles and fuel use in a more environmentally friendly direction.

4.3.5.2 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 2014, the CO_2 tax rates are NOK 0.93 per litre petrol and NOK 0.62 per litre auto diesel subject to the road usage tax. Other mineral oils are as of 2014 subject to a higher, general tax rate of NOK 0.88 per litre. Since 1 January 1999, fuel for domestic aviation has also been subject to CO_2 tax, and the tax rate as of 2014 is NOK 0.84 per litre jet kerosene for domestic aviation not included in the EU ETS , equivalent to the general CO_2 tax on mineral oil in terms of CO_2 content. The CO_2 tax rate for domestic aviation included in the EU ETS is 0.56 NOK per litre in 2014. Owing to international regulations, international aviation is still exempt from CO_2 tax.

4.3.5.3 Motor vehicle registration tax

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 resulted in reduced emissions from new cars. The registration fee on cars depends on the weight, engine power, CO_2 and NOx emissions of the car. The registration fee on CO_2 emissions was introduced in 2007 and gives strong economic incentives to choose cars with low emissions. 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 all years from 2009 to 2014, the registration tax has placed greater weight on CO_2 emissions, and less on engine power,. This is reflected in the average CO_2 emission from new cars, which was reduced from the 2006 figure of 177 g/km to 123 g/km during 2013, (see figure 4.2) EU emission standards for motor vehicles have contributed positively to the reduction in emissions, but an analysis by an independent company found that the changes in the motor vehicle registration tax favouring low emission vehicles may explain most of the reduction in emissions during the period 2006-2011.[7] The white paper on Climate Policy (Meld.St. 21 (2011-2012)) to the Storting 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 Parliament took note of this goal.

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

It is reasonable to assume that the positive trend with lower emissions will continue.

The green column in figure 4.2 shows average emissions from new cars (g/km), the red emissions from new petrol cars and the green emissions from new diesel cars. The blue stripes indicate the introduction of the CO_2 element in the purchase tax in 2007, and the introduction of the NOx component in 2012. The CO_2 element has been adjusted several times after the introduction in 2007.

Estimated effect on national emissions

Estimates indicate that the average CO_2 emission from new passenger cars would have been 22 g/km higher in 2011 if the registration tax had not been changed from 2007 onwards. From 2007 to 2011 the impact of the changes in the registration tax was estimated to be lower than 22 g/km. It is estimated that the changes in the registration tax will reduce CO_2 emissions by approximately 500 000 tonnes of CO_2 by 2020, if the reduction in CO_2 emission from new passenger cars is held constant from 2011 to 2020. The growth in the sales of new passenger cars has estimated at 2.5 per cent per year. The impact on emissions of imports of used cars, commercial vehicles etc. has not been estimated.

4.3.5.4 Exemptions from taxes and other incentives

Norway provides strong user incentives for zero emission vehicles: electrical cars and hydrogen cars are exempt 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. In addition to the tax benefits, electric cars have

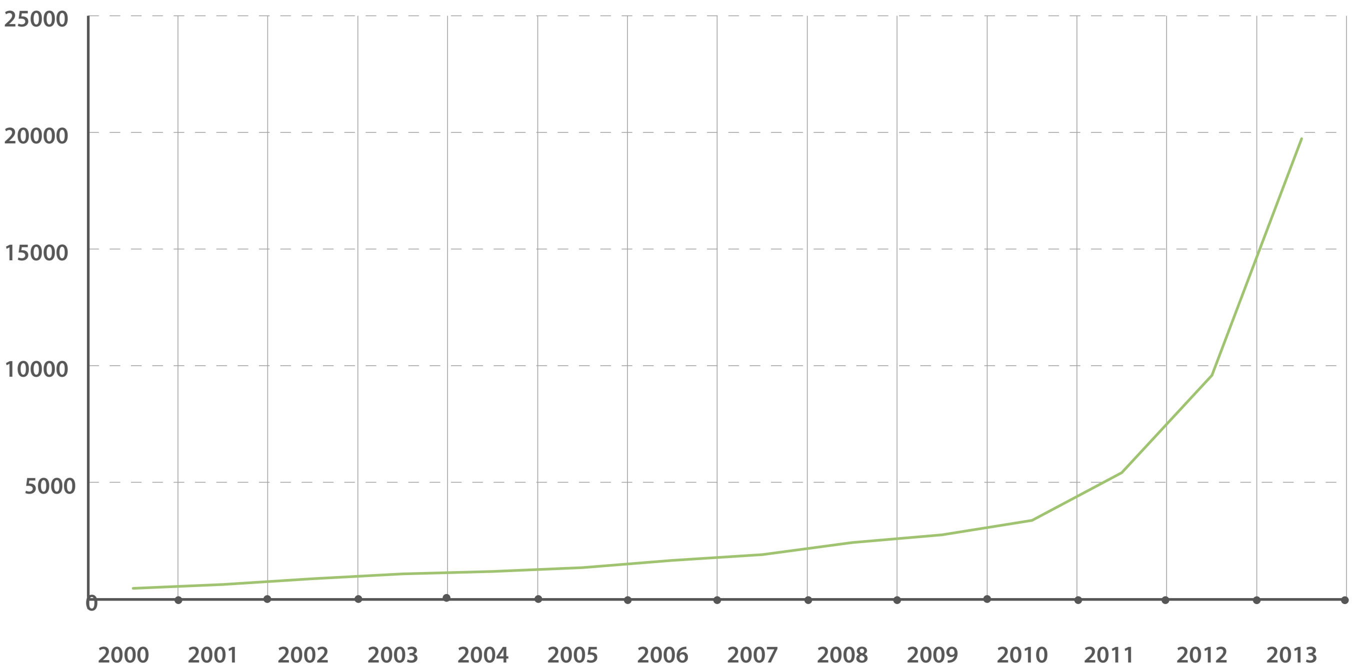
4.2 CO2 EMISSIONS FROM NEW CARS, GRAM CO2 PER KM

SOURCE: Opplysningsrådet for Veitrafikken, 2014 other benefits, like access to bus lanes, free toll passage and free access to public parking spots. More than 4000 charging points have been established. The political agreement on climate of 2012 states that the tax benefits for zero emission cars shall be unchanged until 2017, as long as the number of such cars doesnot exceed 50 000. Other measures to promote zero emission cars, such as free toll passage, access to bus lanes and free parking must be seen in light of the of the development in traffic in the big cities and great weight must be put on local municipalise view.

The incentive scheme, together with support for infrastructure, has had a major effect on the sale of electrical vehicles, and Norway has more than 20 000 electric cars pr January 2014. This is the largest number of electric cars per capita in the world (see Figure 4.3).

Hybrid electric vehicles are partly exempt from the motor vehicle registration tax. The weight of the electric motor and the battery package, and the power of the electric motor, are excluded from the tax basis. In practice, the weight deduction is set at 10 per cent of the vehicle weight. For plug-in hybrid vehicles the deduction is set at 20 per cent. Hybrid electric cars are also partly exempt from the road usage tax since electricity are not subject to this tax. Furthermore, they have relatively low CO_2 emissions and are therefore, owing to the CO_2 component of the tax, subject to a lower registration tax than comparable conventional cars.

4.3 ELECTRIC VEHICLES ON NORWEGIAN ROADS 2000-2013



SOURCE: Norwegian Road Federation

Effect on national emissions

In addition to strong measures to choose low emission cars, emission standards, set by the EU, for new passenger cars will directly reduce emissions also in Norway. In the projections it is assumed that current policies (both national and EU requirements) will reduce emission from new cars to 110 g/km by 2020. Without these measures emissions would have been up to 1.1 million tonnes higher in 2020 than in the base line. The registration tax is estimated to contribute to 0.5 million tonnes. Other incentives for choosing low emission vehicles and the emission standards set by EU are estimated to reduce emissions by 0.4-0.6 million tonnes by 2020.

4.3.5.5 Biofuels

In order to increase the use of biofuels, there is a mandatory biofuels turnover in Norway. A blending obligation was introduced in 2009, committing the economic operators to sell at least 2.5 per cent biofuels. Since April 2010, 3.5 per cent of the total yearly amount of fuel sold for road transport must be biofuels. As of 1 January 2014, sustainability criteria must be met by all biofuels and bioliquids included in renewable energy targets of 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 second generation biofuels.

The tax system is so designed that Norway imposes CO_2 tax on mineral products. This entails that petrol and diesel are subject to CO_2 tax, whereas bio ethanol, biodiesel and hydrogen are not. Biodiesel that meets the sustainability criteria is subject to a reduced road usage tax, corresponding to half of the rate for auto diesel. Bioethanol is exempt from road usage taxes in blends containing more than 50 per cent bioethanol. In lower blends, bioethanol has the same road usage tax as petrol. In the declaration from the new Government in October 2013, it was stated that the Government will maintain the exceptions from road usage tax for alternative fuels until 2020.

Effect on national emissions

The use of bio fuels, blended or pure, has led to reduced CO_2 emissions from road vehicles, see Table 4.7. The content of bio fuels in petrol and auto diesel has increased since 2006. The estimated CO_2 effect in 2020 and 2030 is based on the content of bio fuels as of 2010, cf. table 4.8.

4.3.5.6 Transnova

Norway believes that technology-neutral policies are best suited to push forward the best technologies. In accordance with the

4.7 CONTENT OF BIOFUELS IN PETROL AND AUTO DIESEL. 2006-2011. PER CENT BY VOLUME.

	2006	2007	2008	2009	2010	2011
Petrol	0.0 %	0.0 %	0.1 %	0.1 %	0.6 %	1.2 %
Auto diesel	0.4 %	1.8 %	4.5 %	5.1 %	5.6 %	5.2 %

Source: Norwegian Petroleum Institute

broad political agreement on climate, efforts on research, development and demonstration of climate-friendly transport technology have been increased. In addition, it is aimed to provide necessary infrastructure for vehicles that can use renewable energy (electric vehicles, hydrogen vehicles and flexifuel vehicles that run on biofuels). In 2009 a subsidy programme – Transnova – was established to subsidize demonstration projects and market introduction of climate-friendly transport technologies. Transnova was started as a 3 year project, but in the broad political agreement on climate of 2012 it was decided to establish Transnova as a permanent organ. Transnova's total budget for 2013 is NOK 87 million. Transnova has contributed to the establishment of about half of Norway's charging points.

4.3.5.7 Aiming to absorb the growth in passenger transport in major urban areas through public transport, cycling and walking

It is vital that mobility needs in larger urban areas are met with modes of transport that result in as little air pollution, noise and land-use as possible. Through the broad political agreement on climate of 2012 the Storting has adopted a goal of absorbing the growth in passenger transport in major urban areas through public transport, cycling and walking. This involves a modal shift from private cars to more environmentally friendly transport. To achieve this, there is a need to develop competitive public transport systems, facilitate pedestrians and cyclists, coordinate land use and transport planning, as well as introduce measures for managing and curbing private car traffic. The aim is to introduce a more comprehensive approach in urban policy whereby central and local authorities cooperate on negotiations and undertake to pursue joint objectives in urban environment agreements.

Policies and measures are also implemented in order to stimulate walking and the use of bicycles. There is a potential for increased cycling in Norway, and there is a national goal of increasing the bicycle share of total number of daily travels from today's 4 per cent to 8 per cent within the next 10 years period.

4.3.5.8 Reward scheme for public transport

The reward scheme for the largest cities was established in 2004 to make grants available to those local governments that achieve positive results increasing shares of public transport at the same time as managing traffic with private cars by including a goal of zero growth during the period. The grant should be spent on increased level of service for public transport (higher frequency, improved travel speeds, etc), and the local governments are encouraged to apply restrictions in automobile use (congestion charges, local fuel taxes, reduced parking, building regulations, etc). From 2004 to 2014, the scheme has increased from NOK 75 mill. to NOK 945 mill.

4.3.5.9 Railway

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. Over the last years, there have been substantial increases in funding for investment in new railways maintenance of existing railways , and these increases are planned to continue. The largest project is the upgrading of the existing railway to a modern double track standard between Oslo and the cities of Hamar, Tønsberg, and Sarpsborg, which is planned to be completed by 2026. This is calculated to give a yearly decrease in CO_2 emissions by 63 200 tonnes. A similar upgrading will be carried out on the railway between Bergen and Arna, which is planned to be completed in 2020. This is calculated to give a yearly decrease in CO_2 emissions of 1 900 tonnes. The planned electrification of Trønderbanen and Merakerbanen and the modernisation of Trønderbanen is planned to be completed in 2023, and will lead to a yearly decrease in CO emissions of 14 500 tonnes. Measures to increase the capacity for freight transport on rail by 20-50 per cent are planned implemented in 2023. This will lead to a yearly decrease in CO_2 emissions of 36 200 tonnes.

The implementation of an increased public transport service by train in the Great Oslo area started in 2012. The next step in the implementation is planned for 2014/2015. The increased service gives a high frequent train service between the main stations in the Greater Oslo area. The market has responded very positive to the first step. There has been an increase of passengers in the Great Oslo area by 9.2 per cent in 2013. When the full implementation of the new service in the Great Oslo area is completed this is calculated to give a yearly decrease in CO_2 emissions by 18 000 tonnes per year.

4.3.5.10 Other policies and measures

Through the broad political agreement on climate of 2012, the Storting has called for several new policy instruments to reduce greenhouse gas emission from transport. The white paper on Climate Policy (Meld. St. 21 (2011-2012)) to the Storting 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 Parliament took note of this goal.

The climate agreement also states that car-related taxes are to help in realising a more environmental and climate-friendly vehicle fleet. The taxes shall increase the weighting of climate characteristics and local pollution. The agreement also says that the tax benefits for zero emission cars will be kept unchanged until 2017, as long as the number of such cars does not exceed 50 000.

The political agreement on climatealso includes a goal that the growth in passenger transport in major urban areas should be absorbed by public transport, cycling and walking. In and around major urban areas, public transport and cycling initiatives are to be granted higher priority in the allocation of transport funding. In addition there was agreement on giving public transport an important role in the white paper on the National Transport Plan for 2014–2023 (NTP 2014-2023) and prepare an action plan on public transport as follow-up the transport plan.

Funding for these measures and ensuring tax changes is subject to decisions in the annual budgets.

The current Government has in its political platform stated that it will:

- prepare official requirements that all new public vehicles, and all new taxis, ferries, boats and diesel trains, shall use low or zero emission technologies, when the technology allows it.
- facilitate electric power for ferries and cruise ships in more harbours.
- maintain the exceptions for road usage tax for alternative fuels till 2020.

Foto: Matti Niemi/ Gorilla/NTB scanpix

4.3.5.11 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 is expected to be expanded in 2014. In addition work is ongoing regarding establishment of further global actions to reduce greenhouse gas emissions from international shipping. The IMO is also adressing short-lived climate forcers through the ongoing work on Black Carbon emissions from shipping. The existing regulation on emissions on volatile organic compounds also adress these emissions.

In 2014 the IMO will update the estimate of the global greeenhouse gas emissions 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 gas-fuelled ferries through public procurement and 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.

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. For international aviation Norway is pursuing the introduction of targets for emission reductions and use of market-based measures to achieve such targets. ICAOs General Assembly decided in October 2013 on development of a global market-based measure. It is intended that the design of the scheme will be decided by the Assembly in 2016, with implementation from 2020. Norway will actively support this process.

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.

4.3.6 Industry

4.3.6.1 Introduction

This sector is responsible for emissions from industrial processes. 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. From 2013 emissions from processes in the manufacturing industries will to a large extent be covered by the EU Emissions Trading Scheme (EU ETS).

4.3.6.2 CO_2 compensation scheme

Norway has established a new 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). 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

4.8 SUMMARY OF POLICIES AND MEASURES, TRANSPORT

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
						1995	2000	2005	2010	2011	2020	2030
CO_2-dependent registration tax for new passenger cars *	Reduce emissions from new cars	CO_2	Economic	Implemented 2007, adjusted 2009-2013	Ministry of Finance	-	-	-	0.05	0.10	0.50	1.00
Tax exemptions for electric and hybrid cars and EU emission standards for passenger cars *	Reduce emissions from new cars	CO_2	Economic	Implemented	Ministry of Finance	-	-	-	-	-	0.4-0,6	0.6
Requirement of 3.5 % bio fuels of fuel consumption in road transport *	Reduce emissions	CO_2	Regulatory	Implemented 2009	Ministry of Climate and Environment	-	-	-	0.40	0.46	0.50	0.60

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 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 will be 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.

4.3.6.3 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 emissionsof PFCs per tonne of aluminium produced were 85 per cent lower than in 1990 and 84 per cent lower in 2007. The emission intensity has continued to decrease and in 2011 was 95 per cent lower than in 1990.

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. It is therefore somewhat difficult to separate the effects of the agreement from other effects. Applying a "business-as-usual" scenario from 1990, assuming no change in emission intensity, gives an estimate of 4.6 million tonnes of CO_2 equivalents in 2005. Even before the agreement was signed in 1997, the aluminium industry had voluntarily reduced its PFC emissions substantially, i.e. 54 per cent reduction in the specific emissions of PFCs per tonne of aluminium as CO_2 equivalents compared with 1990. The estimated reductions of emissions since 1997, when the agreement was signed, is about 1.7 million tonnes of CO_2 equivalents in 2005 compared with the "business-as-usual" scenario.

The emissions covered by this agreement were first covered by the 2009 agreement with the processing industry, see description 4.2.6.10, and from 2013 they are covered by the EU emission trading scheme.

4.3.6.4 Agreement on SF_6 reductions from the electro industry

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, average yearly emission were less than half of base year emissions. This trend has continued and has been reinforced in recent years, with emission in 2011 and 2012 at approximately one-third of 2000-levels.

4.3.6.5 F-gas regulation

Norway has implemented EU Regulation No. 842/2006 on certain fluorinated greenhouse gases (F-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.

Owing to delays in the establishment of the certification scheme, full enforcement of this regulation was delayed till 2013. Since the tax and reimbursement scheme for HFC has been in effect for 10 years and has resulted in considerable measures and restructuring, the additional effect of the

F-gas regulation is uncertain and has not been estimated for 2020 and 2030.

4.3.6.6 SF_6 reduction, production of magnesium

Since 1985, Norsk Hydro has 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. From 1987 to 1989, Norsk Hydro reduced its emissions by more than 3 million tonnes of CO_2 equivalents. The emissions were also reduced at the beginning of the 1990s. From 1990 to 1995 the emissions were reduced by approximately 1.7 million tonnes of CO_2 equivalents, but there has been a weak increase from 1995 to 2001 owing to increased production. The specific emissions (emissions per tonne of magnesium produced) were reduced considerably from 1990 to 1995, but were stable from 1995 to 2001. In 2002, the primary production of magnesium in Norway was closed down, and in 2006 recycling of magnesium was also closed down.

4.3.6.7 N_2O reduction, production of nitric acid

In 2011, the N_2O emissions from the production of nitric acid equalled about 0.3 million tonnes of CO_2 equivalents. The emissions from the production of nitric acid decreased by 86.1 per cent from 1990 to 2011. 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 hasbeen equipped with a new technology – N_2O decomposition by extension of the reactor chamber. As a result of the new technology, the emission factor (IEF) for nitric acid production decreased from 5.0 kg N_2O per tonne nitric acid in 1990 to 0.6 kg N_2O tonne of nitric acid in 2011. If we assume a "business-as-usual" scenario from 1990 without the actual reduction in emissions per unit produced, the emissions in 2011 would have been 2.3 million CO_2 equivalents higher.

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 4.3.6.9). The production of nitric acid was opted-in tothe EU ETS in 2008 and this has provided incentives for further emissions reductions.

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

In the production of cement and ferroalloys, the sectors have voluntarily replaced some of the coal consumption with bio carbon. This has resulted in reduced CO_2 emissions in the range of 0.03-0.45 million tonnes of CO_2 equivalents from the year 2000, see table 4.9 for details.

4.3.6.9 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. The GHG inventory shows that 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 N_2O emissions from the production of nitric acid was enough to fulfil the arrangement, but the effect is included under *N2O reduction, production of nitric acid*.

4.3.6.10 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 of greenhouse gases per year for the years 2008-2012. The limit equalled a reduction of 44 per cent compared with the emissions in 1990. In 2007, emissions from the processing industry were 6.4 million tonnes. The target has been 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.

4.3.7 Agriculture

Emissions from agriculture are neither covered by the emissions trading system, nor subject to CO_2 taxation. The reasons for this are both that it is difficult to estimate these emissions and that the emissions

4.9 SUMMARY OF POLICIES AND MEASURES, INDUSTRY

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument
Emissions trading (2008-2012)[1] *	Reduce emissions	CO_2, N_2O	Economic
Climate change agreement with aluminum industry *	Reduce PFC emissions	PFCs	Voluntary agreement
Agreement on SF6 reductions from electro industry *	Reduce SF_6 emissions	SF_6	Voluntary agreement
F-gas regulation *	Reduce HFCs emissions	HFCs	Regulatory
SF6 reduction, production of magnesium	Reduce consumption of SF_6	SF_6	Voluntary
N2O reduction, production of nitric acid *	Reduce N_2O emissions	N_2O	Voluntary/ Voluntary agreement/ EU ETS
Use of bio carbon in the production of cement [3] *	Reduce CO_2 emissions	CO_2	Voluntary
Use of bio carbon in the production of ferroalloys [4] *	Reduce CO_2 emissions	CO_2	Voluntary
Consensus with the process industry, 2004*	Reduce emissions	All six gases or groups of gases	Voluntary agreement
Consensus with the process industry, 2009*	Reduce emissions	All six gases or groups of gases	Voluntary agreement

* The policy and measure is included in the 'with measures' projection. 1 The effect of the EU ETS on the industry is included under Cross-sectoral policies and measures, table 4.3

[2] The plant producing magnesium was closed down in 2006, and emission reductions are not included in the estimated effects of policies and measures after this.

stem from many small units, which are difficult to include in an emission trading system. However, Norway has implemented measures affecting the emissions from agriculture. Existing measures in this sector are both statutory and financial, in addition to measures related to information.

The broad political agreement on climate in the Storting from June 2012 forms the foundation for Norwegian climate policy in the agricultural sector. The Norwegian Ministry of Agriculture and Food presented a white paper on agriculture and climate change in June 2009; Climate Challenges - Agriculture part of the Solution (Meld.St. 39 (2008-2009)).

Identifying measures for reducing climate emissions in the agricultural sector is complex. This is mainly because the emissions vary in relation to natural changes such as precipitation patterns, temperature or soil properties. Table 4.10 therefore shows few national measures. Nonetheless, action is being carried out at regional, local and individual levels in different parts of Norway. This includes information on good agricultural practice, local land use planning, and mapping of climate emissions from specific farms. 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 im-

Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
		1995	2000	2005	2010	2011	2020	2030
Implemented 2008	Norwegian Environment Agency	-	-	-	IE	IE	IE	IE
Implemented 1997	Ministry of Climate and Environment	0-1.3	0.5-2.7	1.7-4.6	1.8-4.1	1.8-4.1	1.8-4.3	1.9-4.3
Implemented 2002	Ministry of Climate and Environment	-	-	0.09	0.09	0.10	0.1	0.1
Implemented	Norwegian Environment Agency	-	-	-	-	-	NE	NE
Implemented	NA	1.0	1.4	1.8	- [2]	- [2]	- [2]	- [2]
Implemented	NA	0.7	0.6	0.5	2.2	2.3	2.3	2.3
Implemented 1990ies	NA	-	0.03	0.13	0.13	0.13	0.13	0.13
Implemented 2000	NA	-	-	0.32	0.22	0.20	0.20	0.20
Implemented 2004	Ministry of Climate and Environment	-	-	IE	IE	IE	IE	IE
Implemented 2009	Ministry of Climate and Environment	-	-	-	-	-	0.2	0.2

[3] The effects for cement were estimated by the producers and reported in Norway's fifth National Communication. For 2010, 2011, 2020 and 2020, the effect has been assumed equal to the effect for 2005.

[4] The effects for ferroalloys are based on the plants' annual reporting to the Norwegian Environmental Agency. For 2020 and 2020, the effect has been assumed equal to the effect for 2011.

prove 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. Norway aims to increase ecological farming which, under some circumstances, has a potential for reduced emissions compared with conventional agriculture.

Information about enhanced practices is disseminated to farmers mainly by the Norwegian Agricultural Extension Service, which is a private enterprise owned by farmers. Information is also provided by up-stream companies, governmental agricultural institutions and Yara, the Norwegian supplier of mineral fertilisers.

The broad political agreement on climate of June 2012, lists the following mitigation actions for the agricultural sector:

- Contribute to the development of biogas in Norway, e.g. farm-based biogas facilities and large joint treatment facilities for manure and waste
- Revise the regulations relating to cultivation to also reflect climate considerations, (see the white paper Meld.St. No. 9 (2011-2012).

These measures are not yet implemented. Funding for these measures is subject to decisions in the annual budget. A group of experts from relevant ministries has been given the task of drafting a cross-sectoral strategy for biogas.

4.3.8 Forestry and CO_2 sequestration

4.3.8.1 Introduction

Norway has an active forest policy, which aims to increase the forest carbon stocks. The forest also represents an important

4.10 SUMMARY OF POLICIES AND MEASURES, AGRICULTURE

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq) 1995	2000	2005	2010	2011	2020	2030
Regional agri-environmental programme	No-autumn tillage and environmentally friendly spreading of manure	CO_2 NH_3 and N_2O	Regulatory and Economic	Implemented	Ministry of Agriculture	NE	NE	NE	NE	NE	NE	NE
Strategy for Biogas	Reduce emissions by subsidising deliveries of manure to biogas plants	CH_4	Economic	Planned	Ministry of Agriculture	-	-	-	-	-	NE	NE

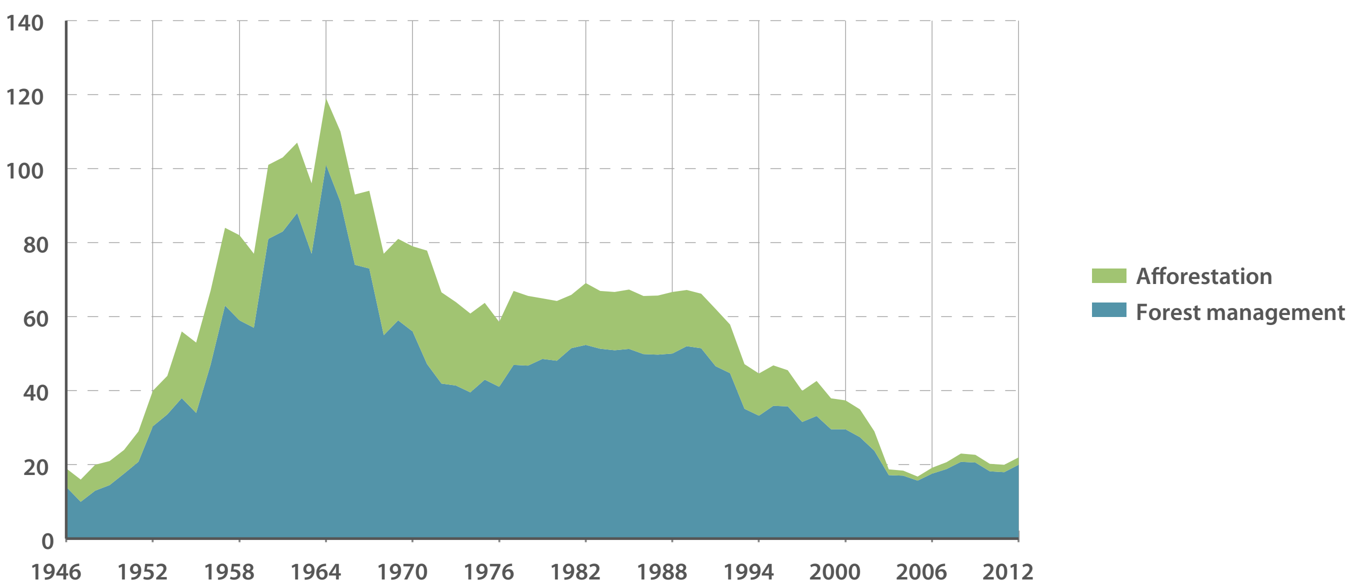
source of renewable energy, and contributes to production of wooden materials that can replace materials with a stronger carbon footprint. The forest as a renewable resource is strengthened through research, added value, and long term sustainable management of the forest.

In 2011, the LULUCF sector contributed net removals of 27.6 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 at 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. Currently only 25 million trees are planted each year. This low number may 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.

4.4 NUMBER OF SEEDLINGS PLANTED IN THE FORESTRY SECTOR IN THE PERIOD 1946-2012



SOURCE:

Forest management practices like afforestation, increased seedling density on regeneration sites, enhanced breeding of forest seedlings and fertilization of forest stands will 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 that has been calculated to achieve maximum effect within 10 years. In the longer term (50 to 100 years), other forestry measures can increase the removals substantially. The total long-term mitigation potential in the forestry sector has been estimated at between 5.9 and 12.3 million tonnes of CO_2 per year, depending on the level of ambition.[8]

8. Klimakur 2020 (Climate Cure 2020).

4.3.8.2 Existing policy instruments for mitigation actions in Norwegian Forestry

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 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. However, the measures implemented will also influence CO_2 sequestration. The For-

4.5 FUNDING IN THE FORESTRY SECTOR WITH MITIGATING IMPACT, MILLION NOK

SOURCE:

estry 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, 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, silviculture and increased use of bio energy and wood. 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.

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 4.11, and illustrated in figure 4.4 and 4.5, without estimating any mitigation effects. However, 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 4.4.

The broad political agreement on climate of June 2012 states that an active, sustainable forestry policy will support the overall climate policy, both nationally and internationally and that measures to increase the forest carbon stocks will be pursued. The forest resources are also an important source of renewable energy, and for production of wood materials that can replace less environment friendly materials. The forest's role as a renewable resource is reinforced through research and long-term sustainable forest management.

At the same time, forests are very important for biodiversity conservation and associated with cultural and recreational values. Priority will be given to climate-motivated measures in the forestry sector that have positive or acceptable effects on biodiversity conservation and other important environmental values.

4.3.8.3 New policies and measures for the forestry sector

Through the political agreement on climate of 2012, the Storting 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

4.11 SUMMARY OF POLICIES AND MEASURES, LULUCF

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status
Forestry, climate and energy funding programme The Forest trust fund[1]	Increase sequestration and forest carbon stocks by silviculture and planting	CO_2	Economic	Implemented
Genetical improvements in tree breeding	Increase sequestration and forest carbon stocks	CO_2	Economic	Implemented
Wood building programme	Use wood in buildings as a replacement for less climate friendly building materials, LULUCF (HWP)	CO_2	Economic	Implemented
Reduce deforestation through land use planning by inter alia strengthening efforts in forest plant breeding, increasing seedling density and reintroducing prohibition against cutting of young forest stands	Objective: Reduce emissions from land use change Activity affected: AFOLU/LULUCF	CO_2	Regulatory and economic	Planned
Reinforcing forest conservation	Objective: Conserve carbon stocks Activity affected: AFOLU/LULUCF	CO_2	Economic	Planned/Partly adopted
Consider policy instruments to increase afforestation and to establish "climate forests"	Objective: Increase forest carbon stocks Activity affected: AFOLU/LULUCF. KP article 3.3	CO_2	Economic	Planned
Increase sequestration through fertilization	Objective: Increase sequestration and forest carbon stocks Activity affected: AFOLU/LULUCF. KP article 3.4	CO_2	Economic	Planned

[1] A regulation under the Forestry Act requires forest owners to set aside between 4 and 40 per cent of the revenues from harvested timber 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. Part of it is, however, exempt from taxation. In addition to the tax relief granted through the Forest Trust Fund, economic support is given for a similar range of activities that support sustainable forestry.

* According to Klimakur2020 (ClimateCure2020) total long term mitigation potential in the forestry sector has been estimated to be in the range between 5.9 and 12.3 million tonnes of CO2 per year, depending on the level of ambition.

Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
	1995	2000	2005	2010	2011	2020	2030
Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Ministry of Climate and Environment, Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE
Ministry of Climate and Environment, Ministry of Agriculture and Food	NE	NE	NE	NE	NE	NE	NE

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 so that e.g. measures with short CO_2 payback periods are prioritized.[9]
- 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.

4.3.9 Waste management

4.3.9.1 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 utilised as far as possible 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 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).
- Tax on the final disposal of waste (see below).
- Extended producer responsibility for specific waste fractions.

4.3.9.2 Requirement to collect landfill gas

The largest emissions in the waste sector derive from landfill gas. In 2011 the methane emissions from landfills amounted to approximately 51 000 tonnes, corresponding to 2 per cent of the total greenhouse gas emissions in Norway. Landfill gas emissions were reduced by about 22 per cent from 2000 to 2011 and by 38 per cent from 1990 to 2011. As an effect of the prohibition of depositing biodegradable waste, we expect that the emissions from landfills will continue to decrease to about 50 per cent of the current level by 2030.

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 gas flux from measuring boxes placed on the landfill surface. Also, visual inspection of the landfill surface for obvious leaks should be conducted regularly.

As a result of these regulations the annual amount of deposited waste was reduced by 82 per cent from 1990 to 2011, although the amount of waste generated increased by 39 per cent. Extraction of landfill gas increased from more than 900 tonnes in 1990 to some 16 000 tonnes in 2011. In Norway,

9. This is described under Chapter 4.3.4.2.5 and listed in summary table 4.6.

in 2011, 21 per cent of the landfill gas production was utilized to generate electricity, 53 per cent is flared, and 26 per cent is used in heat production. As energy from waste and landfill gas incineration to some degree replaces fossil fuels, these emissions are partly offset by avoided emissions from fossil fuel incineration. Average energy utilisation for waste incineration is approximately 77 per cent.

4.3.9.3 Prohibition of depositing waste

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.

4.3.9.4 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, 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 per-centage of recycling reducing the tax one per cent. The recycling rate is set by the Environment Agency, and regulated by the waste regulation.

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. The purpose of the tax is 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. Dispensations from the prohibition against landfilling of biodegradable waste may still be granted. In 2014 the tax rate for landfilling is NOK 488 per tonne of biodegradable waste in contrast at NOK 294 per tonne of other waste to landfills.

4.12 SUMMARY OF POLICIES AND MEASURES, WASTE MANAGEMENT

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status
Requirement to collect landfill gas *	Collection of methane from landfills	CH_4	Regulatory	Implemented
Prohibition of depositing waste *	Prohibition of wet organic waste (2002) and biodegradable waste (2009)	CH_4	Regulatory	Implemented
Agreement with industry to minimise waste			Agreement	
Measures to increase waste recycling				

* The policy and measure is included in the 'with measures' projection.

4.4 Policies and measures no longer in place

Arrangement to reduce emissions in the processing industry, 2004 and 2009

See description in 4.3

Agreement with the aluminium industry

See description in 4.3

Agreement on SF_6 reductions from the electronics industry

See description in 4.3

Implementing entity or entities	Estimate of mitigation impact (not cumulative, in million tonnes CO_2 eq)						
	1995	2000	2005	2010	2011	2020	2030
Ministry of Climate and Environment	0.18	0.40	0.5	0.3	0.4	0.3	0.20
Ministry of Climate and Environment	-	-	-	0.1	0.1	0.3	0.5
Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE
Ministry of Climate and Environment	NE	NE	NE	NE	NE	NE	NE

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

5.1 Introduction

This chapter presents national projections[1] of greenhouse gas emissions in Norway for the years 2020 and 2030. In compliance with the UNFCCC reporting guidelines, these projections are based on measures and policies implemented as of the 4th quarter of 2012. The baseline is thus a "with measures scenario". Accordingly, the projections contain neither the effects of policies adopted after 2012 nor planned measures and policies. The baseline scenario, including comparisons with the previous communication, is given in Section 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 gives an account of the use of Kyoto mechanisms. In section 5.5, supplementarity relating to the mechanisms under the Kyoto Protocol is discussed. Details on methodology are given in Annex 2 of the report. Key macroeconomic assumptions are described in Annex 3, and Annex 4 summarises the changes in projections compared with the previous communication.

5.2 Projections

5.2.1 The baseline scenario

Norway's greenhouse gas emissions totalled 53.4 million tonnes of CO_2 equivalents in 2011 excluding the LULUCF sector.[2] With the exception of 2009, when a decline in economic activity contributed to lower emissions, Norway's emissions have not been lower since 1997. Nevertheless, emissions in 2011 were close to 6 per cent higher than in 1990. Norway's largest source of emissions derives from petroleum activity, when fugitives are included. Emissions from this sector have increased by approximately 75 per cent since 1990, primarily as a result of increased oil and gas production. Recently, strong economic growth and population growth, mainly due to immigration, has also raised emissions in Norway. On the other hand, emissions from the manufacturing industry have dropped by 35 per cent over the past 20 years, mainly owing to reduced emissions of greenhouse gases other than CO_2. Although emissions from road transport have increased by around 30 per cent since 1990, this growth has come to a stop in recent years, despite the strong population growth. All in all, total greenhouse gas emissions from the mainland economy have dropped by around 3 million tonnes of CO_2 equivalents since 1990.

Norway's greenhouse gas accounts show that net carbon sequestration in forest and other land areas (LULUCF) have amounted to 22-27 million tonnes of CO_2 annually in recent years; see Figure 5.1, a level close to half of Norway's total greenhouse gas emissions in other sectors. The estimates for net

1. White paper on Long-term Perspectives on the Norwegian Economy 2013 (Meld. St. 12 (2012–2013)).

2. Preliminary estimates show a decrease to 52.7 million tonnes of CO2 equivalents for 2012, 4.6 per cent higher than in 1990. According to the preliminary figures emissions in the mainland economy were 3.4 million tonnes lower in 2012 than in 1990.

sequestration in the LULUCF sector have been significantly revised downwards, primarily owing to readjustment of the method for calculating carbon sequestration in soils. Most of the carbon sequestration occurs on forested land.

Total greenhouse gas emissions excluding LULUCF are projected to remain relatively stable during the period up to 2020, before declining somewhat by 2030 (see Table 5.1). This projection profile reflects that emissions from the petroleum industry are expected to rise for some years to come before declining towards 2030. According to Statistics Norway's population projections (mean projection) the high immigration during recent years is expected to continue, resulting in a population in 2030 some 20 per cent higher than at present. Despite continued strong economic growth and population growth, emissions from the mainland economy are projected to remain at approximately the same level as during the most recent years. Emissions per capita are thus projected to fall by 20 per cent by 2030 compared with 2011, both in the total and mainland economy. In the years since 1990, emissions per capita have been reduced by 10 per cent (in the mainland economy the reduction has been close to 20 per cent).

The Norwegian forests capacity as a sink is expected to decline. This is due to a combination of an assumed increase in logging and age class effects of the Norwegian forests. Nevertheless, sequestration in forest and other land areas are projected to equal about two-fifths of the aggregate green-

5.1 GHG EMISSIONS BY SECTOR. MILLION TONNES OF CO2 EQUIVALENTS AND PER CENT CHANGE

	Million tonnes				Per cent change		
	1990	2011	2020	2030	1990-2011	1990-2020	1990-2030
Total Energy	29.5	39.8	41.2	39.5	35 %	40 %	34 %
- Electricity and Heat production	0.3	2.1	1.71	1.7	549 %	415 %	435 %
- Petroleum Refining	1.0	0.9	0.8	0.8	-10 %	-16 %	-16 %
- Oil and gas extraction	5.7	11.5	13.0	10.9	102 %	129 %	93 %
- Manufacturing industry and Construction	3.6	3.3	3.5	3.7	-6 %	-1 %	5 %
- Transport	11.1	15.2	15.9	16.6	37 %	43 %	49 %
- Other sectors	4.8	3.5	3.1	2.9	-27 %	-35 %	-40 %
- Fugitives	3.0	3.3	3.2	2.8	7 %	4 %	-7 %
Industrial Processes	14.0	7.8	8.1	7.7	-44 %	-42 %	-45 %
Agriculture	5.0	4.5	4.2	4.2	-11 %	-16 %	-15 %
Waste	1.9	1.2	0.8	0.7	-34 %	-55 %	-64 %
Total emission (excluding LULUCF)	50.4	53.4	54.4	52.2	6 %	8 %	4 %

[1] Owing to costs and uncertainties, the development of large-scale CO2 capture at Mongstad was discontinued in 2013. Projected emissions for 2020 might therefore be somewhat underestimated.

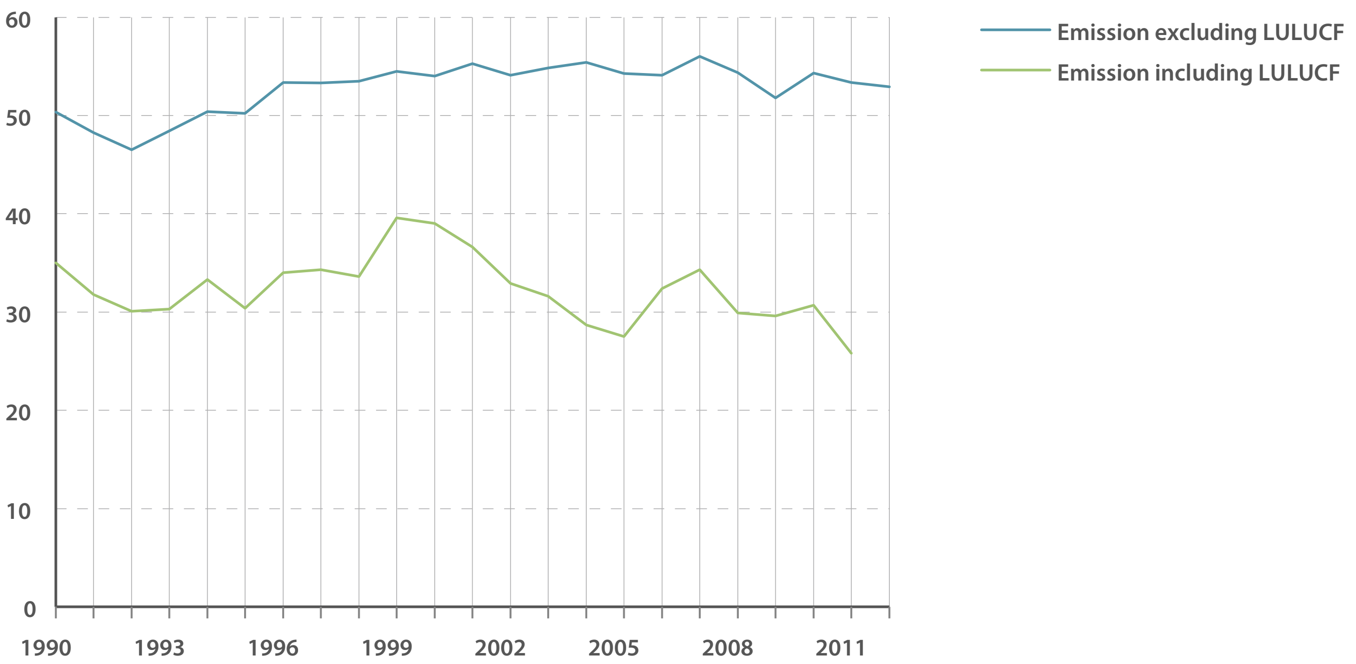
Sources: Statistics Norway, Norwegian Environment Agency, Norwegian Forest and Landscape Institute and Ministry of Finance.

5.2 GHG EMISSIONS BY GAS. MILLION TONNES OF CO2 EQUIVALENTS AND PER CENT CHANGE

	Million tonnes				Per cent change		
	1990	2011	2020	2030	1990-2011	1990-2020	1990-2030
Total emissions (excluding LULUCF)	50.4	53.4	54.4	52.2	6 %	8 %	4 %
CO_2	34.8	44.7	46.2	44.5	28 %	32 %	28 %
Other greenhouse gases	15.5	8.7	8.3	7.6	-44 %	-47 %	-51 %
CH_4	5.0	4.4	3.9	3.7	-13 %	-22 %	-27 %
N_2O	4.9	3.1	2.9	2.9	-38 %	-41 %	-41 %
HFC	0.0	1.0	1.1	0.7			
PFC	3.4	0.2	0.2	0.2	-93 %	-93 %	-93 %
SF_6	2.2	0.1	0.1	0.1	-97 %	-97 %	-96 %

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

5.1 GHG EMISSIONS IN NORWAY, MILLION TONNES CO2 EQUIVALENTS



Sources: Statistics Norway, Norwegian Environment Agency and Norwegian Forest and Landscape Institute house gas emissions from Norwegian territory in 2030.

Emissions of greenhouse gases other than CO_2 were in 2011 reduced to just above half the level of 1990. Only a slight further decrease is projected for the next two decades; see Table 5.2. However, during the period up to 2020, the projections show that lower emissions of methane will to some degree be offset by higher emissions of HFC gases due to the increased use of cooling appliances containing HFCs.

The emission intensity of the Norwegian economy has fallen by 40 per cent since 1990. In the mainland economy the drop has been 50 per cent. This development is predicted to continue, and the emission intensity in the mainland economy is projected to decline by a further 40 per cent from 2011 to 2030; see Figure 5.2. There are several factors behind this downward trend. The intensity of emissions declines as resources are more efficiently utilised, for example owing to technical and organisational innovation and better capital equipment. Putting a price on greenhouse gas emissions spurs the downward trend in the emission intensity. The continuing rise in the service industries proportion of the economy also supports the reduction in emission intensity.

The emission path from oil and gas extraction is based on the expected production profile of oil and gas. In 2030, emissions from the petroleum sector are projected to be 15 per cent lower than in 2020. Compared with the previous national communication, emissions in 2020 are expected to be somewhat higher owing to estimated longer lifetime of fields in production, postponed start-up of some projects under development and new emission factors for flaring. Estimates for 2030 were not given in the previous national communication.

The updated emissions projections for the mainland economy for 2020 are almost 4 million tonnes lower than the figures in the previous national communication (NC 5). Lower projected emissions from manufacturing industry, transport and use of heating oil are the main contributors to the downward adjustment. Technical improvements in the production of fertiliser and somewhat stronger efficiency improvements are the most important factors behind the downward adjustment in manufacturing industries. It is assumed that energy-intensive manufacturing industries will consume approximately the same amount of electricity as in 2010. However, as a result of increased productivity, production levels in energy-intensive industries will rise somewhat over time while emissions remain stable. Thus, the emissions per produced unit continue to fall; see Figure 5.2. The future decline in emission intensity is expected to be in line with historical trends.

Electricity generation in Norway is almost entirely based on hydro power. Emissions from this sector are projected to remain at a low level also in the decades to come, at about 3 per cent of total emissions. As opposed to most other countries, Norway does not have the opportunity to reduce emissions from electricity generation by developing more renewable energy.

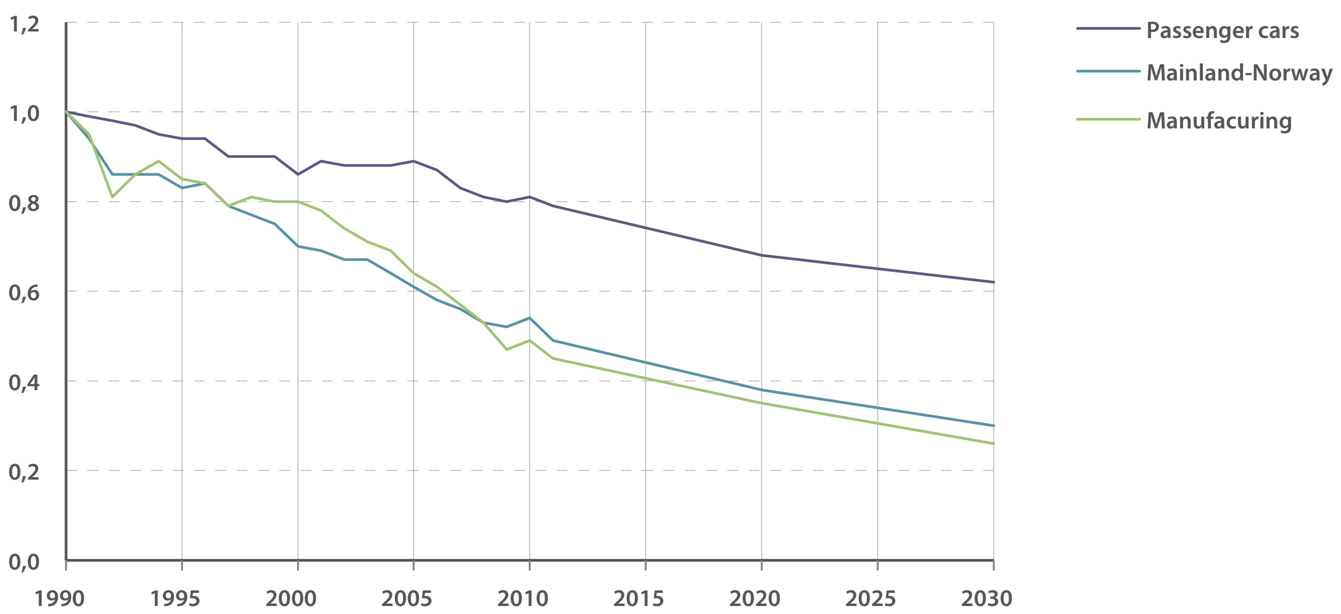
Consumption of heating oil is assumed to be lower in 2020 and 2030 than today. Higher oil prices, stricter regulation on the use of heating oil and more generous subsidies for substitution support this development. Use of heating oil in households is projected to be phased out by 2030.

Emissions from transport are projected to increase somewhat. However, compared with the previous national communication, emissions have been adjusted downwards. Future growth in emissions from road transport is expected to decline significantly compared with the trend until the mid-2000s and almost come to a halt, which is in line with the observed trend for the last 5-6 years. The changes in car taxation have significantly contributed to this development. Owing to continued technological improvements and lower per capita traffic growth the low growth is expected to continue. This is also illustrated in Figure 5.2, which shows emissions from passenger cars per kilometre driven in Norway. Constant improvements in technology over several decades have ensured a reduction in emission intensity. Stricter environmental regulation, in the form of high fuel taxes in a number of countries, and more stringent emission standards have supported the development of more fuel-efficient cars. Nevertheless, high population and traffic growth have caused emissions from road traffic to increase in Norway. Retaining the current strong incentives to choose low-emission cars, along with continued technological improvements, will help to ensure continued efficiency improvements of the car fleet in future.

5.2.2 Uncertainty

Long-term projections of greenhouse gas emissions are subject to considerable uncertainty. The macroeconomic model used gives a simplistic description of the economy, although the model is comprehensive and based on broad empirical research. In addition, available information on current developments in the economy will often be imperfect and both the emission account and the national account are subject to re-

5.2 EMISSION INTENSITIES IN THE MAINLAND ENOMOMY, INDEX 1990=1



Sources: Statistics Norway, Norwegian Environment Agency and Ministry of Finance visions. The starting point of the projections, cyclical developments and underlying features may therefore turn out to be different from the initial assumptions. Moreover, unexpected events may occur, such as technological changes that may alter the underlying mechanisms and the development path in the economy.

Strong population growth mainly caused by labour immigration has contributed to high economic growth in Norway, putting upward pressure on emissions. The uncertainty of the the population projections has increased since immigration has recently been the main drivers of population growth in Norway. As a result we have seen large adjustments in the population projections from Statistics Norway. For example, the estimated population in 2020 has been revised upward by 500 000 persons since 2006, or almost 10 per cent. Viewed in isolation, a larger population and higher GDP both contribute to increased greenhouse gas emissions.

Another important factor of uncertainty is the development of petroleum activities on the Norwegian continental shelf. Since the previous national communication (NC 5), new estimates indicate that emissions from the Norwegian petroleum activity will be about 2 million tonnes higher in 2020 and more than 4 million tonnes higher by 2030, than previously envisaged.

As a small country with a relatively narrow industrial base, Norway is highly dependent on climate- friendly technology being developed abroad. The low international carbon prices at present do not promote climate-friendly technology.

5.2.3 Other emissions

Nitrogen oxides (NO_X), non-methane volatile organic compounds (NMVOC) and carbon monoxide (CO) have an indirect effect on the climate through their influence on greenhouse gases, in particular ozone. Sulphur dioxide (SO_2), on the other hand, increases the level of aerosols with a subsequent cooling effect.

Table 5.3 shows projected emissions of NO_X, NMVOCs and SO_2 consistent with the baseline scenario. The estimates are based on the same assumptions as for the other gases, as described in Annex 2.

5.3 ANTHROPOGENIC EMISSIONS OF NO_X, NMVOC AND SO_2. THOUSAND TONNES

	1990	2010[1]	2011	2020[1]	2030
NO_X	195.4	185.6 (156)	179.7	161.02 (157)	138.6
SO_2	52.2	19.5 (22)	18.8	20.4 (22)	20.2
NMVOC	292.6	142.2 (195)	138.8	120.6 (132)	116.3

[1] The Norwegian commitments under the Gothenburg Protocol in brackets.

[2] The estimated effect of the agreement between the authorities and industries on NOX reductions for the second commitment period (2011-2017) is not included in the projections.

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

5.4 CO$_2$ EMISSIONS FROM INTERNATIONAL BUNKER. MILLION TONNES

	1990	2011	2020	2030
International Bunkers	2.1	2.7	2.8	3.0
Aviation	0.6	1.2	1.4	1.8
Marine	1.5	1.5	1.4	1.2

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

5.2.4 Fuel sold to ships and aircraft engaged in international transport

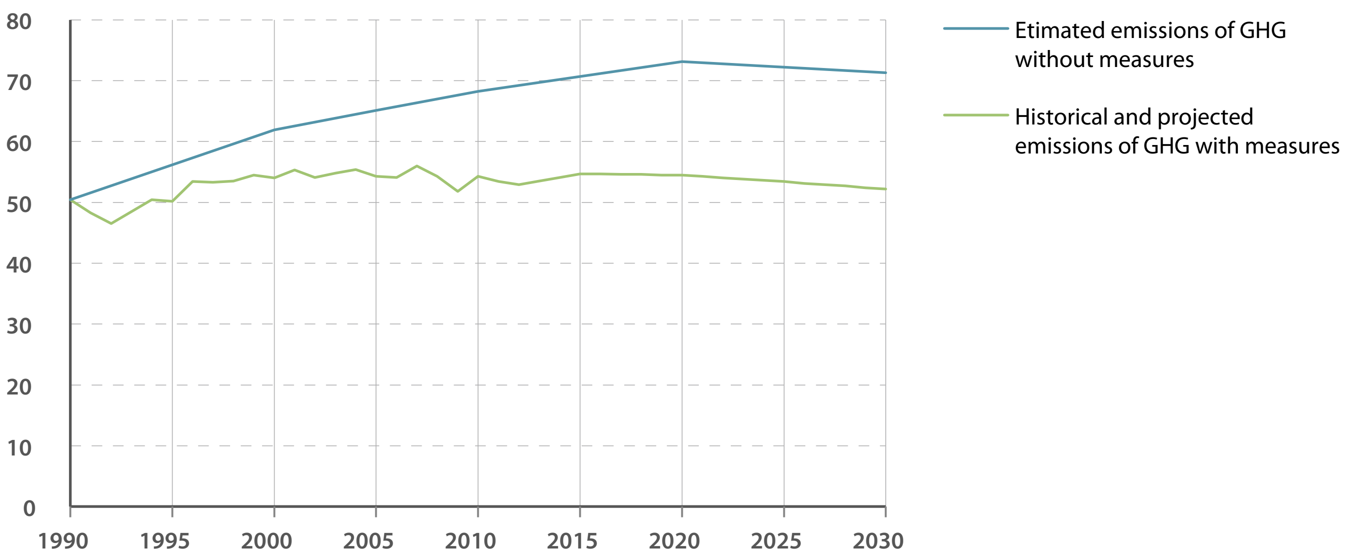
Table 5.4 summarises the projected emissions of fuel sold to ships and aircraft engaged in international transport. CO$_2$ emissions from use of international bunker in aviation are projected to increase up to 2030 by the same average annual growth as during the period 2000-2011. Emissions from fuel sold to ships are projected to decrease by 1 per cent annually during the projection period.

Compared with the previous national communication emissions have been adjusted somewhat downward, mainly because emissions in 2010 were lower than predicted.

5.3 Assessment of aggregated 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 12.6-15.2 million tonnes of CO$_2$ equivalents higher than observed, if these policies and measures had not been implemented. GHG emissions would be 17.1-

5.3 EMISSIONS WITH AND WITHOUT MEASURES, MILLION TONNES CO2 EQUIVALENTS



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

20.1 million tonnes higher in 2020 and 17.8-20.5 million tonnes higher in 2030(see 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 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.

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.

5.4 Accounting for the Kyoto mechanisms

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's Assigned Amount Unit (AAU) under the Kyoto Protocol's first commitment period (2008-2012) of 1 per cent above the 1990-level, equals an annual average of about 50.1 million tonnes of CO_2 equivalents. Average annual emissions excluding the LULUCF sector were about 53.3 million tonnes during the same period, (see table 5.6). Hence, the difference between average emissions and assigned

5.5 EFFECTS OF POLICY AND MEASURES THAT HAVE BEEN IMPLEMENTED. MILLION TONNES OF CO_2 EQUIVALENTS

	1995	2000	2005	2010	2011	2020	2030
Cross sectoral policies	-	0.8	1.1	1.5-1.8	1.6-1.9	1.6-1.9	1.4-1.7
Petroleum activity	0.6	3.0	3.2	5.3	5.3	7.3	7.2
Energy	-	-	-	0.6	0.6	1.5	1.5
Transport	-	-	-	0.5	0.6	1.4-1.6	2.2
Industry	1.7-3.0	2.5-4.7	4.5-7.4	4.4-6.7	4.5-6.8	4.7-7.2	4.7-7.1
Waste	0.2	0.4	0.5	0.4	0.5	0.6	0.7
Sum effect of implemented policies and measures	2.5-3.8	6.7-8.9	9.4-12.3	12.6-15.2	13.0-15.6	17.1-20.1	17.8-20.5

Sources: See Chapter 4.

amount was 3.2 million tonnes. Norway does not expect any issue of Removal Units (RMUs) pursuant to Article 3.3 (afforestation, reforestation and deforestation). However, Norway expects to issue 1.5 million RMUs under Article 3.4 owing to forest management calculated as an annual average. Further, in line with what was stated in Norway's "Initial report" in 2006, these RMUs issued by Norway will not be used to meet the commitment under Article 3.1. If these units had been used for compliance, the need for net acquisition of Kyoto units would have been 1.7 million tonnes annually.

Installations in Norway are covered by the European Union Emission Trading System (EU ETS). International transfers within the EU ETS are also part of the emissions trading scheme under the Kyoto Protocol since each unit issued in the scheme is backed by an AAU in 2008-2012. The Norwegian installations have on average delivered 4.1 million more units (AAUs,

5.6 NORWAY'S KYOTO ACCOUNTING. ESTIMATED ANNUAL AVERAGES FOR THE FIRST COMMITMENT PERIOD (2008-2012)

	Million tonnes CO_2 equivalents	
A. Norway's emissions	53.3	
B. Norway's assigned amount (1 per cent over the 1990-level)1	50.1	
C. Gap between emissions and assigned amount (A-B)	3.2	
D. Issuance of RMUs in accordance with Article 3.3 and 3.4	1.5	
E. Gap between emissions and the sum of assigned amount and RMUs (C-D)	1.7	
F. Net import of quotas from the EU ETS (i-ii-iii)2	4.1	
i) Emissions from EU ETS-installations		19.1
ii) Allocation of quotas to EU ETS-installations free of charge		8.0
iii) Sale of EU ETS quotas from Norway		7.0
G. Total overachievement of the Kyoto commitment 2008-2012 (i+ii+iii)3	6.6	
i) Target for overachievement of commitment by 10 per cent		5.0
ii) Cancellation of RMUs issued under Article 3.4		1.5
iii) Compensation for government travel and CCS test centre		0.1
H. Governmental net need acquire Kyoto units (C-D-F+G)	4.2	

[1] The number of Assigned amounts (AAU) is fixed even though the emission level in 1990 has changed somewhat.

[2] Does not include aviation (included in the EU ETS from 2012).

[3] Includes overachievement of Norway's Kyoto commitment by 10 per cent. In addition, Norway will not use the 1.51 million RMUs to be issued on the basis of forest management activities under article 3.4 to meet its commitments. Norway will also compensate for the governmental employees international air travel in the years 2008-2011, and their travels in and out of EEA in 2012, as well as emissions from the CCS test centre at Mongstad.

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

Foto: Berit Roald/NTB Scanpix

ERUs and CERs)[3] annually to the Norwegian government than Norway has allocated free of charge or through sale under the EU ETS, cf. line F in table 5.6. This implies that the participation in the EU ETS in itself has led to a net acquisition of Kyoto units that has more than closed the gap between Norway's emissions and its commitment under the Kyoto Protocol's first commitment period. Thus, Norway meets its Kyoto commitment for the period 2008-2012 without any need for government purchases of Kyoto units.

Norway has voluntarily chosen to over achieve the Kyoto commitment for 2008-2012 by 10 per cent, which is equivalent to 5 million tonnes per year. In addition Norway will buy 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, as well as emissions related to the CCS test centre at Mongstad. Table 5.6 shows that the government needs to buy 4.2 million units annually for Norway to realize the overachievement, and that the total overachievement equals 6.6 million tonnes when including RMUs issued under Article 3.4.

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, are contracted pursuant to the first commitment period. By end December 2013 22 million units were delivered, which exceeded the expected delivery volume and was more than sufficient to realise the overachievement, for which 21.2 million tonnes was needed. The total expenditure for the 2008-2012 portfolio is estimated at NOK 1,447 million (175 mill EUR). 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.

5.4.2 Second commitment period (2013-2020)

Norway's commitment entails that average annual emissions of greenhouse gases are to be limited to 84 per cent of emissions in 1990. This is in line with the target of reducing emissions by 30 per cent in 2020.

The exact number of AAUs Norway can issue for the period 2013-2020 pursuant to the commitment under Article 3.1 is not yet known. However, based on figures from the latest GHG inventory and applying the new GWP values consistent with the new reporting guidelines under the Convention, Norway's emissions in 1990 can be roughly estimated to amount to 51.6 million tonnes of CO_2 equivalents. Given this estimate, the commitment of 84 per cent of the 1990 level corresponds to an issuance of 346 million AAUs for the period 2013-2020 as a whole for Norway, or approximately 43.3 million AAUs a year. In addition, Norway expects to be eligible to issue RMUs corresponding to 3.5 per cent of total greenhouse gas emissions in 1990 from forest management (Article 3.4), 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. The net changes in greenhouse gas emissions by sources and removals by sinks resulting from land-

3. Installations are allowed to use about 3 Mt CERs and/or ERUs annually for compliance in 2008-2012, but have used less than 2Mt/year.

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. It is uncertain whether this contribution will amount to a net reduction or a net emission. It is uncertain how and to what extent the participation in the EU ETS will contribute to the fulfilment of the commitments for 2013-2020.

Policies and measures that will ensure compliance with the commitment for the second commitment period under the Kyoto Protocol will, to a large extent, involve continuation of an established system, which is well integrated into Norwegian climate policy. The current guidelines for the procurement programme for Kyoto units will also continue also during the period 2013-2020. The programme will only acquire UN-approved credits and contribute to the development of a global carbon market.

The carbon market is currently 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 changes in the carbon market, Norway will only acquire units from projects facing a risk of discontinuing their operations, or from new, yet unregistered projects. Norway will, as in the restrictions in the EU ETS, refrain from purchasing units from so-called industrial HFC projects. Furthermore, Norway will not purchase units from coal-based energy production without carbon capture and storage. A small part of the portfolio will be procured from the UN Adaptation Fund.

Norway has allocated funds for acquisitions and has also contracted the Nordic Environment Facility Cooperation (NEFCO) to acquire 30 million tonnes on its behalf.

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 10 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 20 per cent of the 1990 emission level. The estimate is uncertain, but could still be conservative as not all policies and measures are quantified. The estimate 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 3.2 million tonnes. As stated in the Initial Report, the RMUs to be issued under Article 3.4 pertaining to 2008-2012 will not be used for compliance. Had these units instead been used for compliance, another 1.5 million tonnes of the gap would

6 Vulnerability assessment, climate change impacts and adaptation measures

6.1 Introduction

The Norwegian economy, environment and society are vulnerable to climate change. The Norwegian 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[1] (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 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[2] on climate change adaptation (Meld.St. 33 (2012-2013) was prepared and considered by the Storting[3]). The White Paper outlines actions to be taken at various governmental levels and within sectors in order to adapt to a changing climate, and was adopted by the Storting in June 2013.

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 (see 2.2) as well as in the projections of future climate change. These contrasts are found both from coast to inland, 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 a separate paragraph below.

In Norway comprehensive studies of regional climate development in a scenario of global warming were initiated in 1997 through the RegClim project and have since 2007 continued in the NorClim-project. The NorClim-project involves all the major research institutes and universities in Norway. The activities in NorClim include studies of mechanisms for climate variations in time-scales from years to several decades, production of climate projections to the middle and end of the 21st century with quantification of uncertainties, and providing information on future climate development to governmental bodies, decisionmakers and policymakers, researchers, enterprises, NGOs, and the general public. Furthermore, project activities include downscaling and tailoring of climate projections for impact and adaptation studies, and conducting research on improvement of models and knowledge of uncertainties.

Projections of climate change for Norway from the present climate (1961-1990)

1. 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.

2. White papers (Meld.St.) are drawn up when the Government wishes to present matters to the Storting that do not require a decision. White papers tend to be in the form of a report to the Storting on the work carried out in a particular field and future policy. These documents, and the subsequent discussion of them in the Storting, often form the basis of a draft resolution or bill at a later stage.

3. Norwegian Parliament

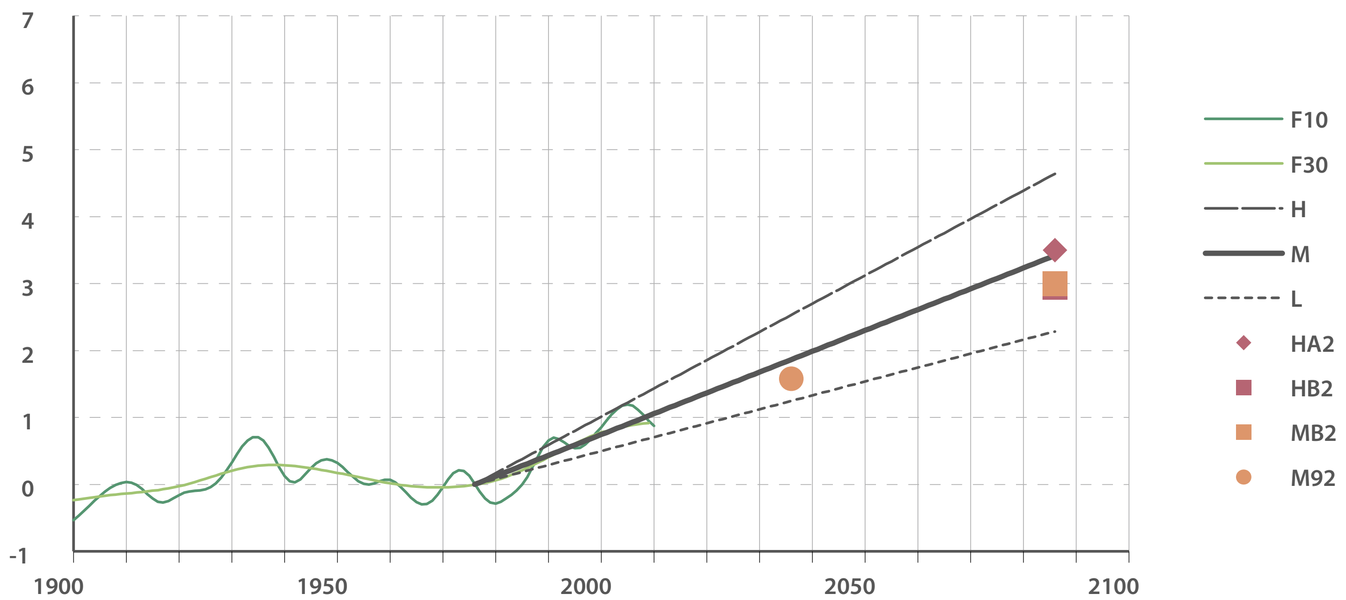
Foto: Berit Roald/
Scanpix Norway/
NTB scanpix

and up to two scenario periods (2021-2050 and 2071-2100) are presented by Hanssen-Bauer et al., (2009). This assessment was prepared on commission from NOU Climate Change Adaptation in order to provide a joint scientific basis for assessments of vulnerability and adaptive needs. The projections are based on statistical and dynamic downscaling of global climate model results from IPCC (2001, 2007). For temperature, precipitation and sea level both high, low and average projections are estimated. The findings presented below indicate projected average changes (low and high values in brackets) from 1961-1990 to 2071-2100 based on the results from Hanssen-Bauer et al. (2009). These results are reinforced by the results of the Intergovernmental Panel on Climate Change (IPCC) published in September 2013.

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 3.4 (2.3-4.6) °C up to year 2100. For the Norwegian mainland, the largest annual temperature increase 4.2 (3.0 – 5.4) °C is estimated for the northernmost county (Finnmark) and the smallest 3.1 (1.9-4.2) °C for Western Norway. The largest temperature increase is projected for the winter season, and smallest increase for the summer.

6.1 OBSERVED AND PROJECTED TEMPERATURE DEVELOPMENT IN NORWAY, °C



SOURCE: Hanssen-Bauer et al. (2009)

Growing season

The growing season, defined in Norway as the number of days with a mean temperature above 5° C, is projected to increase by 1-2 months over large parts of the country. It 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 country and two to three months in areas at a slightly higher altitude.

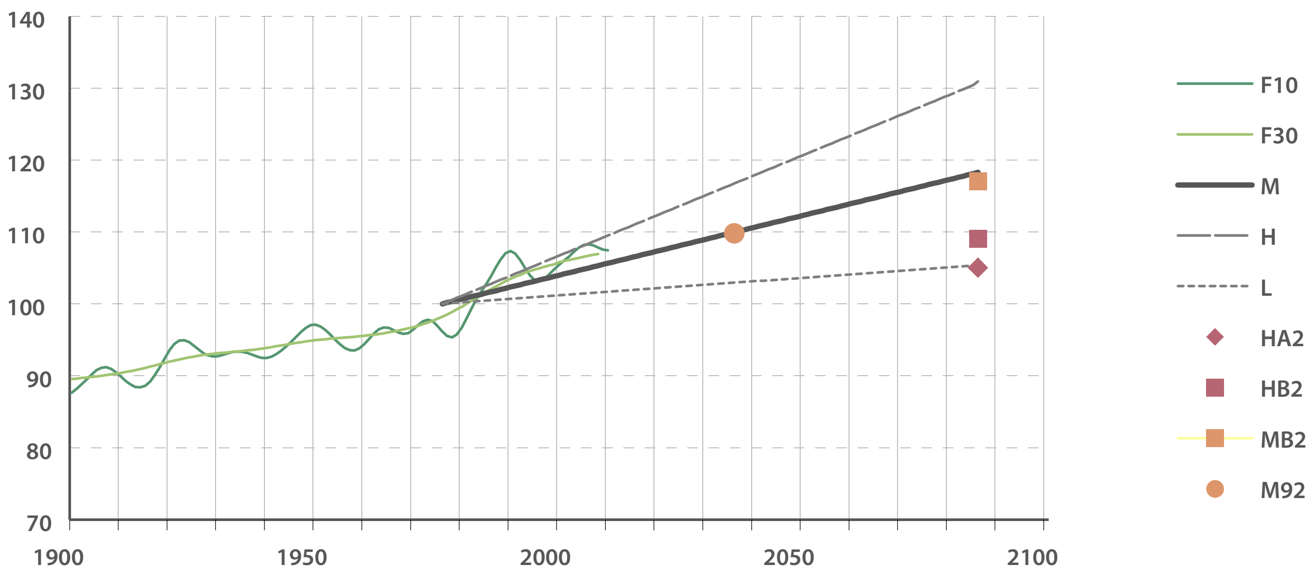
Precipitation

Annual precipitation averaged over the Norwegian mainland is projected to increase by 18 (5-31) per cent up to year 2100 (Figure 6.2). The largest seasonal precipitation increase is 23 (5-33) per cent for the autumn, while the smallest increase of 9 per cent is found for the summer season.

For the summer season the low projection indicates a reduction (-3 per cent) in the total precipitation for the Norwegian mainland, while the high projection gives an increase of 17 per cent. The low projection indicates reduced summer precipitation throughout Southern Norway. In the south, it indicates a reduction of almost 30 per cent. In many areas, the high projection indicates an increase in excess of 50 per cent in autumn, winter or spring precipitation.

The medium projection indicates more days with heavy precipitation and higher average amounts of precipitation for these days throughout Norway and during all seasons. This also applies to summer in the regions where it is estimated that the average precipitation will decrease. In the winter and autumn, the medium projection

6.2 OBSERVED AND PROJECTED PRECIPITATION DEVELOPMENT IN NORWAY 1900 -2100, % OF NORMAL



SOURCE: Hanssen-Bauer et al. (2009)

indicates more than a doubling of days with heavy precipitation on a national basis.
The projections indicate that the number of days with heavy precipitation will increase over the course of the century. In addition, it is expected that the amount of precipitation will increase the number of such days. This applies to all seasons and all precipitation regions. However, owing to low resolution of the models, there are uncertainties associated with these projections.

Wind speed

The climate models show little or no change in average wind conditions throughout Norway towards the year 2100. However, some results indicate that adverse wind conditions may become more frequent.

Hydrology, landslides and avalanches

The annual runoff from the Norwegian mainland is estimated to increase, but regional differences can be expected. In general, the runoff is projected to increase in the autumn and winter whereas there will be reduced runoff in most places in summer. In glacial areas, increased runoff is also expected in summer.

The snow season is projected to become shorter throughout all of Norway towards the end of this century. The snow season is estimated to become 2-3 months shorter for low-elevation areas for projection close to the mean for changes in temperature and annual precipitation. This means that areas that currently have snow for 2–3 months can be expected to be snow-free most years towards to the end of the century.

Rainfall floods can be expected to increase, whereas the probability of large snowmelt floods will be reduced. However, flood projections are uncertain, as local variations are large. Higher temperatures will cause an earlier onset of spring floods, whereas there will be more floods in late autumn and winter.

Higher temperatures and somewhat lower precipitation during the summer season will lead to reduced streamflow and increased soil moisture deficit. This will result in more serious summer droughts which are expected to be substantial towards the end of the century. This particularly applies to Southern Norway.

Glaciers vary in size as a result of changes in both summer temperature and winter precipitation. Medium climate projections for the period 2071–2100 indicate 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. However, there is considerable uncertainty concerning the future trend in glacier size.

It is common to distinguish between avalanches, rock slides and/or rock falls and debris slides, which include quick clay landslides and landslides and/or mud flows. The climate is one of the main factors that trigger slides, and extreme weather conditions can cause avalanches and landslides and/or mud flows. However, there are complex cause and effect relationships behind rock slides and rock falls which makes it difficult to relate specific climate variables to these types of slides.

Oceans

A small number of projections for specific locations have been prepared for the oceans along the Norwegian coast. These projections indicate that the annual mean changes in the surface temperature for the North Sea are expected to rise by 1.5–2° C. Equivalent temperature increases will apply to most of the southern and western coasts. Furthermore, the temperature increase is expected to be 0.5–1.5° C lower for the coastal area north of the Stadtlandet Peninsula than for the areas south of Stadtlandet. There is much uncertainty in regarding how the temperature will develop in the Barents Sea. However, some results indicate a warming of 0.5–1° C, but there is not enough knowledge to draw any conclusions yet.

Over the course of the 21st century, the sea level is expected to rise around 70 cm along the southern and western coasts, around 60 cm in Northern Norway and around 40 cm in the innermost reaches of the Oslo Fjord and the Trondheim Fjord. The specified values have an estimated uncertainty of -20 to +35 cm.

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 that Norwegian waters will see a decrease of at least 0.5 pH units by the year 2100.

A few calculations have been made of future wave conditions based on selected climate projections. They show relatively small changes along most of the Norwegian coast. The North Sea and Skagerrak are exceptions with an estimated 6–8 per cent increase in significant wave height for the most extreme waves.

6.3 Vulnerability to climate change and expected impacts on biodiversity and natural ecosystems

6.3.1 Introduction

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 utilisation, 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 through changes in the distribution of species, through natural selection and 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.

6.3.2 Terrestrial ecosystems

The 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 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. This will happen at the same time as pressure increases in alpine areas owing to land use and other human activity. Hence, some of the alpine species, such as wild reindeer, are dependent on large, continuous alpine areas and will experience multiple stress factors.

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. Northerly forests are regarded as particularly vulnerable to climate change in the long term. But 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. More precipitation results in further erosion of wetlands in many areas with such encroachment. 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.

6.3.3 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

Atlantic puffins (Fratercula arctica) Lofoten, Norway. Foto: Frans Lanting/ DPA/NTB scanpix

The introduction of invasive alien species is one of the greatest threats to the global natural environment. Invasive alien species that are introduced to new habitats suppress the indigenous species, and they can cause irreversible changes to the ecosystem. In an assessment of 65 invasive, alien species, either already in Norway or door-knockers to Norway, 40 were predicted to increase distribution with climate change. The "*Alien Species in Norway - with the Norwegian Black List 2012*" includes ecological risk assessments of 1180 alien species that already occur in Norway and also 134 species that are not yet established in Norway, but that are known to pose an ecological risk in nearby countries ("door knockers"), and which may become established here if climate change makes conditions more suitable for them. In the risk assessment for all species, the predicted climate changes are included. Of the 1180 species already in Norway, 106 are assessed to have very high ecological risk, 111 high risk, 198 potentially high risk, 399 low risk and 366 no known risk. Of the 134 "door knockers» 7 have very high risk, 23 high risk, 9 potentially high risk 67 low risk and 28 no known risk.

Examples of invasive alien species in Norway which are predicted to spread with climate change and which have also been assessed as posing a very high ecological risk are:

– **Pondweed** *Elodea canadensis* (affects water quality and changes the living conditions for a number of freshwater species is the cause of significant biodiversity loss, and it could establish itself further north than today as a result of climate change).
– **Pacific oyster** *Crassostrea gigas* (spreading along the coast of southern Norway and may can displace mussels and flat oysters and destroy beaches; currently only reproduce during hot summers).
– **Chinese mitten crab** *Eriocheir sinensis* (can cause significant damage to fishing nets and fish farms, only a few occurrences in the Oslo Fjord today, but could spread to the Trøndelag coast if the water temperature increases by two degrees).
– **Giant hogweed** *Heracleum mantegazzianum* (this species creates dense patches and displaces all other species in their habitat, very difficult to eradicate, most common in Southern Norway today).
– **Spanish slugs** *Arion lusitanicus* (can significantly harm plants, thrive in the coastal climate of Southern Norway, but have been found as far north as Bodø) could spread northwards as a result of climate change.

Based on the reports:

Alien species and climate change in Norway 2009. Gjershaug, J.O., Rusch, G.M, Öberg, S & Qvenild, M. – NINA Report 468

Alien Species in Norway - with the Norwegian Black List 2012. Gederaas, L., Moen, T.L., Skjelseth, S. & Larsen, L.-K. (red.) 2012.

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 water flow are expected. For vulnerable fish species such as salmon, trout and Arctic char, temperatures exceeding 20°C could be critical. Regulated rivers with low residual flows may be particularly exposed.

6.3.4 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 to 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 human activity – oil pollution, competition with fisheries, climate change (increasing sea temperatures), marine litter, persistent organic pollutants, in-

Central assessments on climate change, impacts, vulnerability and adaptation measures in Norway since the NC5 (most obtained by the committee that produced the Official Norwegian Report (NOU) on adaptation):

- Aaheim, Asbjørn et al. (2009): *Konsekvenser av klimaendringer, tilpasning og sårbarhet i Norge. (Consequences of climate change, adaptation and vulnerability in Norway.)* CICERO, ECON Pöyry and Vestlandsforskning (the Western Norway Research Institute). CICERO Report 2009:04.

- Follestad, A. et al.(2011). Effekter av klimaendringer for havstrand. (Effects of climate change on seashores.) NINA Report 667.

- Hanssen-Bauer, Inger et al. (2009): *Klima i Norge 2100*. (Climate in Norway 2100) The Norwegian Climate Centre, Oslo, Norway.

- NVE (2010): *Klimautfordringer i kraftsektoren 2100*. (Climate challenges in the power sector 2100.) Norwegian Water Resources and Energy Directorate, Oslo, Norway.

- Ottesen, Preben (ed., 2010): Helsekonsekvenser *av klimaendringer i Norge*. (Health effects of climate change in Norway). Norwegian Institute of Public Health and the Norwegian Directorate of Health.

- Øyen, Cecilie Flyen et al. (2010): *Klima- og sårbarhetsanalyse for bygninger i Norge*. (Climate and vulnerability analysis of buildings in Norway.) Sintef Building and Infrastructure, Oslo, Norway.

- Rasmussen, Ingeborg and Haakon Vennemo (2010): *Samfunnsøkonomiske virkninger av klimaendringar i Norge*. (Socio-economic effects of climate change in Norway). Vista Analyse, Oslo, Norway.

- Rottem, Svein Vigeland et al. (2010): *Globale og regionale følger av klimaendringer. Konsekvenser for Norge*. (Global and regional impacts of climate change. Consequences for Norway.) Fridtjof Nansen Institute, Lysaker, Norway.

- Rusch, G. M. 2012. *Climate and ecosystem services*. NINA Rapport 791.

- Solbakken, Jan Idar and Stine Rybråten (2010): *Klimatilpasninger: Samiske næringer – fiskeri, utmarksnæringer og jordbruk*. (Adaptations to climate change: Sámi industries – fisheries, wilderness- based industries and agriculture). Sámi University College and CICERO.

- Vennemo, Haakon (2009): *Hvordan forholde seg til klimaendring – en prinsippdrøfting*. (How to relate to climate change – a discussion of principles). Sensible Research, Memo 2009–101.

- Harvold, Kjell et al. (2010): *Ansvar og virkemidler ved tilpasning til klimaendringer*. Responsibilities and policy instruments in the adaptation to climate change). Collaborative report: Norwegian Institute for Urban and Regional Research (NIBR) / Norwegian Institute for Water Research (NIVA) / CICERO / Institute of Transport Economics (TØI).

troduced 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.

6.4 Vulnerability to climate change and expected impacts on society

6.4.1 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 be decided by the extent to which climate change considerations is 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 sanitation, are particularly 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 particularly 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.

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.

Climate change and other development processes, such as social change are taking place simultaneously, and changes in society will largely determine our vulnerability to climate change. 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 of these tasks will be affected by climate change, and plans and decisions adopted by municipalities today will have consequences for many decades. 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.

Future vulnerability is also decided by how society is planned and developed, including development of infrastructure, buildings, technical installation, as well as demographic changes, migration patterns, economic development, etc. Climate change will affect this development and it is necessary to take climate change impacts into consideration in planning and decision-making in all sectors and at all levels of society.

6.4.2 Human life and health

6.4.2.1 Civil protection and emergency planning

The purpose of civil protection and emergency planning work is to safeguard life, health and property against various kinds of risks and threats. Climate change will alter the level and nature of the risks we face in a number of ways. More frequent and more intense extreme weather events, changes in patterns of flooding, landslides and avalanches, and a greater risk of forest fire in certain parts of the country will make it necessary to improve risk reduction and emergency planning.

A cross-sectorial approach is essential because of the interdependencies between sectors and levels. Cross-sectorial risk and vulnerability assessments, covering a variety of hazards and sectors and based on available research and local knowledge, should provide the basis for defining relevant measures for reducing existing risks.

Natural disasters such as landslides, avalanches and floods are already a challenge to society today. Search and rescue work following natural disasters such as avalanches is demanding, and an increase in the number of such events will result in greater challenges for rescue services. More extreme weather events as a result of changed climatic conditions may increase the risk of the infrastructure systems not managing to fulfil their intended functions. This can create problems for the population, business and industry and the authorities.

6.4.2.2 Health

A warmer climate may affect public health in a number of ways, but the main effect will be to intensify the health risks posed by today's climate.

The quality of drinking water may become poorer, increasing the risk of water-borne infections. In general terms, the impacts can be split into two categories, impacts on the raw water and water treatment plants, and impacts on the distribution infrastructure.

Food- and water-borne infections are among the commonest infections both in Norway and in other parts of the world and are considered to be particularly sensitive to climate change.

The prevalence of communicable diseases may increase as conditions become more suitable for infective agents such as ticks and mosquitoes. A longer and more intense pollen season may aggravate the symptoms of people who suffer from allergic diseases.

Climate change may also have indirect impacts on health if for example medical transport services are blocked by damage to transport or other critical infrastructure caused by extreme weather events. However, climate change is not expected to cause any great changes in mortality in Norway.

6.4.2.3 Infrastructure and buildings

Infrastructure is affected by climate, and through direct exposure to the weather, will be exposed to climate change and changes in precipitation and temperature. The vulnerability of infrastructures varies, but the need for maintenance will be a major common challenge in connection with climate change.

At the same time, different types of infrastructure are mutually dependent, further increasing their vulnerability. For example, power supply is essential for the functioning of all the other socially important infrastructures, and a functioning telecommunications network is necessary for a stable power supply. In the event of any disruption in power supply, there is a dependency on the transport system to perform repairs. This mutual dependency increases vulnerability to climate change and makes society even more vulnerable.

However, vulnerability to climate change varies between different infrastructure areas. According to the NOU 2010:10 Adapting to a changing climate, the power supply has a relatively high adaptive capacity, which counters the fact that the sector is highly exposed to climate change. The overall vulnerability is, therefore, relatively low.

The Norwegian national risk assessment (2013), carried out by the Directorate for Civil Protection in cooperation with relevant agencies and research communities, contradicts some of the conclusions of the Official Norwegian Report. According to the national risk assessment, four of the worst case scenarios for possible disasters in Norway are climate related (extreme weather, flood, landslide, quick clay landslide). Moreover, the national risk assessment concludes that Norway is highly vulnerable to failures in critical infrastructure such as water and electricity, and that such failures may represent a threat to life, health and economic and material losses. Consequences of such failures will affect large parts of society across sectors. Norway has already experienced breakdown of electricity, water supply, telecom and damage to roads and railways caused by extreme weather, floods or landslides, which shows that there is already high risk of such events. Climate change will increase the risk of such events and may also affect society's vulnerability.

The adaptive capacity of the water supply and sewerage sector is, in the opinion of the NOU committee, low, and the vulnerability is correspondingly high. The assessments of the transport sector and buildings provide a more complex picture of adaptive capacity and vulnerability

A backlog in maintenance is a shared challenge for large portions of the infrastructure and buildings. Climate change will increase the need for maintenance and increase the challenges related to the maintenance backlog, which is particularly true for transport, buildings, water supply and sewerage.

6.4.2.4 Transport

The challenges related to the maintenance backlog will intensify with climate change.

Road and railway transport are exposed to natural events. An increased risk of floods, landslides and avalanches entails a traffic safety hazard and may increase the frequency of disruptions. Greater precipitation volumes will result in an increased strain on drainage systems. Rising sea levels and storm surges may create problems linked to wave erosion and overflow, which may result in erosion damage and traffic disruptions. This can also increase the risk of water flowing into underground tunnels with low-lying entrances. Increased amounts of water will also expose road fill and bridge foundations to more strain and erosion.

The maritime infrastructure in the form of waterways, navigation guides (lighthouses and markers), harbours and the infrastructure in harbours (quays, etc.) are important requirements for sea transport. The maritime infrastructure is exposed to rising sea levels and increased ocean acidification and storm surge levels and generally harsher weather effects. Climate change will increase the strain and weathering on maritime infrastructure.

All Norwegian airports will be affected to varying degrees and in different ways by climate change. Climate affects both air traffic and the physical infrastructure. Many Norwegian airports are located near the coast on flat or reclaimed land near the sea or open water, making them vulnerable to impacts from higher sea levels and large waves. Safety zones and lighting facilities at several airports could be exposed to erosion and be vulnerable to climate change. Increased precipitation can make it more important and more demanding to drain runoff water and more frequent temperature variations around 0° C will be an additional challenge in some places as regards controlling the friction conditions on runways.

6.4.2.5 Water and sewerage system

Climate change will increase the risk of disruptions in the water supply and sewerage services. A disruption in the water supply will quickly affect private households and the business community, and a disruption of sewerage processing can have serious consequences for health and the environment. The water supply and sewerage sector currently has a significant maintenance backlog.

Many water supply and sewerage plants are located in or near watercourses and coasts, and may also be exposed to floods, flood slides, rising sea levels and storm surges. Higher temperatures, combined with greater precipitation intensity and runoff may have negative effects on drinking water quality. More erosion and runoff from areas around the water sources may lead to an increased prevalence of infectious matter, environmental toxins, nutrients and organic matter in the water. Increased precipitation volumes and intensity will create problems for drainage systems and increase the risk of drinking water pipes becoming immersed in sewage-contaminated water.

6.4.2.6 Stormwater/runoff surface water

Stormwater in this context means runoff on impermeable surfaces such as roofs and roads that originates from precipitation, a storm surge or meltwater. Climate projections indicate a trend towards more, and more intense, precipitation in Norway, which will result in more stormwater runoff in urban areas and may lead to urban flooding. This may cause serious damage to buildings and other infrastructure and entail a threat to life and health. The Official Norwegian Report (NOU 2010: 10) Adapting to a changing climate stresses that climate change, with higher total precipitation and more frequent intense precipitation events, will make stormwater management a more challenging task.

Urban areas contain a high proportion of impermeable surfaces – for example car parks, roads, yards and footpaths – that prevent stormwater from infiltrating naturally into the ground. Urban stormwater is therefore largely channelled through the municipal sewer system, either in separate stormwater drains that may discharge directly into nearby river systems, or via the sewer systems for wastewater, which discharge to wastewater treatment plants. During intense rainfall, the volume of stormwater entering the sewer system is often so high that some of the mixed stormwater and wastewater has to be discharged directly to the sea or a river system instead of being treated first. This can contaminate beaches and drinking water and pose a risk to public health and the environment. Excessive volumes of stormwater can also flood buildings, damage infrastructure and contaminate drinking water, resulting in substantial costs and possibly threatening life and health. Failure to manage stormwater properly through the existing sewer systems is already resulting in major damage.

6.4.2.7 Power supply

Norway's power supply is primarily based on renewable energy, such as hydropower, and it will thus be impacted directly by climate change through changes in the production potential due inter alia to increased precipitation. At the same time the expected increase in temperature will mean that Norway requires less heating, but more cooling.

The power supply system is designed to withstand the forces of nature. At the same time, weather conditions are a major cause of the faults and disruptions that do occur in the distribution, regional and national grids. Expected increase in extreme weather events will increase the risk of damage at various types of power supply infrastructure.

6.4.2.8 Buildings

Increased precipitation, exposure to moisture and changes in the wind patterns are the key climate variables that determine a building's vulnerability. Moisture problems as a result of more frequent and more intense precipitation will be the greatest threat in a changed climate. The effect of moisture is reinforced by rising sea levels, increased and more intense precipitation and increased floods, landslides and avalanches in a changed climate.

The risk of rot in exterior wood constructions above ground is dependent to a great extent on local climate conditions. More parts of the country will be exposed owing to climate change.

More extreme events, such as storm surges, landslides, avalanches and floods, will entail a risk to buildings in exposed locations. Some locations that are already exposed may become even more exposed, and new locations may become exposed. Rising sea levels in combination with storm surges will increase the risk of floods in coastal settlements.

6.4.3 Business and other industry

6.4.3.1 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 sector, such as breach in power supply. Utilising the opportunities that may emerge will also require adaptive measures to enable these opportunities to be realised.

6.4.3.2 Agriculture and forestry

Climate change and higher average temperatures may result in enhanced risk of extreme weather events such as flooding and drought. In addition to reductions in crop yields, climate change may increase the prevalence of animal and plant diseases. Drought and water shortages are already causing problems for agriculture in many large food-producing countries. Areas where food security is already poor and where the population is least equipped to adapt to such changes are probably also most vulnerable to climate change. All in all, climate change entails a risk of changes in the basis for world food production, which may cause instability in food production and food markets.

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. 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.

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.

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.

6.4.3.3 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 industry has very high adaptive capacity since the deep-sea fishing fleet has an extensive range. The coastal fleet on the other hand will be more exposed to climate change owing to its more limited range.

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 salomon, 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 will probably increase fish resources in the Norwegian Exclusive Economic Zone, particularly in the north, whereas it is less certain that the North Sea ecosystem will become more productive. 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.

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.

6.4.3.4 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 us of facilities.

6.4.3.5 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.

6.5 Adaptation measures

6.5.1 Introduction

Climate change will affect almost all areas of society and is a shared responsibility. Individuals, businesses and industry and NGOs as well as local, regional and national authorities must take responsibility for integrating climate change considerations in their work. The authorities are responsible for creating the necessary framework for others to adapt to a changed climate. This includes providing national statutes, regulations and guidelines. 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.

6.5.2 Norwegian Climate Adaptation Programme 2007-2013

In 2007, an inter-ministerial working group was appointed to promote coordination and dialogue. The working group was led by the Ministry of Climate and Environment and was mandated to establish information platforms, including the official clearing house "klimatilpasning.no", coordinate national adaptation efforts at directorate level and build capacity for local planners through the county governors' office.

In 2008 the Government presented a five-year platform to enhance society's resilience to climate change, to reduce vulnerability and strengthen our ability to adapt. The platform set out the following objectives:

1. Identify vulnerabilities and incorporate climate change considerations into affected policy areas.
2. Obtain more knowledge about climate change and climate adaptation.
3. Promote coordination, information and competence development.

The inter-ministerial working group was supported by a programme-secretariat that was established in the Directorate for Civil Protection. The Programme Secretariat had responsibilities within all three pillars of the national work programme for adaptation, but the particular focus of the secretariat was on the third pillar information and coordination. The responsibilities were to foster information and knowledge transfer, operate pilot projects (e.g. "Cities of the Future"), maintain an online Climate Change Adaptation (CCA) portal to promote knowledge exchange, facilitate the development of methodologies for climate change risk assessment, provide training to local and regional authorities and support the development of national CCA policies.

The Secretariat has made use of the coordination instruments of the Directorate for Civil Protection (DSB), such as audits of ministries and county governors, legislation and directives, development of guidelines, competence building etc. to address climate change adaptation as an integrated part of societal planning. The main focus for the secretariat has been local level planning, e.g. the municipal level. The secretariat has worked to include adaptation in municipal planning partly through pilot projects such as 'Cities of the Future', and partly through cooperation and coordination of other agencies at directorate level, research institutions, and various organisations. As a part of its work, the Secretariat has made use of Norway's National Platform for Disaster Risk Reduction (Samvirkeområde natur), which has been established by the DSB as an authority network addressing risk and vulnerability reduction for hydro meteorological and geological challenges, including climate change adaptation.

The Secretariat has contributed within an extensive network of policy-makers, scientists, educators, relevant national agencies (hydrology, meteorology, maritime, road, power, health, etc.), local and regional authorities, and the National Emergency Planning College.

The Programme Secretariat supported CCA efforts at various levels during the period 2007-2013:

- National level: Contribute to the development of national CCA strategies, develop/manage websites, undertake and coordinate cross-cutting and/or sector-specific CCA initiatives.
- Local/regional level: Develop and support pilot programme. Capacity building on the use of risk analysis in local and regional spatial planning. Promote networks of local planners, regional policy-makers and research communities.
- CCA-related research: Research planning, follow-up and dissemination. Facilitate contacts with research communities in Norway within any CCA-relevant sector.
- Capacity building: Assist training programmes, workshops, seminars etc.

A guide to local climate change adaptation has been developed, together with practical guidelines to the municipalities on how to address sea level rise in spatial planning.

The website (www.klimatilpasning.no) provides practical tools, case studies and information on climate change adaptation tailored to meet the needs of those responsible for spatial planning in the municipalities. The county governor plays an important role in following up and supporting the municipalities in their work on adaptation, in particular related to risk and vulnerability analysis and land use planning.

The "Cities of the Future" is 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 Programme runs from 2008–2014. Case studies from different municipalities in Norway can be found on the CCA-Portal www.klimatilpasning.no

In the 2009 budget proposal a broad-based independent review of Norway's vulnerability to climate change, developing the knowledge base, coordinating adaptation initiatives and awareness rising was initiated.

An Official Norwegian Report on Norway's vulnerability and adaptive needs was prepared by a committee consisting of experts from government agencies, research institutes and civil society. The Official Norwegian Report 2010: 10 report *Adapting to a changing climate: Norway's vulnerability and the need to adapt to the impacts of climate change,* was published in November 2010[4]. 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 represented 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.

Following the Official Norwegian Report, the Ministry of Climate and Environment published in May 2013 a white paper on climate change adaptation in Norway. The White Paper focuses on the challenges associated with climate change and how Norway can become more resilient in the face of climate change. 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.

Furthermore, an Official Norwegian Report (NOU) on the Value of Ecosystem services was published in august 2013. The document draws on the international project The Economics of Ecosystems and Biodiversity (TEEB). Climate change is a major driver of changes in ecosystem services and the report makes a number of recommendations regarding adaptation measures to secure these vital goods and services.

Moreover, extensive targeted research relevant for climate change adaptation has been carried out. Research and dissemination on basic climate change science is to a large extent funded through public funds. Climate Change and its Impacts in Norway (NORKLIMA) was a 10-years research programme aimed at generating vital new knowledge about the climate system, about climate trends in the past, present and future, and about the direct and indirect impacts of climate change on the natural environment and society, as a basis for adaptive responses by society. This programme started in 2004, and ended in 2013. In 2014 a new large-scale climate programme (KLIMAFORSK) will succeed the NORKLIMA programme. The primary objective of this large-scale climate programme is to generate essential future-oriented knowledge about the climate to the benefit of society, of national and international significance[5]. In 2013 climate research received NOK400 million in funding, which is twice the amount of the public funds allocated in 2005. The climate research is carried out by universities, university colleges and research institutes. Norwegian researchers participate actively in international research collaborations such as EU-funded programmes, and contribute extensively to the work of the Intergovernmental Panel on Climate Change (IPCC).

6.5.3 Common framework for adaptation to climate change

Since Norway's 5th National Communication to UNFCCC, the knowledge base and the policy framework related to adaptation to climate change have been substantially improved through the Official Norwegian

4. 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

5. For further information, please see chapter 8.

Report on Norway's vulnerability and adaptive needs and on the white paper on climate change adaptation in Norway and accompanying assessments. Furthermore, the extensive research and practical experience gained by sharing knowledge and competence among municipalities and other actors in planning for a changing climate have contributed to increased knowledge and capacity in climate change adaptation.

Knowledge is essential for effective climate change adaptation – both knowledge about climate change and its impacts, and knowledge about possible measures and policy instruments to adapt to a changing climate. Adaptation work must always be based on the best available knowledge about climate change and how the changes can be addressed. In the white paper on adaptation to climate change the Government emphasises its intentions to 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.

Projections on future climate change are fundamental to climate change adaptation. As a precautionary approach, assessments of the impacts of climate change should be based on figures from the high end of the range of national climate projections. However, the balance between the weight to be given to climate change considerations and other considerations of the public interest must be determined on a case-by-case basis.

There will be updates of knowledge about the impacts of climate change and vulnerability and of assessments of adaptation needs in Norway. Updates will be considered when substantial new knowledge is available, particularly related to the assessment reports of the Intergovernmental Panel on Climate Change (IPCC).

The authorities are responsible for providing a framework to enable individuals, the business sector and the voluntary sector to carry out their tasks and meet their responsibilities under varying weather and climatic conditions. In certain areas, this is formalised through legislation or other forms of regulation. For example, there are standards regulating building in flood zones, and regional and local authorities are responsible for ensuring compliance with these.

A fundamental principle of climate change adaptation in Norway is that the actor responsible for the work is the actor responsible for the task or function affected by climate change. In consequence, everyone has a responsibility for climate change adaptation: individuals, households, private businesses and the public sector.

The Norwegian Directorate for Civil Protection was given time-limited responsibility, ending in 2013, for coordinating the work of central government authorities on climate change adaptation. In the fiscal budget proposal for 2014 it was announced that the Norwegian Environment Agency will, as of 1 January 2014, be the agency supporting the Ministry of Climate and Environment in its climate change adaptation work. The Norwegian Environment Agency will have a responsibility for providing the ministry with scientific knowledge on which to base policy decisions. The agency will also support the Ministry in its work in international forums such as the UNFCC and the IPCC. The Ministry of Climate and Environment will involve the agency in developing further guidelines for planning and regulations. Another important task is to provide information on government adaptation efforts and promote exchange of experience and network building. In order to ensure knowledge sharing and disseminate results on the various activities, a website on adaptation to climate change is maintained. The website klimatilpasning.no[6] provides tools, case studies and information on climate change adaptation for practitioners, particularly in the public sector, but is nevertheless of value to a wider audience. The Environment Agency will be responsible for the website.

The Directorate for Civil Protection will continue to have responsibility for climate change adaptation within its areas of responsibility and will from 2014 continue its work on climate change adaptation as an integral part of its work to prevent or reduce society's vulnerability to natural hazards related to climate change. This includes cross-sectoral coordination of work to prevent or reduce society's vulnerability to natural hazards related to climate change. The directorate also has a role in following up local level planning for disaster prevention through the Planning and Building Act, and for the overall work to reducing vulnerability at all levels through the Civil Protection Act. The DSB is also the focal point for the International Strategy for Disaster Reduction (ISDR) work and chairs Norway's national platform on Disaster Risk Reduction.

A number of other actors also carry a sector responsibility for climate change adaptation

6.5.4 Facilitating adaptation at local and regional level

The municipalities play an important role in climate change adaptation, since a number of the challenges will be at the local level. The municipalities role in spatial planning is one of the core elements in this responsibility and should take account of climate change and of the vulnerability of society and the environment in their planning activities under the Planning and Building Act and in other areas where they exercise authority.

The white paper on adaptation to climate change describes plans to draw up central planning guidelines prescribing 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.

Climate change create a need for a generally available service to provide information on the current and future climate and play a part in translating climate science into practical adaptation work. Norway's Centre for Climate Services was established in 2011. One important reason for developing climate services is to provide support for climate change adaptation by the municipalities and sectoral authorities.

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, in Bergen. The Bjerknes Centre has Norway's leading expertise on climate modelling and has provided important input to the IPCC's work. The Meteorological Institute has overall responsibility for the centre for climate services. The Water Resources and Energy Directorate is Norway's national centre of expertise for hydrology,

6. http://www.regjeringen.no/en/dep/md/kampanjer/engelsk-forside-for-klimatilpasning.html?id=539980

and monitors hydrological changes, including flooding.

One important reason for establishing a centre for climate services is to provide support for work on climate change adaptation by the municipalities and sectoral authorities. Such support is one of the specific measures recommended by the committee in the report *Adapting to a changing climate*. The framework for the new centre must enable it to provide practical support and make it easier for the municipalities to carry out the necessary impact assessments and climate change adaptation measures.

Norway's centre for climate services should be developed in a way that enables those who are responsible for risk assessment and for adapting their activities to climate change to carry out their work as effectively as possible and with clear targets. The centre will:

– make available and coordinate climate and hydrological data and other information that is currently held by many different central government agencies;
– improve dissemination of climate data and hydrological projections for use by the public administration, especially at municipal level;
– analyse how the consequences of climate change will vary from one part of Norway to another, as a basis for the development of climate indexes and climate zones for use in practical climate change adaptation, (see 8.5 on infrastructure and the 2012 white paper on building policy (*Gode bygg for eit betre samfunn* Meld. St. 28 (2011–2012), in Norwegian only);
– share its expertise on climate change through advice and courses held in cooperation with other authorities.

The centre will be developed in close dialogue with its users. A pilot project in Troms county, also involving the Directorate for Civil Protection, is currently developing and evaluating products that municipalities can use to incorporate climate change into their planning activities. Information technology plays an essential role in climate research. Basic climate research, including modelling of the climate system, requires high-performance computing resources. The use and development of ICT tools and products will be a key task for the centre.

6.5.5 Risk reduction and natural hazard management

6.5.5.1 Introduction

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 a strong 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.

6.5.5.2 Civil protection and emergency planning

The Norwegian Directorate for Civil Protection (DSB) support the Ministry of Justice and Public security in coordinating civil protection and emergency planning efforts in Norway, in order to prevent or limit consequences of natural hazards and are responsible for following up the work done on :

– **National level** (audits the ministries' preparedness work on civil protection, systemises and analyses statistics, audit findings and other information to build knowledge). The DSB also provides the annual "Norwegian Risk Assessment" that for several years has concluded that extreme weather and landslides are among the hazards most likely to affect Norway, with potentially severe consequences for our citizens.

– **Regional leve**l (handles management of the county governor's offices as regards civil protection (prevention and preparedness), priorities and tasks)
– **Local level** (integrating CCA in spatial planning and risk and vulnerability assessments, in order to prevent and limit consequences of a changing climate)

To prevent or limit the impact of climate change and consequences from natural hazards, the work on civil protection across sectors and governmental levels is essential.

Like climate change adaptation, civil protection is a cross-cutting issue which covers all sectors and levels. Although civil protection has a wider scope than adaptation and covers more than climate-related challenges, the principles, tools and mechanisms are to a large extent the same. The interdisciplinary approach of civil protection ensures that climate change is managed as a part of a holistic approach, emphasising the interdependencies between different sectors, different types of infrastructures, and different levels of planning. The use of risk and vulnerability analyses in the planning process ensures that impacts of extreme weather and climate change are taken into consideration in societal planning. Such analyses create a basis for defining possible measures for preventing negative impacts of climate change, either by avoiding new vulnerability or by reducing existing vulnerability. In cases where preventive measures are not possible or desirable, civil protection also includes measures for emergency planning and preparedness.

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):

1. ***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.
2. ***Prevention*****: Avoid new risk and vulnerability** by ensuring that development does not take place in hazard-prone areas, or by promoting security 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.
3. ***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.

4. ***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 programmes ('build back better'), etc.

To enable the municipalities to ensure that Norwegian communities are resilient with respect to natural hazards and sustainable in the future, adaptation to climate change must be made an integral part of municipal responsibilities. According to Norway's Civil Protection Act, municipalities are required to carry out an overall risk and vulnerability analysis. This must identify the types of incidents or emergencies that may arise, including impacts of climate change. The analysis must be followed up by the preparation of an overall emergency plan for the municipality. The emergency plans must include an overview of the measures the municipality has implemented for crisis management.

6.5.5.3 Stormwater 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, Water Resources Act, and the Pollution Control Act. However, there is a need for clearer rules and a better framework for municipal stormwater management. As a response to this, the Government will appoint a committee to evaluate the current legislation and make appropriate proposals for amendments to provide a better framework for the municipalities, that will have to deal with increasing volumes of stormwater as a result of climate change.

6.5.5.4 Flooding, landslides and avalanches

Identifying hazard zones, avoiding developments in these zones, and protecting buildings and settlements at risk are a continuous process. This is described in detail in a 2012 white paper on flooding, landslides and avalanches (Meld. St. 15 (2011–2012) *Hvordan leve med farene – om flom og skred*, in Norwegian only). In 2010 the Norwegian Water Resources and Energy Directorate prepared a strategy on climate change adaption. The objective of this strategy is a more holistic and targeted approach to the climate change issues.

The Norwegian Water Resources and Energy Directorate is to draw up a plan for flood hazard mapping to clarify the priorities for initial mapping of new areas and for updating existing maps. Furthermore, the Directorate will continue flood hazard mapping in flood-prone areas.

All municipalities should map tributaries and streams where the damage potential is high. The Water Resources and Energy Directorate will therefore draw up guidelines for municipal mapping to ensure that sound, uniform procedures are followed.

Furthermore, the Directorate will draw up a manual for landslide/avalanche protection, based on established practice and experience in other countries.

6.5.6 Nature and ecosystems

Since the natural environment is not man. made, it differs fundamentally from most of the other areas discussed with regard to adaptation measures,. Climate change adaptation is therefore not possible in the same way as in other sectors, which largely

Small Pasque Flower (Pulsatilla pratensis) on Larkollen, Østfold. Grows on sandy soil or dry, chalky rock. Rare in Norway.

concern adapting the infrastructure or social conditions impacted by climate change.

In order to improve the natural environment's adaptive capacity, society must make arrangements for the best possible conditions for the adaptations that take place in the natural environment. The natural environment is influenced by activities in many different sectors and management areas. The adaptations involve a comprehensive approach to management of the natural environment in order to minimise the negative effects of climate change, or to exploit the positive effects with regard to national and international environmental goals.

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. In the white paper 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 paper points 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 paper also focuses on that the natural environment`s function as a buffer against many negative impacts of climate change. For example, vegetation plays an important role in preventing the erosion and damage that could otherwise be caused by increased precipitation and more intense precipitation events.

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). As of spring 2013 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). 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 offshore renewable energy production. To this end the 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 also has its own strategy for the sectoral work on climate adaptation. With regard to nature management, the strategy is based on the assessment *Climate change – nature management measures,* DN Report 2-2007[7]. Various types of adaptations or measures are included, 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).

Securing a representative network of land areas through national parks and other protected areas is important for plants

7. DN report 2007-2b. Climate Change – Nature Management Measures.

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, these considerations are already being included. In the Norwegian national park plan 27 per cent of the mountain areas will be protected. For wild reindeer, regional plans developed in 2012, will also help in ensuring comprehensive living areas for the species in the future. Protected areas are also important for the forest ecosystems. In addition, existing regulations with regard to placement of forest roads and other measures are important for preventing erosion, particularly in steep terrain. A forum has been established for cooperation between the agricultural and environmental managements, which will encourage climate adaptation in forests.

With regard to the cultural landscapes threatened by climate change due to increased growth and regrowth, a number of national and regional environmental programmes and measures, which are aimed at securing cultural landscapes.

Wetlands are particularly important with regard to climate change. Ecosystems along rivers are known as one of the most 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 is under development.

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. Regional plans have been developed for all water regions, and include monitoring programmes and measures to reach the environmental goals. A common European guide[8] 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 or under development, 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 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 10th Conference of the Parties to the Convention on Biological Diversity in Nagoya in 2010, a Strategic Plan for Biodiversity 2011-2020 with 20 global biodiversity targets goals was adopted, and Norway is developing national target goals, as a follow-up. In this work, climate adaptation and the capacity of ecosystems to counteract effects of climate change on society will be included.

The OSPAR Convention (Oslo/Paris Convention for the Protection of the Marine Environment of the north-east Atlan-

8. 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

tic) 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. The International Council for the Exploration of the Sea (ICES) plays an important role here.

6.5.7 Human life and health

6.5.7.1 Health

A new Public Health Act was adopted in January 2012. This Act addresses climate change. A precautionary principle and emergency preparedness should be the basis for incorporating climate change in risk and vulnerability assessments and in emergency plans.

Norway participates actively in processes related to environment and health under the World Health Organisation. This work includes implementation of the water protocol which also addresses climate change and drinking water issues.

Climate change might improve the conditions for infective agents. The Norwegian Institute of Public Health and the Norwegian Veterinary Institute therefore have a programme where inter alia the spreading of ticks is mapped.

6.5.7.2 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. In August 2013 the government presented its National action plan for governmentally secured outdoor recreational areas. The action plan includes measures to facilitate the use of these areas, and assesses the need for special considerations regarding adaptation to a changing climate. This includes measures regarding increases in extreme rainfall and heavy wind. The expected increased risk of forest fires and more tick-borne diseases, may lead to an increased need for information, e.g. on the rules for use of open air fire, and on ticks.

6.5.8 Infrastructure and buildings

6.5.8.1 Transport

On the basis of new knowledge about climate change, the transport agencies have in recent years revised handbooks, guidelines and standards for both maintenance and construction of new infrastructure.

New guidelines for the transport agencies are provided in the National Transport Plan 2014 – 2023. These guidelines provide principles for integrating climate change and climate change impacts in planning and prioritisation processes.

In 2013 the Ministry of Transport finalised a research and development project aiming at increasing the knowledgebase on risks in the transport sector.

In sea transport, risk and vulnerability assessments for marine infrastructure are under development.

Assessments and mapping have been a major task for the transport sector. The Norwegian Public Roads Administration and the Norwegian government's agency for railway services have conducted a research and development project "Climate and Transport". A follow-up project, "Natural hazards - infrastructure, flood and landslides" is now being carried out by these two agencies in cooperation with the Norwegian Water Resources and Energy Directorate. The objective of this project is to increase the robustness of the infrastructure and improve interactions between the players in natural hazards situations.

The Norwegian government's agency for railway services has developed a warning system for extreme weather events and flooding, and the Norwegian Public Roads Administration is currently working on a similar system. Furthermore, a national warning system for landslides and avalanche has been developed.

The Norwegian Civil Aviation Administration is planning to carry out a climate change vulnerability study for Norwegian airports.

6.5.8.2 Power supply

The Norwegian power supply is primarily based on hydro power. Increased precipitation caused by climate change will likely serve the basis for increased power production. There is a high level of certainty that power production will increase due to climate change. It is, however, very uncertain how large this increase will be. At the same time increased temperature may lead to decreased demand for electric power.

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 follow this up through licensing and inspections. Furthermore, the Norwegian Water Resources and Energy Directorate conducts research and development in the light of anticipated challenges of the energy sector and climate change.

6.5.8.3 Buildings

Impacts of climate change are of vital importance for 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.

6.5.9 Business and industry

6.5.9.1 Agriculture and forestry

Adaptation in the agricultural sector is important in order to prevent and limit the damages from extreme weather events and climate change. Adaptation is also important for utilisation of the potential productivity benefits of climate change.

In 2013 a new climate- and environment programme was established to continue and integrate the preceding separate Climate and Environmental Programme. The goal is 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. The budget for 2013 is NOK 18 mill.

In 2012 it was decided that grants be allocated to support reserves of seed corn as a food security measure.

Pursuant to the Agricultural Agreement economic support is granted for plant breeding in order to secure Norwegian agriculture and horticulture a supply of Norwegian plant species with sufficient genetic variety to adapt to future climate change.

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.

The 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.

According to the white paper Meld.St. No 9 (2011-12) from the Ministry of Agriculture and Food, in addition to further development of contingency strategies and plans, there may also be a need to strengthen monitoring and preventive measures for example for forest in the vicinity of import junctions.

Adaptation is being assessed in the ongoing revision of "Standards for agricultural and forestry roads", 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. The Ministry for Agriculture and Food has started to revise regulations for planning and construction of agricultural and forestry roads.

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 programmes, 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. In the context of the programmes BIONÆR and NORKLIMA the Norwegian Research Council has announced several projects for adaptation in agriculture and forestry sectors.

6.5.9.2 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. 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.

In autumn 2011, the Government established the strategy group HAV21. HAV21 has proposed a broad strategy for all marine research in order to help ensure targeted and efficient use of marine research resources.

6.5.9.3 Insurance

The insurance companies play an important role in reducing the economic risk borne by companies and private households. This means that they can for example offer lower premiums to customers who take steps to prevent climate-related damage. In this way, they can play an important part in reducing overall damage caused by climate change.

Forest owners can take out fire and/or storm damage insurance for productive forest on their properties. In addition, regulations under the Natural Hazards Act provide for the Norwegian Natural Disaster Fund to act as reinsurer if the total storm damage to forest exceeds NOK 200 million in a specific case.

The Natural Hazards Act also contains provisions that can reduce the risk of future damage to property that has already suffered natural hazard damage. As a general rule, any compensation provided must be used to repair the damage, but the board of the Natural Disaster Fund may make it a condition for payment of compensation that this is done in a way that reduces the risk of natural hazard damage in the future.

6.6 Arctic

6.6.1 Climate change in the Norwegian Arctic

This chapter presents specific challenges to the Arctic region which have not been covered by the previous chapters.

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 2°C higher than it was a hundred years ago, and data indicate that the summer temperatures are now higher than at any time during the past 2000 years.

The summer sea ice cover has been reduced by about a third in recent years compared with the average for the normal period 1979–2000. In September 2012, the extent of the sea ice reached the lowest level since measurements started, and was 48 per cent under the average for the period 1979–2000. The extent and duration of snow coverage have also decreased significantly. The estimated annual loss of mass from the Greenland ice sheet has quadrupled since 2000, and the loss of mass from other ice caps and glaciers in the Arctic is also increasing sharply.

The Svalbard archipelago has also experienced rapidly rising temperatures, combined with a rise in precipitation. Since the mid-1960s, the average temperature in Longyearbyen has risen by 0.9 ˚C per decade. The extent of the sea ice has been showing a clear downward trend both in the Barents Sea and in the Fram Strait between Svalbard and Greenland since satellite monitoring began in 1979. Svalbard's glaciers are also retreating rapidly and their mass balance is negative. In addition, the temperature of the permafrost is rising.

IPCC (2007, 2013) states that the projected 21st century global warming will be enhanced in the northern high latitudes owing to complex feedback mechanisms in the atmosphere-cryosphere-ocean system and it is expected that temperatures in the Arctic will continue to rise twice as fast as the global average. The Arctic climate conditions show large variability, both from year-to-year, but also on a decadal scale.

Projections from the NorACIA-RCM, a regional climate model developed for the Norwegian Arctic areas, are produced for the scenario periods 2021-2050 and 2071-2100 (Figure 6.3 and 6.4). For Svalbard the increase in annual temperature up to the end of the 21st century varies from approximately 3°C in the southwest and approximately 8°C in the northeast (Figure 6.3b). Substantial increase in air temperature is also projected for the ocean areas between

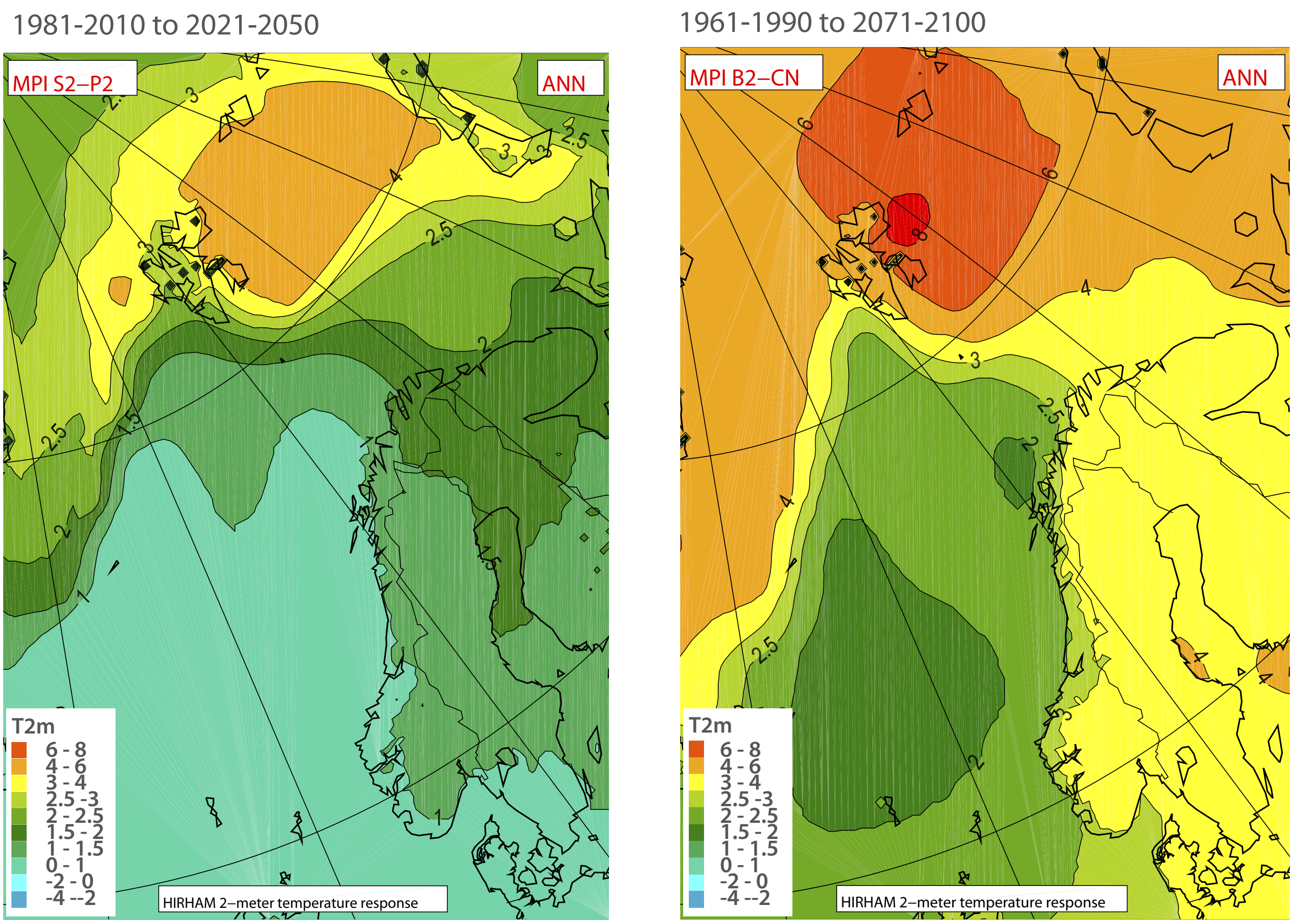
Svalbard and Novaja Zemlja. This increase is greatest in areas where sea-ice is replaced by open water (Førland et al. 2009).

For the sea, the projected temperature rises are more moderate: sea temperature in the northern Barents Sea is projected to rise by 2–3 ˚C.

It is very uncertain how fast the Arctic sea ice will retreat, but both modelling results and the rapid reduction in the area and volume of the ice indicate that the Arctic seas may be almost ice-free in summer by the middle of this century. Melting of the Greenland ice sheet and other ice caps and glaciers is expected to accelerate, but it is uncertain just how rapid the process will be. The thawing of permafrost and the reduction in snow coverage are also expected to continue, and ocean circulation and weather patterns may change considerably.

For large parts of Northern Norway the projected increase in annual precipitation from 1961-1990 to 2071-2100 is 20-30 per cent, while for north-eastern parts of Spitsbergen the increase is up to 40 per cent (Figure 6.4b).

6.3 PROJECTED CHANGE IN MEAN ANNUAL TEMPERATURES, °C



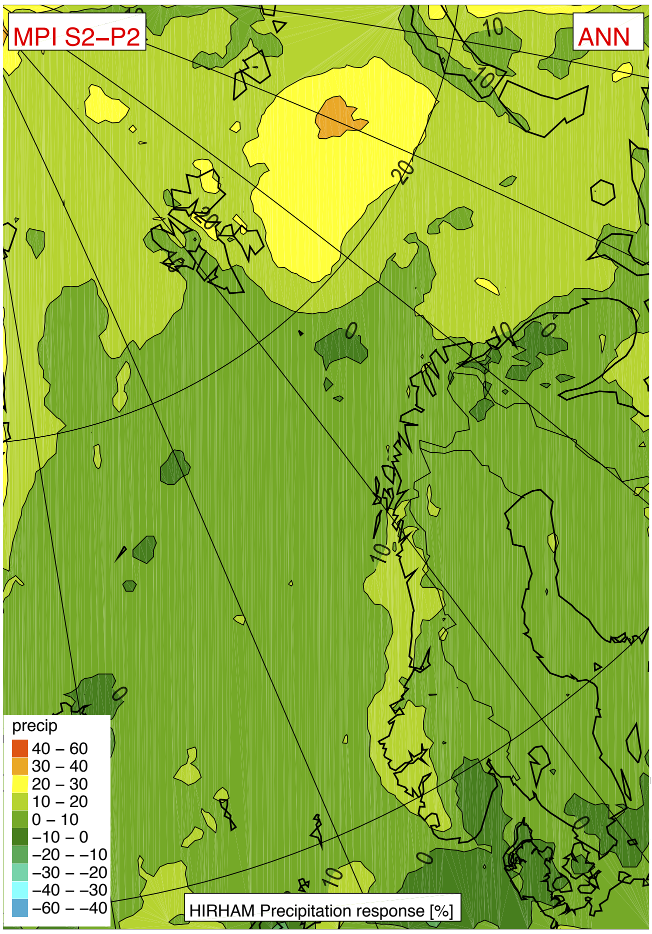
SOURCE: Førland et al. (2009)

6.6.2 Vulnerability to climate change and expected impacts on biodiversity and natural ecosystems

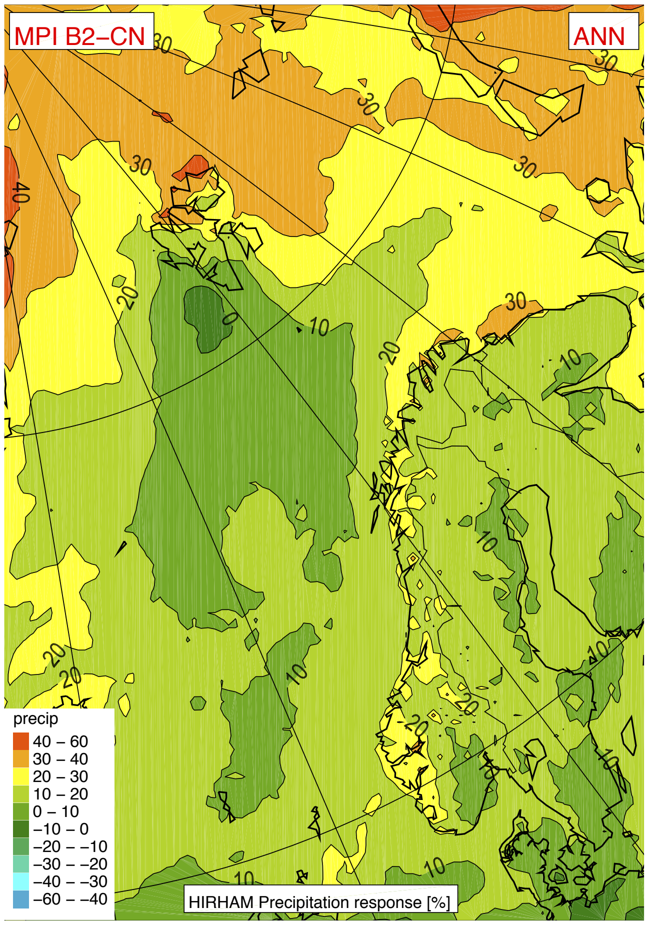
The rapid temperature rise in the Arctic is expected to intensify many of the same types of impacts that are expected to become apparent further south. Many species and habitats that are characteristic of the Arctic today are expected to have difficulties in adapting to climate change, both because of the rapid pace of change and because many species 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 may disappear from larger and larger areas of the Arctic. This applies especially to species that depend on ice, such as the polar bear, ringed seal, walrus, narwhal, little auk, ivory gull, polar cod and a number of other species.

6.4 PROJECTED CHANGE IN MEAN ANNUAL PRECIPITATION, PERCENT

1981-2010 to 2021-2050



1961-1990 to 2071-2100



SOURCE: Førland et al. (2009)

Rising temperatures will result in a northward shift in the distribution of species and habitats. The Arctic species and habitats found in the region now are expected to be gradually displaced by species and habitats that are currently found further south. The tundra areas north of the Arctic treeline are some of the terrestrial habitats that are expected to undergo the most dramatic changes.

Marine ecosystems will change as the sea temperature rises. Higher temperatures and the retreat of the sea ice will allow 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. The distribution of commercially important fish species such as cod, haddock, herring and capelin may change. The declining sea ice cover is making marine and coastal waters in the Arctic more accessible for fisheries, maritime transport, cruise ships and oil and gas activities. In certain areas, a reduction in ice cover may make it easier to start mining activities and extract minerals. The increase in activity levels may lead to more harvesting, infrastructure development, habitat loss and fragmentation, the spread of invasive alien species, disturbance of the fauna, pollution and the risk of pollution.

6.6.3 Vulnerability to climate change and expected impacts on society

In Svalbard, as in mainland Norway, climate change may increase the risk of landslides, avalanches and flooding, and result in more frequent and more severe extreme weather events, sea level rise and storm surges. Infrastructure such as roads, buildings and port facilities will be vulnerable to such climate-related events. Their isolation may make the settlements more vulnerable to climate-related events that disrupt critical infrastructure.

The active layer (the soil layer above the permafrost that thaws each summer) is becoming deeper and deeper, which makes the ground unstable and is a threat to buildings and other infrastructure. Coastal erosion may also become 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, and will be affected by climate change. The increasing length of periods without sea ice in 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 shortened the season for snowmobile-based tourism, and restricted 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. The industry may also have to comply with new and stricter environmental standards.

Svalbard is one of the most important sites for scientific research in the Arctic. However, climate change affects research in a number of ways. 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. However, in the long term the retreat of the sea ice may considerably restrict opportunities for research on processes, ecosystems and species associated with the sea ice.

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. The Governor of Svalbard, the Norwegian Coastal Administration and the Norwegian Coast Guard may all need additional resources and capacity as a result.

6.6.4 Adaptation measures

6.6.4.1 Ecosystems

Important measures have already been introduced in Svalbard in response to more accessible areas due to reduced sea ice. To reduce the risk of a shipwreck or grounding carrying heavy bunker oil is prohibited, 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 is being introduced, and charting of the waters around Svalbard is being improved. Climate change adaptation is one of the elements of the management plans that are being drawn up for the protected areas in Svalbard. Furthermore, an action plan to prevent the introduction and spread of invasive alien species in Svalbard is being drawn up.

Extensive research, monitoring and mapping of species and ecosystems in Svalbard is in progress, and results are reported through the environmental monitoring programme for Svalbard and Jan Mayen (MOSJ), which includes several indicators of impacts of climate change in Svalbard.

6.6.4.2 Settlements

The Governor of Svalbard is revising the risk and vulnerability analysis for Svalbard, which dates from 2009.

Climate change considerations are to be incorporated into land-use and general planning processes in Svalbard and this work is in progress. During the most recent revision of the land-use plan for Longyearbyen, adaptation to changed conditions, including landslides, avalanches and flooding, was one of the topics that was highlighted. The guidelines on land-use planning under the Svalbard Environmental Protection Act are now being revised. The revised guidelines will include a description of how climate change considerations are to be taken into account for the different land-use planning areas in Svalbard.

6.6.4.3 Emergency preparedness

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 will be available from 2014. This will strengthen search and rescue capacity in Svalbard and nearby sea areas.

Since 2010, the Norwegian Space Centre has been running a project to test satellite technology to monitor maritime traffic in northern waters. Moreover, in 2009 the International Maritime Organization (IMO) introduced obligatory long-range identification and tracking of cargo and passenger ships at sea (LRIT), with global coverage. This means that Norway will from now on have access to better information on maritime activity in Arctic waters, which will also be valuable for search and rescue operations. From 1 July 2012, the Pilotage Act and associated regulations were made applicable to Svalbard. This means that the rules relating to the state pilotage service, compulsory pilotage and pilot exemption certificates also apply in the waters around Svalbard. Compulsory pilotage is being introduced gradually during the period 2012 to 2015. It has applied to coal vessels to and from the Svea mine since 2012, and from 2013 includes large passenger vessels (length 150 metres or more). From 2015, the rules for the waters around Svalbard will be the same as for mainland Norway, meaning that vessels of a length of 70 metres or more and passenger vessels of a length of 24 metres or more must use a pilot when sailing inside the baselines. Smaller size limits apply to vessels carrying dangerous cargo.

6.6.4.4 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.

The Arctic Council has published a number of reports that synthesise and assess new knowledge on climate change in the Arctic. Adaptation Actions for a Changing Arctic (AACA) is a Norwegian initiative that is intended to enable more informed and timely adaptation in a rapidly changing Arctic. It will develop a range of Arctic scenarios for the period up to 2050 as a basis for adaptation strategies and planning.

The Barents Euro-Arctic Council (BEAC) is a cooperation in the Barents Euro-Arctic Region, with members from Denmark, Finland, Iceland, Norway, Russia, Sweden and the European Commission. The council is now in the process of adopting an Action Plan on Climate Change for the Barents Cooperation, in which climate adaptation is one of four policy areas measures are suggested.

Norwegian institutions have for many years been involved in research and monitoring relating to climate change in the Arctic and its impacts.

7 Financial resources and transfer of technology, including information under articles 10 and 11 of the kyoto protocol

7.1 Introduction

Norway has long emphasised the strong inter-linkages between climate change and development. Main priorities for Norwegian public climate finance in recent years have been on reducing emissions from deforestation and forest degradation and promotion of renewable energy and energy conservation/efficiency. Adaptation to climate change is another priority, with particular focus on food security and disaster risk reduction.

The budget for climate change mitigation and adaptation assistance has increased strongly over the past 7 years. Norway's bilateral climate finance was 851 million USD in 2012, while the level in the two preceding years was USD 477 and USD 557 million, respectively. In 2006 the share of bilateral climate finance in the overall Official Development Assistance (ODA) budget was around 3 per cent, which by 2012 had increased to 18 per cent. During the same period, the total ODA budget also increased from an already high level.

The total climate finance figures reported for the years 2010 - 2012, as presented above, deviate somewhat from the figures reported in our Fast Start Finance Report which was submitted to the UNFCCC in August 2013. This deviation is caused by the two reports using slightly different criteria for the timing of reporting on funding. The National Communication utilises the OECD/DAC reporting system in which only the amount that has been received by the recipient during a given year, can be reported as disbursed that given year. The Fast Start Finance Report also reports funding that has been committed, extracted from the development budget and set aside on a promissory note, but not yet disbursed to the recipient. This difference in reporting methodology only causes a discrepancy between the two reports in the case of Norwegian payments for verified emission reductions to Brazil's Amazon Fund. These are payments that Brazil during the period from 2010 to 2012 earned by verifiably reducing emissions from deforestation in the Amazon, but which were only disbursed to the Amazon Fund in accordance with a Brazil's estimate of the amount needed to finance its project pipeline. From 2010 to 2012 a total of USD 543 million was set aside as promissory notes for the Amazon Fund in the Bank of Norway. Out of these funds, USD 61 million was transferred to the Amazon Fund in 2012, while the remaining USD 482 million was transferred in 2013.

Norway has made a wide range of financial contributions related to the implementation of the Convention, including multilateral institutions such as the Global Environment Facility 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.

7.2 Provision of 'new and additional' financial resources

7.2.1 Overview

The main goal of Norway's ODA is poverty reduction, equitable distribution of social and economic goods and sustainable development. The strong inter-linkages between climate change and development has been emphasised, and the budget for climate change adaptation and mitigation has increased strongly over recent years.

Norwegian total ODA has not only exceeded 0.7 per cent of Gross National Income (GNI) for many years, but oscillated around 1 per cent in the last few years. All our climate finance can be counted beyond the 0.7 per cent threshold. Moreover, we have steadily increased the volume of our ODA budget as the economy has been growing, so that the increase in climate finance has not reduced other ODA.

There is no internationally agreed definition of what constitutes "new and additional" resources under Article 4.3 of the Convention. As illustrated above, Norwegian ODA has been increasing steadily over the period under review. The same applies for funding to climate change actions; by any definition these can therefore be classified as "new and additional".

It should be noted that efforts are being made, where relevant, to integrate climate change concerns into all development efforts. This is not altogether 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 helps to improve resilience to climate change.

While a large part of our total 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 climate change resilience. Also, renewable energy projects may promote climate change adaptation. In these cases, both markers have been used. This has been part of a conscious effort to ensure more consistent use of the adaptation marker since 2010. For 2011, we reported that the numbers for adaptation were too low, since not all disaster risk reduction (DRR) assistance was included. In 2012, the adaptation marker was used also for DRR. In our view, there is clearly a need for better guidance on what to include under adaptation.

7.2.2 Global Environment Facility

The Norwegian government's contribution to the Global Environment Facility for the GEF 5 period 2010-2013 was approximately USD 62.7 million. In GEF 5, the climate change focal area receives approximately 30 per cent of GEF resources. In addition, a fast growing number of multi focal area projects and programmes are being introduced,

7.1 FINANCIAL CONTRIBUTIONS TO THE GLOBAL ENVIRONMENT FACILITY (GEF)

	Contribution (millions of US dollars – 1 USD = approx. NOK 6)			
	2010	2011	2012	2013
Global Environment Facility	9.12	17.72	17.72	17.72

mainly involving the focal areas of climate change, biodiversity and land degradation.

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

7.3.1 Overview

There is no internationally agreed definition of which developing country parties are "particularly vulnerable", nor is there any likelihood that such a definition will be agreed in the foreseeable future.Few if any developing countries would fall outside the groups listed in Article 4.8 of the Convention. Hence, the definition of which countries are most vulnerable is up to each country.

Development aid and climate change adaptation are interlinked in a complicated way. We have no clear criteria for when a specific development assistance project should be accounted also as an adaptation project, although much effort is being put into work on this. Hence, it is difficult to provide a comprehensive overview on assistance for climate change adaptation. Statistically, there are still some gaps that make it difficult to provide correct data for support to adaptation.

Sustainable development that takes the environment, poverty reduction and economic development into account is also the best way to adapt to a changing climate. Hence, adaptation efforts should to the extent possible be integrated into the development process.

Assistance for climate change adaptation has been scaled up over the last two to three years as a matter priority. The areas where assistance has increased most are disaster risk reduction and food security. Support for climate services, mainly through the WMO, has also increased since 2010, as well as support for national adaptation planning, inter alia through the Least Developed Country Fund (LDCF), the Special Climate Change Fund (SCCF) and the Pilot Program for Climate Resilience (PPCR).

Africa received the largest share of this support, about 40 per cent of the total adaptation budget in 2012. Among countries, Haiti, Mozambique and India received the highest amount of funding for climate change adaptation in 2012.

The bulk of Norway's support for adaptation activities of developing countries is mainly channelled through the general contributions to multilateral development institutions, including through the UNDP and international financing institutions. A few examples of measures and programmes that Norway supports and which are relevant to adaptation are:

World Bank:

- Pilot Program for Climate Resilience: NOK 91,2 million for 2009 - 2012.
- Global Facility for Disaster Risk Reduction: NOK 18 million for 2010 – 2012. NOK 18 million is pledged for 2013.

Consultative Group on International Agricultural Research (CGIAR):

- NOK 326 million for 2010 - 2012.

Global Crop Diversity Trust:

- NOK 80 million for 2010 - 2012.

Global Framework for Climate Services – WMO:

- NOK 60 million for the period 2011-2014 for the GFCS secretariat and for activities strengthening weather and climate services in Africa

- NOK 60 mill scheduled for the period 2013-2015 for strengthening the production of user friendly climate services in Africa, mainly Tanzania and Malawi. Joint programme between WMO, WHO, WFP, CGIAR, IFRC, Cicero and CMI.

7.3.2 Funds under the UNFCCC, administered by the GEF

For the period 2010 – 2013, contributions to the Least Developed Countries Fund (LDCF) and the Special Climate Change Funds (SCCF), both essentially for adaptation, were as follows (millions of US dollars – 1 USD = approx. NOK 6):

The Norwegian carbon procurement programme contributes to the Adaptation Fund through direct transactions of some 1.2 Mt for the Kyoto I-period. The program will continue its engagement in the Adaptation Fund by transactions also in the Kyoto II-period.

Norway has also introduced a programme for "climate proofing" of all bilateral development assistance. Through examination of development activities by Norwegian embassies, the aim is to make sure that all assistance takes account of climate change. These examinations are carried out on the basis of OECD's recent guidelines for integration of climate change adaptation into development assistance.

7.4 Provision of financial resources, including financial resources under Article 11 of the Kyoto Protocol

7.4.1 Introduction

The report covers our bilateral (including support to non-governmental organisations) and multilateral support for climate change action in developing countries. It should be noted that the information, as for 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. Consequently, the figures should be interpreted with caution. Since there is no room for distinction between the two values main objective and significant objective, this reporting treats them as equal. This may lead to overestimation of climate change funding. Hence, the figures should be interpreted as "total value of projects that fully, or to a certain degree, target climate change mitigation and adaptation". Despite this inherent weakness, the methodology is applied because the policy markers are well established parts of the international reporting system which ensures comparable information among countries, and because it is well incorporated into the Norwegian reporting system.

It should also be noted that the term "bilateral" includes assistance through public

7.2 CONTRIBUTIONS TO THE LDCF AND THE SCCF

	2010	2011	2012	2013	Total
LDCF	4.17	8.83	3.33	3.67	20
SCCF	2.5	2.5	2.83	2.5	10.33

7.3 A PROVISION OF PUBLIC FINANCIAL SUPPORT: SUMMARY INFORMATION IN 2010

Allocation channels	Year – 2010					
	Domestic currency (NOK mill)					
	Core/gene-ral	Climate-specific				Core/ general
		Mitigation	Adaptation	Cross-cutting	Other	
Total contributions through multilateral channels:						
Multilateral climate change funds	114.7	0.1				19.0
Other multilateral climate change funds						
Multilateral financial institutions, including regional development banks	1 480.9	8.6		888.6		245.0
Specialized United Nations bodies	870.0			480.6		143.9
Other multilateral channels				117.9		
Total contributions through bilateral, regional and other channels			35.1	1 208.8		
Total	2 465.6	151.3	35.1	2 695.9		407.9

7.3 B PROVISION OF PUBLIC FINANCIAL SUPPORT: SUMMARY INFORMATION IN 2011

Allocation channels	Year – 2011					
	Domestic currency (NOK mill)					
	Core/ general	Climate-specific				Core/ general
		Mitigation	Adaptation	Cross-cutting	Other	
Total contributions through multilateral channels:						
Multilateral climate change funds	194.3	-0.4				34.7
Other multilateral climate change funds						
Multilateral financial institutions, including regional develop-ment banks	1 665.7			733.8		297.2
Specialized United Nations bodies	870.0			283.5		155.2
Other multilateral channels				143.8		
Total contributions through bilateral, regional and other channels		66.6	8.6	1 887.9		
Total	2 730.1	66.2	8.6	3 049.0		487.1

USD (mill.)			
Climate-specific			
Mitigation	Adaptation	Cross-cutting	Other
0.0			
1.4		147.0	
		79.5	
		19.5	
23.6	5.8	200.0	
25.0	5.8	446.0	

USD (mill.)			
Climate-specific			
Mitigation	Adaptation	Cross-cutting	Other
-0.1			
		130.9	
		50.6	
		25.7	
11.9	1.5	336.8	
11.8	1.5	544.0	

and private sector, as well as NGOs. The figures applied under core-support to multilateral channels, refers to all un-earmarked support to the organisation, regardless of its climate change relevance.

All items in the tables are specified as provided. This means that the amounts are disbursed during the year reported for.

Furthermore, the tables below do not give the complete picture when it comes to distinguishing between support to climate change adaptation and mitigation. As the predefined tables allows for one category only for each row, any contribution that could be divided between mitigation and adaptation are reported as cross-cutting, independent of the ratio between the two. E.g. if 90 per cent of the contributions through a multilateral organisation aims at mitigation, and the remaining 10 per cent at adaptation, the total amount is reported as cross-cutting. Another issue should be noted regarding the bilateral support. The tables below 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 summary information of the provision of public financial support during the years 2010 – 2012, see tables 7.3(a) to (c).

7.4.2 Bilateral Climate Finance

Tables 7.4 (a) to (c) below show total 2012 bilateral finance directed at climate change to be NOK 2 984,4 million, compared with NOK 1 963 million in 2011 and 1 386,6 in 2010. During this period we have therefore experienced more than a doubling of Norwegian public financial support through bilateral, regional and other channels.

7.3 C PROVISION OF PUBLIC FINANCIAL SUPPORT: SUMMARY INFORMATION IN 2012

Allocation channels	Year – 2012					
	Domestic currency (NOK mill)					
	Core/ general	Climate-specific				Core/ general
		Mitigation	Adaptation	Cross-cutting	Other	
Total contributions through multilateral channels:						
Multilateral climate change funds	162.3					27.9
Other multilateral climate change funds						
Multilateral financial institutions, including regional development banks	1 634.4			1 388.4		281.1
Specialized United Nations bodies	870.0			437.4		149.6
Other multilateral channels				138.0		
Total contributions through bilateral, regional and other channels		272.1	25.3	2 687.0		
Total	2 666.8	272.1	25.3	4 650.8		458.6

Norwegian bilateral finance directed at climate change covers a wide variety of areas and sectors. Norway offer 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.

Renewable energy and energy efficiency are core elements of Norwegian assistance. Extensive energy efficiency measures, a marked rise in the use of renewables, and carbon capture and storage will be necessary also in developing countries in order to reach global emission reduction targets. It is a challenge to increase access to energy for the poor without increasing emissions of greenhouse gases. Many developing countries have considerable deposits of non-renewable resources such as oil, gas and minerals. The extraction of these could significantly boost economic development. However, this requires sound management that promotes economic growth, and ensures distribution of wealth, welfare and environmental sustainability. Norway provides bilateral assistance in these fields through the Clean Energy for Development and Oil for Development programmes. Norway help to secure access for developing countries to the capital, expertise and technology needed for sustainable economic growth and the implementation of green development strategies based on low emissions and sustainable development of the natural resource base.

Norway's International Climate and Forest Initiative was established in 2008. It is targeted at all types of forest in developing countries – from mangroves and rain forests to dry savannah forests. The initiative is designed to support the international climate negotiations and promote measures in partner countries that contribute to global emissions reductions. It also contributes to the fight against poverty and the efforts to achieve the Millennium Develop-

USD (mill.)			
Climate-specific			
Mitigation	Adaptation	Cross-cutting	Other
		238.8	
		75.2	
		23.7	
46.8	4.4	462.1	
46.8	4.4	799.8	

ment Goal of ensuring environmental sustainability. A large share of Norway's bilateral climate finance is directed towards REDD activities.

Adaptation to climate change includes both preventing and dealing with the damage caused by climate change. A country's adaptive capacity is linked to its capacity for social planning, which again depends on the quality of its governance and its level of development. Thus, all effective development assistance helps to build resilient societies, which are less vulnerable and more able to adapt in response to all types of threats, from financial crisis or political instability to climate change. Norway has stepped up assistance to sectors that are particularly vulnerable to climate change, primarily agriculture and disaster risk reduction.

In general, environmental issues and vulnerability to climate change are to be taken into consideration in all Norwegian aid through climate proofing and a stronger environmental dimension. This means identifying any negative effects of projects or programmes and taking steps to prevent them. Environmental and climate elements are sought integrated into all projects or included as an additional component. This is an important factor in the quality assurance of activities.

See tables 7.3 (a) to (c) for summary information of the provision of public financial support through bilateral, regional and other channels in the years 2010 – 2012.

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. Some of the examples below also reflect bilateral initiatives through multilateral channels.

Myanmar

In Myanmar Norway's support to the organisation RECOFTC () has contributed to initiating a cooperation with the government for forests and "local community forestry". Eventually the support will be covered by the core assistance from Norway to RECOFTC.

The Norwegian Ministry of Climate and Environment and the authorities in Myanmar are engaged in dialogue for concrete expert exchange and capacity building in relation to forest preservation. In 2012, NOK 540,000 was paid from Norway's Climate and Forest Initiative to Myanmar. The funds were provided to finance a preliminary initiative which will form the basis of a future UN REDD programme in Myanmar. The final report is expected in summer 2013. The support is in line with the

7.4 A PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH BILATERAL, REGIONAL AND OTHER CHANNELS IN 2010

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	10,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Angola	-0,7	Provided	ODA	Grant	Mitigation	Energy
	Botswana	0,0	Provided	ODA	Grant	Adaptation	Fishing
	Burundi	0,4	Provided	ODA	Grant	Adaptation	Other
	Congo, Dem. Rep.	14,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Eritrea	2,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ethiopia	54,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ghana	1,4	Provided	ODA	Grant	Mitigation	Forestry
	Kenya	1,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Liberia	-0,9	Provided	ODA	Grant	Mitigation	Cross-cutting
	Madagascar	5,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malawi	97,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mali	13,3	Provided	ODA	Grant	Adaptation	Cross-cutting
	Mozambique	12,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Niger	8,6	Provided	ODA	Grant	Adaptation	Other
	Nigeria	0,6	Provided	ODA	Grant	Mitigation	Other
	Somalia	10,0	Provided	ODA	Grant	Adaptation	Cross-cutting
	South Africa	0,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South of Sahara Regional	42,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Sudan	7,3	Provided	ODA	Grant	Mitigation	Cross-cutting
	Tanzania	79,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Togo	0,6	Provided	ODA	Grant	Mitigation	Other
	Uganda	68,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Zambia	4,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
America	America Regional	2,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Brazil	184,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Chile	64,0	Provided	ODA	Grant	Mitigation	Energy
	Cuba	0,5	Provided	ODA	Grant	Adaptation	Other
	Guatemala	1,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Guyana	1,7	Provided	ODA	Grant	Mitigation	Other
	Nicaragua	25,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	North & Central America Regional	0,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Panama	14,3	Provided	ODA	Grant	Mitigation	Energy
	Peru	3,5	Provided	ODA	Grant	Mitigation	Forestry
Asia	Armenia	1,5	Provided	ODA	Grant	Mitigation	Energy
	Asia Regional	14,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
	Bangladesh	2,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Bhutan	9,9	Provided	ODA	Grant	Mitigation	Cross-cutting
	Cambodia	0,0	Provided	ODA	Grant	Adaptation	Agriculture
	Central Asia Regional	0,8	Provided	ODA	Grant	Mitigation	Forestry
	China	47,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Georgia	4,2	Provided	ODA	Grant	Cross-cutting	Energy
	India	57,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Indonesia	20,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Kazakhstan	2,5	Provided	ODA	Grant	Mitigation	Cross-cutting
	Laos	0,8	Provided	ODA	Grant	Adaptation	Cross-cutting
	Nepal	74,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Pakistan	9,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Philippines	86,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South & Central Asia Regional	1,2	Provided	ODA	Grant	Adaptation	Other
	Sri Lanka	0,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Tajikistan	0,1	Provided	ODA	Grant	Mitigation	Energy
	Thailand	0,3	Provided	ODA	Grant	Adaptation	Cross-cutting
	Viet Nam	1,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Europe	Albania	0,1	Provided	ODA	Grant	Mitigation	Energy
	Belarus	3,0	Provided	ODA	Grant	Mitigation	Cross-cutting
	Bosnia-Herzegovina	1,3	Provided	ODA	Grant	Mitigation	Energy
	Europe Regional	13,7	Provided	ODA	Grant	Mitigation	Cross-cutting
	Kosovo	5,2	Provided	ODA	Grant	Mitigation	Cross-cutting
	Macedonia (Fyrom)	8,5	Provided	ODA	Grant	Mitigation	Cross-cutting
	Ukraine	3,4	Provided	ODA	Grant	Mitigation	Cross-cutting
Not geo-graphically allocated	Global Unspecified	282,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Oceania	Papua New Guinea	1,0	Provided	ODA	Grant	Mitigation	Forestry
The Middle East	Syria	0,1	Provided	ODA	Grant	Cross-cutting	Other
Total		**1386,6**					

7.4 B PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH BILATERAL, REGIONAL AND OTHER CHANNELS IN 2011

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	20,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Cameroon	0,3	Provided	ODA	Grant	Mitigation	Energy
	Congo, Dem. Rep.	14,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Eritrea	0,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ethiopia	31,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ghana	3,7	Provided	ODA	Grant	Mitigation	Forestry
	Kenya	24,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Liberia	4,9	Provided	ODA	Grant	Mitigation	Forestry
	Madagascar	6,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malawi	158,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mali	28,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mozambique	52,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Niger	8,2	Provided	ODA	Grant	Adaptation	Other
	Nigeria	0,3	Provided	ODA	Grant	Mitigation	Energy
	South Africa	9,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South of Sahara Regional	83,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South Sudan	9,4	Provided	ODA	Grant	Mitigation	Cross-cutting
	Tanzania	96,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Togo	1,0	Provided	ODA	Grant	Mitigation	Cross-cutting
	Uganda	103,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Zambia	178,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
America	America Regional	2,5	Provided	ODA	Grant	Mitigation	Other
	Brazil	364,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Chile	-68,1	Provided	ODA	Grant	Mitigation	Energy
	Cuba	0,7	Provided	ODA	Grant	Mitigation	Water/ sanitation
	Dominican Republic	0,2	Provided	ODA	Grant	Mitigation	Other
	Guatemala	11,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Guyana	6,0	Provided	ODA	Grant	Mitigation	Cross-cutting
	Haiti	0,4	Provided	ODA	Grant	Cross-cutting	Agriculture
	Nicaragua	24,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Panama	38,8	Provided	ODA	Grant	Mitigation	Energy
	Peru	3,5	Provided	ODA	Grant	Mitigation	Forestry
	St.Vincent & Grenadines	0,7	Provided	ODA	Grant	Mitigation	Other
Asia	Afghanistan	7,0	Provided	ODA	Grant	Mitigation	Energy
	Armenia	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Asia Regional	16,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
	Azerbaijan	2,6	Provided	ODA	Grant	Mitigation	Energy
	Bangladesh	4,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Bhutan	13,8	Provided	ODA	Grant	Mitigation	Cross-cutting
	Cambodia	0,2	Provided	ODA	Grant	Mitigation	Cross-cutting
	China	38,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Georgia	1,5	Provided	ODA	Grant	Mitigation	Energy
	India	42,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Indonesia	15,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Kazakhstan	4,7	Provided	ODA	Grant	Mitigation	Cross-cutting
	Kyrgyz Rep.	0,1	Provided	ODA	Grant	Mitigation	Agriculture
	Laos	38,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malaysia	1,4	Provided	ODA	Grant	Mitigation	Forestry
	Myanmar	0,3	Provided	ODA	Grant	Mitigation	Other
	Nepal	43,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Pakistan	10,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Philippines	45,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Sri Lanka	0,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Tajikistan	7,5	Provided	ODA	Grant	Mitigation	Energy
	Thailand	0,3	Provided	ODA	Grant	Adaptation	Cross-cutting
	Viet Nam	1,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Europe	Belarus	3,8	Provided	ODA	Grant	Mitigation	Cross-cutting
	Europe Regional	6,1	Provided	ODA	Grant	Mitigation	Cross-cutting
	Kosovo	4,1	Provided	ODA	Grant	Mitigation	Forestry
	Macedonia (Fyrom)	8,9	Provided	ODA	Grant	Mitigation	Cross-cutting
	Serbia	0,0	Provided	ODA	Grant	Cross-cutting	Other
	Ukraine	1,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Not geo-graphically allocated	Global Unspecified	419,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Oceania	Papua New Guinea	0,3	Provided	ODA	Grant	Mitigation	Other
The Middle East	Palestine	0,5	Provided	ODA	Grant	Mitigation	Water/sanitation
Total		**1 963,0**					

7.4 C PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH BILATERAL, REGIONAL AND OTHER CHANNELS IN 2012

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	25,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Angola	1,1	Provided	ODA	Grant	Adaptation	Cross-cutting
	Burundi	0,3	Provided	ODA	Grant	Adaptation	Other
	Cameroon	0,8	Provided	ODA	Grant	Mitigation	Energy
	Congo, Dem. Rep.	14,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ethiopia	100,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ghana	1,5	Provided	ODA	Grant	Mitigation	Forestry
	Kenya	19,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Liberia	3,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Madagascar	15,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malawi	83,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mali	32,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mozambique	66,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Namibia	1,8	Provided	ODA	Grant	Adaptation	Other
	Niger	8,4	Provided	ODA	Grant	Adaptation	Other
	Nigeria	3,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Somalia	-0,1	Provided	ODA	Grant	Adaptation	Agriculture
	South Africa	21,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South of Sahara Regional	85,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South Sudan	11,9	Provided	ODA	Grant	Mitigation	Energy
	Sudan	1,0	Provided	ODA	Grant	Adaptation	Agriculture
	Tanzania	117,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Togo	1,3	Provided	ODA	Grant	Mitigation	Energy
	Uganda	90,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Zambia	72,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
America	America Regional	5,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Brazil	1 186,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Chile	186,8	Provided	ODA	Grant	Mitigation	Energy
	Cuba	12,0	Provided	ODA	Grant	Mitigation	Other
	Guatemala	1,1	Provided	ODA	Grant	Adaptation	Cross-cutting
	Guyana	2,3	Provided	ODA	Grant	Mitigation	Forestry
	Haiti	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Nicaragua	11,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	North & Central America Regional	0,0	Provided	ODA	Grant	Cross-cutting	Other
	Panama	8,8	Provided	ODA	Grant	Mitigation	Energy
	Peru	9,4	Provided	ODA	Grant	Mitigation	Cross-cutting
Asia	Afghanistan	3,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
	Armenia	5,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Asia Regional	42,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Azerbaijan	2,7	Provided	ODA	Grant	Mitigation	Energy
	Bangladesh	2,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Bhutan	4,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Cambodia	0,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	China	46,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Georgia	0,9	Provided	ODA	Grant	Mitigation	Energy
	India	107,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Indonesia	33,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Kazakhstan	3,4	Provided	ODA	Grant	Mitigation	Cross-cutting
	Laos	0,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malaysia	1,2	Provided	ODA	Grant	Mitigation	Forestry
	Myanmar	8,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Nepal	70,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	North Korea	10,0	Provided	ODA	Grant	Adaptation	Other
	Pakistan	7,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Philippines	-13,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Sri Lanka	4,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Tajikistan	11,9	Provided	ODA	Grant	Mitigation	Energy
	Thailand	0,7	Provided	ODA	Grant	Adaptation	Cross-cutting
	Viet Nam	4,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Europe	Albania	1,8	Provided	ODA	Grant	Cross-cutting	Energy
	Belarus	1,2	Provided	ODA	Grant	Mitigation	Other
	Europe Regional	2,8	Provided	ODA	Grant	Cross-cutting	Other
	Kosovo	6,5	Provided	ODA	Grant	Mitigation	Forestry
	Macedonia (Fyrom)	9,1	Provided	ODA	Grant	Mitigation	Cross-cutting
	Serbia	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ukraine	0,9	Provided	ODA	Grant	Cross-cutting	Other
Not geo-graphically allocated	Global Unspecified	393,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Oceania	Papua New Guinea	0,3	Provided	ODA	Grant	Mitigation	Other
The Middle East	Jordan	0,2	Provided	ODA	Grant	Adaptation	Other
	Palestine	0,9	Provided	ODA	Grant	Adaptation	Other
Total		**2 984,4**					

goal of helping to conserve natural forests in developing countries.

Through the UNDP and UN-Habitat, Norway is supporting prevention and emergency preparedness in disaster-prone local communities. Through support to the *Asian Disaster Preparedness Center* in Bangkok, Myanmar has been included in the regional cooperation for early warning of natural disasters.

Malawi

In Malawi the Norwegian embassy disbursed a total of around NOK 141 million in 2011 to support agriculture, food security, environment and climate. More than five million trees have been planted with Norwegian funds. This involves both restoration of forest areas, measures undertaken in cultivated fields and establishment of fruit orchards. In addition, over 18,000 new households have switched to using energy efficient cooking stoves that reduce the need for wood and charcoal by up to 60 per cent.

More than 10,000 new households have switched to more climate-robust agriculture. In addition there are around 4,000 farmers financed by Norway who are preparing to make the shift. Norway supports development and improvement of irrigation systems. Approximately 150 hectares of cultivated fields were irrigated in 2011, giving farmers the opportunity to grow up to three crops per year.

Tanzania

Norway's efforts in Tanzania have mainly been directed at the Climate and Forestry Cooperation, but have also involved important efforts within research and policy development in relation to climate-robust and sustainable agricultural development and energy.

Norway has promised up to NOK 500 million for forestry initiatives in Tanzania over a five-year period. The money will be spent on policy development and work on addressing the driving forces behind deforestation, for instance, through improved agricultural methods and alternatives to the current use of firewood and charcoal in the households. Tanzania is a pilot country in the UN REDD programme. The bilateral cooperation with Tanzania for REDD is now in its concluding phase in the current form.

For several years Norway has been an important partner for Tanzania in the energy sector. Particularly in Zanzibar Norway has been central in the work to ensure electricity supply. A good example is the 74 kilometre long subsea cable, produced in and financed by Norway, which has kept the island of Pemba connected to the electricity network on the mainland since 2010. Furthermore, Norway has signed agreements to finance maintenance of hydropower plants and help to strengthen the maintenance capacity and know-how in the government energy companies on the mainland and in Zanzibar.

In 2013 Norway and Tanzania signed an agreement under which Norway will contribute NOK 700 million for improving access to energy in Tanzania's rural areas. This is one of Norway's largest bilateral assistance agreements and will probably be an important contribution to Tanzania's ambitious goal of electrifying the country.

Bangladesh

Norway is supporting three pilot projects in Asia – Bangladesh, Vietnam and China – to reduce consequences of cyclones, earthquakes, tsunamis and other natural disasters. Bangladesh is among those countries of the world that are most vulnerable to natural disasters and climate change. During the rainy season 10-40 per cent of the country is flooded, depending on whether it is a normal flood or a deluge.

In order to deal with the challenges, Norway is supporting the UNDP's Comprehensive Disaster Management Program (CDMD) with NOK 100 million over five years. In 2012, NOK 20 million was transferred. The goal is to help reduce poverty by reducing the impacts of natural disasters.

During recent years a number of cooperation agreements have been made between Norwegian and Bangladeshi institutions. In order to increase knowledge about climate the Bjerknes Centre for Climate Research is cooperating with Bangladesh Centre for Advanced Studies, and the Norwegian Meteorological Institute is cooperating with theBangladesh Meteorological Department.

In December 2011 the Norwegian embassy signed a three-year agreement with the Norwegian research institute Bioforsk for assistance in a project for maintaining rice production in Bangladesh under changed climatic conditions. Assistance of up to NOK 3.1 million is being provided, out of which NOK 1.5 million was paid in 2012. The grant helps enable Bioforsk to work with Bangladesh Rice Research Institute (BRRI) and the Centre for Environment and Geographic Information Services (CEGIS) for research on how rice can be made more resistant to drought and flood. The objectives are to prepare models for how climate change will affect rice production and to identify adaptation strategies.

South-Africa

Norway has cooperated with South Africa on environmental programmes and projects for many years, including on issues such as waste treatment and air pollution, environmental impact analyses and biological diversity. In June 2013 a Declaration of Intent (DoI) was signed for further bilateral cooperation between the Department of Environmental Affairs and the Norwegian Ministry of Climate and Environment. The DoI singled out the following topics as a main focus for further cooperation; climate change, oceans and coastal management, biodiversity and chemicals. Project cooperation at a technical level on the establishment of national GHG inventories, as well as collaboration on ocean management plans and systems, are important parts of this cooperation.

Norway has also given a grant to establish a national centre for carbon capture and storage (CCS). The Centre has produced a South African CO_2 Storage Atlas, and is currently preparing for a CO_2 injection pilot co-funded by Norway. The co-operation with South Africa also extends to businesses: a South-African company has entered into technology development partnership in the Technology Centre at Mongstad in Norway. This is expected to provide additional value, in the form of expertise, for the further development of the CCS Centre. As regards research, the Norwegian embassy is involved in a climate-oriented programme.

7.4.3 Support to multilateral organisations

Core Support to multilateral institutions partly or fully targeting climate change in 2010 - 2012 is presented in table 7.5 below, but without estimates on the share of these grants targeted for climate change in general, and for adaptation and mitigation in particular. Some, estimates are more accurate than for others. For example, the climate change focal area of the GEF receives around 30 per cent of total resources in a given GEF period. The activities of the GEF climate funds (LDCF and SCCF)and the UNFCCC Secretariat are specifically directed towards climate change. It is much more difficult to estimate the exact climate share of core support to, for example, the UNDP or the WFP.

It is also very difficult to report accurately on the percentages of core funding provided to multilateral organisations devoted to mitigation and adaptation respectively. For the purpose of this report, we have therefore decided to simply present the overall core support to those multilateral organisations that we classify as climate-relevant, in the sense that core support can be assigned to climate change activities.

Tables 7.5 (a) to (c) provides a summary of Norwegian financial support through multilateral channels in the years 2010 – 2012. This is followed by a more descriptive breakdown of Norwegian support to a selection of multilateral organisations, including both ODA and non-ODA contributions.

The Green Climate Fund

The Green Climate Fund (GCF) was established to make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change. The GCF Board is still working to operationalise the Fund and initial funding has not yet taken place. However, Norway has so far contributed USD 1,037 million to the administrative budget of the GCF.

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 2010 – 2013, the actual contributions were NOK 145 million.

Prototype Carbon Fund (World Bank)

Norway was among the early movers in carbon finance and joined the PCF in 2000, with a commitment to pay USD 10 million over the life-time of the fund. As per October 2013, approximately 70 per cent of this amount has been called up (NOK 12 million in 2010-2013) .The PCF finances projects that reduce greenhouse gas emissions in developing countries.

GEEREF

Norway participated in the establishment of the Global Energy Efficiency and Renewable Energy Fund (GEEREF) in 2008 together with the European Commission and Germany. We have supported GEEREF over a period of four years with a total of NOK 110 million. 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 subfunds tailored to regional needs and conditions stimulates these markets.

REEEP

The Renewable Energy and Energy Efficiency Partnership (REEEP) is a market catalyst for clean energy in developing countries and emerging markets. In this

7.5 A PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH MULTILATERAL CHANNELS IN 2010

Donor funding	Total amount (NOK mill.) Core/ general	Climate-specific	Status	Funding source	Financial instrument	Type of support	Sector
Multilateral climate change funds							
1. Global Environment Facility	54.7		Provided	ODA	Grant	Other	Other
2. Least Developed Countries Fund	25.0		Provided	ODA	Grant	Other	Other
3. Special Climate Change Fund	15.0		Provided	ODA	Grant	Other	Other
4. Adaptation Fund							
5. Green Climate Fund							
6. UNFCCC Trust Fund for Supplementary Activities UNFCCC	20.0	0.1	Provided	ODA	Grant	Mitigation	Cross-cutting
7. Other multilateral climate change funds							
Subtotal	**114.7**	**0.1**					
Multilateral financial institutions, including regional development banks							
1. World Bank (excl. IFC)	898,5	720.7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation		8.6	Provided	ODA	Grant		Cross-cutting
3. African Development Bank		160.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	74.2		Provided	ODA	Grant	Other	Other
5. European Bank for Reconstruction and Development	8.2	7.9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank							
7. Other							
Subtotal	**1 480.9**	**897.2**					
Specialized United Nations bodies							
1. United Nations Development Programme	770.0	478.4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	100.0	2.3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. Other							
Subtotal	**870.0**	**480.6**					
Other multilateral channels		**117.9**	**Provided**	**ODA**	**Grant**	**Cross-cutting**	**Cross-cutting**
Total	**2 465.6**	**1 495.9**					

7.5 B PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH MULTILATERAL CHANNELS IN 2011

Donor funding	Total amount (NOK mill.)		Status	Funding source	Financial instrument	Type of support	Sector
	Core/ general	Climate-specific					
Multilateral climate change funds							
1. Global Environment Facility	106.3		Provided	ODA	Grant	Other	Other
2. Least Developed Countries Fund	53.0		Provided	ODA	Grant	Other	Other
3. Special Climate Change Fund	15.0		Provided	ODA	Grant	Other	Other
4. Adaptation Fund							
5. Green Climate Fund							
6. UNFCCC Trust Fund for Supplementary Activities UNFCCC	20.0	-0.4	Provided	ODA	Grant	Mitigation	Cross-cutting
7. Other multilateral climate change funds							
Subtotal	**194.3**	**-0,4**					
Multilateral financial institutions, including regional development banks							
1. World Bank (excl. IFC)	1019.0	719.8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation							
3. African Development Bank	534.2		Provided	ODA	Grant	Other	Other
4. Asian Development Bank	71.8		Provided	ODA	Grant	Other	Other
5. European Bank for Reconstruction and Development	37.3	14.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	3.5		Provided	ODA	Grant	Other	Other
7. Other							
Subtotal	**1665.7**	**733.8**					
Specialized United Nations bodies							
1. United Nations Development Programme	770.0	280.8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	100.0	2.7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. Other							
Subtotal	**870.0**	**283.5**					
Other multilateral channels		**143.8**	**Provided**	**ODA**	**Grant**	**Cross-cutting**	**Cross-cutting**
Total	**2 730.1**	**1.160.8**					

7.5 C PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH MULTILATERAL CHANNELS IN 2012

Donor funding	Total amount (NOK mill.) Core/ general	Total amount (NOK mill.) Climate-specific	Status	Funding source	Financial instrument	Type of support	Sector
Multilateral climate change funds							
1. Global Environment Facility	106.3		Provided	ODA	Grant	Other	Other
2. Least Developed Countries Fund	20.0		Provided	ODA	Grant	Other	Other
3. Special Climate Change Fund	17.0		Provided	ODA	Grant	Other	Other
4. Adaptation Fund							
5. Green Climate Fund							
6. UNFCCC Trust Fund for Supplementary Activities UNFCCC	19.0		Provided	ODA	Grant	Other	Other
7. Other multilateral climate change funds							
Subtotal	**162.3**						
Multilateral financial institutions, including regional development banks							
1. World Bank (excl. IFC)	1 008,4	1 197.9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation							
3. African Development Bank	533.8	155.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	73.5	20.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	15.4	15.5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	3.3		Provided	ODA	Grant	Other	Other
7. Other							
Subtotal	**1 634.4**	**1 388.4**					
Specialized United Nations bodies							
1. United Nations Development Programme	770.0	408.9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	100.0	28.6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. Other							
Subtotal	**870.0**	**437.4**					
Other multilateral channels		**138.0**	**Provided**	**ODA**	**Grant**	**Cross-cutting**	**Cross-cutting**
Total	**2 666.8**	**1 963.9**					

role, it acts as a funder, information provider and connector for up-scaling clean energy business models. Norway has been second-largest donor to the Renewable Energy and Energy Efficiency Partnership (REEEP) since 2006, and has supported with a total of NOK 61,5 million. REEEP has supported 185 projects in 65 different countries.

Norway has also supported a number of research institutions in Norway, including CICERO, ECON, Fridtjof Nansen's Institute, and international institutions like Chatham House and Wilton Park (UK) and Teri (India) on various issues relating to climate change. Likewise, considerable research and other climate change activities are being supported in the Arctic region.

Agreement on the European Economic Area (EEA)

The aim of the EEA and Norway Grants is to stimulate economic and social development in 15 beneficiary states in Central and Southern Europe. During the period 2009-2014, the contribution amounts to more than NOK 14.86 billion. Around one fourth of the funds contribute to environmental protection. More than NOK 1,89 billion is allocated to projects in the areas of environmental and Climate Change related Research and Technology, Renewable Energy, Energy Efficiency, Adaptation and Carbon Capture and Storage.

1. Environmental and Climate Change related Research and Technology

The objective is a strengthened knowledge base on environment and climate change and increased development and application of environmental technology. Norway has allocated NOK 390 million to this programme area.

2. Renewable Energy

In the renewable energy sector the objective is an increased share of renewable energy in energy use. Norway has allocated NOK 602 million to this programme area.

3. Energy Efficiency

The objective is reduced emissions of greenhouse gases and air pollutants. Norway has allocated NOK 488 million to this programme area.

4. Adaptation to Climate Change

The objective is reduced human and ecosystem vulnerability to climate change. Norway has allocated NOK 333 million to this programme area.

5. Carbon Capture and Storage (CCS)

In this programme area the objective is mitigation of climate change through increased knowledge and transnational cooperation on CCS. Norway has allocated EUR 7 million to this programme area. In addition, NOK 85 million has been set aside for CCS-related research under the Polish-Norwegian research programme.

The EEA and Norway Grants 2004-09 support for greenhouse gas reduction projects was reviewed in 2009/10. The EEA and Norway Grants were considered to be a well-managed and well-received programme. The review found that projects were strongly aligned with national environmental priorities, and represented a cost efficient contribution towards the reduction of emissions of greenhouse gases.

World Bank Multi-Donor CCS Capacity Building Trust Fund

In 2009, Norway initiated the establishment of the World Bank Trust Fund on Capacity

Building on Carbon Capture and Storage in Developing Countries. Since then Norway has contributed NOK 68 million and has been the largest financial contributor during the first four years. The trust fund has undertaken capacity building activities in about 10 countries. Norway has supported the Trust Fund in identifying demonstration projects and appreciates that larger financial contributions from other donors are now being channelled through the fund to support pilot and test projects.

Norway also contributes financially to the Near Zero Emission Coal (NZEC) project in China with up to NOK 60 million. The objective of this EU-China cooperation project is to install CCS on a medium-size coal-fired power plant in China.

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 new and innovative structure, by which the Board consists of equal representation by recipients and contributors, and observers from, amongst others the UN, NGOs and the private sector. Norway has so far joined the Pilot Program for Climate Resilience (PPCR) (NOK 91,2 million for 2009 - 2012), the Forest Investment Program (NOK 570 million for 2010 - 2012) and the SREP (Scaling up Renewable Energy in Low Income Countries (NOK 340 million for 2010 – 2012).

Forest Carbon Partnership Facility (World Bank)

The Forest Carbon Partnership Facility (FCPF) is designed to assist developing countries to develop and carry out REDD programmes. It consists of two funds: the Readiness Fund and the Carbon Fund. During the period 2010 - 2012, Norway contributed NOK 956 million to the FCPF. In 2010, Norway contributed NOK 56 million to the Readiness Fund and in 2012 NOK 900 million to the Carbon Fund.

The Energy Sector Management Assistance Program (ESMAP)

The ESMAP is a global technical assistance program aimed at promoting environmentally sustainable energy solutions and economic growth. Norway has supported ESMAP with altogether NOK 20 mill 2010 – 2012.

Clean Energy Financing Partnership Facility (Asian Development Bank)

Norway contributed NOK 50 million during the period 2011–2012 to the Clean Energy Financing Partnership Facility, which aims at improving energy security in Developing Member Countries (DMCs) and decrease the rate of climate change through increased use of clean energy. Furthermore, Norway contributed to the establishment of the 'Energy for all project development facility'. The facility's overall objective is to enhance energy access in Asia and the Pacific to enable more effective delivery of modern, reliable, and clean energy services to the poor while reducing GHG emissions. Norway contributed NOK 20 million in 2012.

Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants– CCAC

Norway became a member of the CCAC in 2012, and contributed NOK 12 million to the CCAC Trust Fund for 2012 to support the CCAC secretariat and the initiatives on activities reducing emissions of short lived climate pollutants as agreed by the Coalition. An additional contribution to the CCAC of NOK 60 million was announced for 2013 for activities in developing countries, especially concerning health benefits in vulnerable communities.

Global Gas Flaring Reduction Partnership

Global Gas Flaring Reduction Partnership is a partnership between oil companies, producing countries' authorities and donors, aimed at reducing gas flaring in connection with oil drilling. The Norwegian contribution in the period 2010 – 2012 was NOK 1.5 million.

OECD

Support has been provided to the OECD Climate Change Expert group, including for seminars with non-Annex I countries. During the period 2010 – 2012 Norway contributed NOK 2.55 million.

IPCC

Norway has consistently supported the work of the IPCC and developing country participation therein. For 2009, NOK 3 million was transferred to the IPCC Trust Fund, and NOK 1 mill in 2010. In 2011, we supported work on the Special Report on Extreme Events and Disaster Management with NOK 2.2 million.

7.4.4 The Government of Norway's International Climate and Forest Initiative

The Government of 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 organisations and REDD+ countries to reach its goals.

In 2012, Norway disbursed approximately USD 338 million to REDD+ related activities. NICFI worked closely with committed developing forest countries and multilateral REDD+ initiatives, such as the Forest Carbon Partnership Facility (FCPF), the UN-REDD programme, the Forest Investment Programme (FIP) under CIF (Climate Investment Funds) and the Congo Basin Forest Fund (CBFF) to finance REDD+ activities. During the period 2010-2012, Norway committed a total of approximately USD 1.227 billion to REDD+ and disbursed a total of USD 745 million. The remaining 482 million committed for the period 2010 to 2012 was disbursed in 2013.

Bilateral partnerships

In August 2008, Norway's Prime Minister of that time, Jens Stoltenberg, announced that Norway will contribute USD 1 billion to Brazil's Amazon Fund if Brazil reduces deforestation in its Amazon region. Norway's contributions are results-based, in line with the Amazon Fund's incentive structure. The Amazon Fund finances projects that help in implementing Brazil's plans to reduce deforestation. From 2010 to 2012 a total of USD 543 million was committed and set aside as promissory notes for the Amazon Fund in the Bank of Norway. Out of these funds, USD 61 million was transferred to the Amazon Fund in 2012, while the remaining USD 482 million was transferred in 2013.

In November 2009, Norway and Guyana signed a Memorandum of Understanding declaring the two countries' determination to provide a working example of how partnerships between developed and developing countries can reduce deforestation and forest degradation also in countries with minor deforestation. Norway contributed approximately USD 65.8 million to support Guyana's REDD+ Investment Fund in 2010 and 2011. In 2012, approximately USD 0.4 million was disbursed to Conservation International for its work on MRV (Measurement, Reporting and Verification) activities in Guyana. A total of USD 66.2 million was disbursed in the years 2010- 2012.

In May 2010, Norway and Indonesia agreed to enter into a partnership to support Indonesia's efforts to reduce emissions from deforestation and degradation of forests and peat lands. In 2012, Norway disbursed USD 2.9 million for Indonesia related activities. In the 2010 - 2012 period, Norway's contribution to Indonesia was approximately USD 34.6 million.

Through a Memorandum of Understanding signed in May 2010, Mexico and Norway agreed to work together on climate, forests and environment. Norway supported Mexico with approximately USD 7.5 million in 2011 to reinforce REDD+ readiness in Mexico and enable south-south cooperation. This was also the sum disbursed in the 2010 – 2012 period.

In 2009, Tanzania and Norway entered into an agreement on support for REDD activities. During the period 2010 – 2012, Norway disbursed a total of USD 28.5 million under this agreement.

Norway's collaboration with Brazil (the Amazon Fund), Guyana, Tanzania, Indonesia and Mexico should have profound effects and produce fast results, demonstrating that reducing emissions from deforestation and forest degradation in developing countries is possible. The collaboration with Brazil, Guyana and Indonesia exemplifies bilateral partnerships where payments are made for results in reducing CO_2 emissions from deforestation and forest degradation on a national scale.

Multilateral collaboration and support to civil society

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. FIP has selected eight pilot countries. In 2010 and 2011, Norway contributed USD 48 and 58.3 million, respectively, to the FIP. For the Fast Start period, the total is USD 106.3 million.

The UN-REDD Programme is a collaborative partnership bringing together the expertise of the UN Food and Agricultural Organization (FAO), the UN Development Programme (UNDP) and the UN Environment Programme (UNEP). The Programme has 35 member 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. In 2012, Norway contributed USD 32.8 million to the UN-REDD Programme. For the 2010 – 2012 period, the total was USD 85.8 million.

In May 2010, the interim REDD+ Partnership was established at the Oslo Climate and Forest Conference. The Partnership, now comprising 75 countries, has helped bring about closer cooperation between tropical forest countries and donors to reduce deforestation and forest degradation. The partnership has provided an important forum for dialogue among parties involved in the UNFCCC process. It has also promoted transparency in relation to REDD+ financing through the development of the Voluntary REDD+ Database (VRD) to track fast-start finance for REDD+ and carry out gap analysis of financing for REDD+ activities.

The Carbon Fund of the World Bank's Forest Carbon Partnership Facility (FCPF) is piloting performance-based payments for verified emission reductions from REDD+ programmes. In 2012, Norway disbursed approximately USD 150 million for

7.6 AN OVERVIEW OF DISBURSEMENTS FOR 2010 - 2012 IS GIVEN BELOW*:

	2010 Disbursed** USD)	2011 Disbursed**(USD)	2012 Disbursed**(USD)	2010-2012 (total) Disbursed**(USD)
UN-REDD Programme	33 mill	20 mill	32.8 mill	85.8 mill
Forest Carbon Partnership Facility (readiness)	9.3 mill	-	-	9.3 mill
Forest Carbon Partnership Facility (carbon fund)	-	-	150 mill	150 mill
Forest Investment Programme	48 mill	58.3 mill	-	106.3 mill
Congo Basin Forest Fund	26.6 mill	-	25.8 mill	52.4 mill
Support to Civil society (Norad)	27 mill	30 mill	33.3 mill	90.3 mill
Brazil (BNDES)***	-	-	61.0 mill	61.0 mill
DR Congo R-PP	-	-	4.3 mill	4.3 mill
Mexico	-	7.5 mill	-	7.5 mill
Guyana (World Bank)	29.4 mill	36.4 mill	0.4 mill	66.2 mill
Indonesia	30.7 mill	0.9 mill	2.9 mill	34.5 mill
Vietnam	-	-	8.3 mill	8.3 mill
Myanmar	-	-	0.1 mill	0.1 mill
Tanzania	7.3 mill	9.7 mill	11.5 mill	28.5 mill
Other projects	2.8 mill	6.3 mill	5.2 mill	14.3 mill
Total disbursed	214.1 mill	169.1 mill	335.6 mill	718.8 mill

** These figures do not correspond to funds actually used at country level during the period; there are at any time substantial balances kept in various facilities for Norwegian funds.*

***Figures are based on an average exchange rate of 1 USD = 6 NOK. In other tables, average rates may have been calculated slightly differently, giving rise to minor inconsistencies.*

**** Figures for Brazil only include funds that were disbursed to BNDES in the period from 2010 to 2012. A total of USD 543 million was committed and set aside on promissory notes for the Amazon Fund in the Bank of Norway over the same period. Out of these funds, USD 61 million was transferred to BNDES in 2012, while the remaining USD 482 million was transferred in 2013.*

Foto: CIFOR, Center for International Forestry Research this purpose, this also being the total contribution during the 2010 – 2012 period.

Strategic partnerships have also been set up with selected NGOs and research institutions. These are intended to promote innovation and to encourage systematic knowledge dissemination and debate on the need for a new climate regime that includes deforestation and forest degradation. In 2012, approximately USD 30.5 million was channelled through the Norwegian Agency for Development Cooperation (Norad) for such activities. For the 2010 – 2012 period, the total was USD 90.3 million.

A detailed breakdown of Norwegian Fast-start Finance for REDD+ may be found at the Voluntary REDD+ Database website (http://reddplusdatabase.org/ https://reddplusdatabase.org).

7.5 Activities related to transfer of technology and capacity building

Transfer of technology and know-how in order to promote development, availability and efficiency of energy constitutes an important element of Norwegian Official Development Assistance (ODA) and has significant environmental co-benefits consistent with the promotion of the Convention on Climate Change. Many of the elements already reported in Chapter 7 of the Sixth National Communication, which has focused on ODA, also facilitate transfer of technology. In addition Norway supports a wide range of technology transfer and capacity-building efforts, of which a few are described in more detail below. Technology transfer and capacity-building activities are described under the same heading and in tandem, as it is often difficult to distinguish between the two and one often involves the other.

Energy

Norway is an active supporter of the inclusion of the private sector's involvement in Renewable Energy projects globally. Technology transfer is a key area in this respect. Based on more than 100 years of hydropower development in Norway, we have seen all the positive effects this renewable technology has had in developing the econ-

7.7 ASSISTANCE FOR THE ENERGY SECTOR DURING THE PERIOD 2010-2012 THAT WAS CODED WITH THE CLIMATE MARKERS:

		2010 US$ mill.	2011 US$ mill.	2012 US$ mill.	Total US$ mill.
Climate change mitigation (only)	Main objective	59	139	228	426
	Significant objective	28	41	56	125
Total mitigation		**88**	**180**	**284**	**552**
Climate change adaptation (only)	Main objective	0	0	0	1
	Significant objective		2	10	13
Total adaptation		**0**	**3**	**11**	**13**
Both climate change mitigation and adaptation			**7**	**9**	**15**
Total bilateral aid directed at climate change		**88**	**189**	**304**	**581**

omy, and also the positive climate effects. As a result of this, we now have a share of about 60 per cent renewable energy in our total energy consumption.

At the end of 2012, Norway cooperated with close to 50 countries and organisations within the field of clean energy, through bilateral and multilateral co-operation. Assistance for capacity building and institutional development, with emphasis on legislation, resource mapping and national planning, remain among the most important areas for bilateral energy cooperation. Important areas also includeimproving the framework for commercial investments, protecting vulnerable groups and the environment and encouraging partner countries' participation in regional energy cooperation. Responsiveness to recipient countries' wishes and needs is fundamental. Multilateral assistance complements the bilateral cooperation. In addition Norway has especially put an emphasis on how to leverage private investment to clean energy projects in developing partner countries. In 2012 the total amount channelled bilaterally and through multilateral institutions to support these activities reached NOK 1.8 billion or approximately USD 300 million. This figure includes Norfund's investment in renewable energy. The examples below show some of the work done in the field of energy.

Engaging the private sector

In order to lay the foundation for large-scale private investments, strong public-private partnerships can help mobilise necessary financing and technology. Only by including the private sector is it realistic for renewable energy to become an important tool in the fight against global climate change.

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. Norwegian assistance for clean energy therefor uses public sources to mobilise and incentivise commercial investment that leads to increased energy access and energy efficiency.

The Norwegian Clean Energy for Development Initiative

The Government's Clean Energy for Development Initiative was launched in 2007 to coordinate and ensure the quality of an increased clean energy portfolio within Norway's development cooperation. The Initiative was established on the basis of the acknowledgement that access to energy is a necessity in the fight against poverty and a prerequisite for economic development.

Norway contributes to the international transfer of energy-related technology by supporting investment in infrastructure and 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. Norway supports investments in energy technologies that are given political priority by the recipient country and are economically viable and competitive. Activities include improvement of electricity grids, improved utilisation of petroleum resources and other measures to improve energy efficiency. The intention is to make a positive contribution to sustainable development in fields where Norwegian technology and know-how have a comparative advantage. Norway supports investment and capacity building related to hydropower development in particular, but also related to solar energy and other renewable energy technologies. This helps to reduce emissions of greenhouse gases. Africa (and a number of countries in Asia are the largest recipients of Norwegian assistance to clean energy.

The Norwegian Water Resources and Energy Directorate is a subordinate directorate under the Ministry of Petroleum and Energy and is a key institution in implementing the programme Clean Energy for Development. The directorate is involved in capacity building in the renewable energy and power sector in developing countries, and draws on their experience from all relevant sub-sectors.

Below follow a few examples of results of bilateral energy related development cooperation during the period 2010-2012, building on the technology and know-how referred to earlier. These examples show some of the contributions made by Norway in assisting developing countries access environmentally sound technologies.

Mozambique

Mozambique has important, yet significantly underdeveloped, hydropower potential, far exceeding Mozambique's domestic demand for electricity. This places Mozambique in a strategically unique position as potential provider of clean energy to the sub-region. Developing these resources will require significant investment, and a substantial and coordinated effort from the public sector, private actors, donors and international financing institutions.

Mozambique is one of Norway's main development partners within the field of clean energy. A new programme targeted at support for off-grid clean energy, including solar, mini hydro and wind, is under development. In 2011, bilateral energy assistance to Mozambique amounted to NOK 60 million (excluding support to CDM capacity building). In addition, Norwegian assistance was channelled through multilateral organisations such as the African Development Bank and the World Bank.

The Norwegian assistance aims at increasing the electricity access rate and supporting national goals for sustainable exploration of Mozambique's renewable energy resources. This includes supporting infrastructure development, improving the legislative framework, and increasing the implementation capacity of governmental institutions. In order to achieve more commercial sustainability for the utilities, and as a means to achieve economic growth and create employment, focus has been given to productive uses of electricity.

Nepal

The main thematic areas for Norwegian bilateral energy cooperation with Nepal are i) Accelerated Hydropower Development, ii) Rural Renewable Energy and Development and iii) Technical Energy Research. The main focus is on using bilateral aid to strategically leverage private sector hydropower investment through support to transmission infrastructure and institutional capacity building projects. In 2011 Nepal became an Energy+ partner country, and future bilateral energy cooperation with Nepal will be based on an Energy+ approach. Bilateral assistance, including assistance through the NGO channel, amounted to NOK 60 million in 2011, mainly targeting support to transmission infrastructure and rural energy.

Nepal needs foreign investment to develop its hydropower resources. The Norwegian commercial energy sector is represented in Nepal through SN Power19 and BKK20, which are the major shareholders of Himal Power Limited (HPL), together with the national Butwal Power Company (BPC). HPL has successfully operated the 60 MW Khimti Hydropower plant since the commissioning in 2000. The shareholders of HPL are planning to develop the 68 MW Kirne project. Commissioning may take place before the summer of 2015.

In 2011, a co-financing agreement was signed with the Asian Development Bank for the "Nepal Electricity Transmission Expansion and Supply Improvement Project." GoN, ADB and Norway will provide USD 28 million, USD 75 million (mainly loans) and NOK 150 million (about USD 25 million, grants), respectively.

Together with Denmark (lead donor), Germany and the UK, Norway supports the Energy Support and Assistance Programme (ESAP) which includes off-grid electrification through micro-hydro, solar home systems and more efficient cooking stoves in remote areas.

Uganda

Norway has supported the Ugandan power sector since the late 1990s. Energy is a key area of cooperation between GoU and Norway, and support to the power sector has increased over the last years. In 2011 the contribution was NOK 87 million. The major contribution includes investments in national power infrastructure such as power production, transmission and distribution lines as well as support to capacity building in key government institutions. Increasing access to electricity and improving the capacity of the energy sector framework, will be crucial in underpinning overall social and economic development and industrialisation efforts.

The support has helped to increase the production of renewable energy in Uganda and has increased access to modern energy services. Norwegian companies have also invested in power production in Uganda. In 2011 TronderPower and Jacobsen Elektro contributed with approximately 20 per cent of the country's power production through the Bugoye hydropower plant and the Namanve thermal plant. In 2011, Norad entered into an agreement with Trønder Energi AS for use of the N-REP (Norwegian Renewable Energy Partnership) facility in connection with the feasibility study for the Nsongezi Hydropower Project. Norad's support of NOK 2 925 000 is 50 per cent of the total budget for the feasibility study.

Energy+

The International Energy and Climate Initiative Energy+ was launched by Norwegian Prime Minister Jens Stoltenberg and UN Secretary General Ban Ki-moon during the Energy for All Conference in Oslo in October 2011. The Energy+ initiative aims to increase access to sustainable energy services and reduce greenhouse gas emissions. These two objectives link the topics of energy and climate in a development perspective.

Substantial investment will be needed to increase access to sustainable energy through improved energy efficiency and renewable energy. Official Development Assistance (ODA) alone will not be enough to meet this need. However, by using ODA strategically, it is possible to encourage commercial investment and realise renewable energy potential.

Energy+ has three distinct pillars to achieve the goals of increased energy access and reduced emissions: A sector-wide approach, payment by results and measures to leverage commercial investments.

Energy+ focuses on the sector level rather than the project level, i.e. it focuses on the energy sector as a whole, rather than on individual projects. This includes contact with national authorities and helping to draw up national energy plans. By focusing on the energy sector as a whole, it is possible to achieve greater impacts than by focusing on individual projects. In this respect, Energy+ is an initiative which seeks to increase access, energy efficiency and renewable energy by engaging in dialogue with stakeholders and national authority decision makers.

Nearly fifty countries and organisations have signed up to the Energy+ Partnership. The plus in the name signifies the intention to scale up financing and deployment of modern energy sources to the poor while avoiding increased greenhouse gas emissions. The Energy+ Partnership is voluntary and open to all interested actors who endorse the guiding principles. Energy+ supports the goals and timelines of the UN Secretary-General's Sustainable Energy for All (SE4All) initiative.

In order to ensure reliable access to energy, it is crucial to help to build up sound, efficient and well-functioning institutions in the energy sector. Support is therefore provided to government institutions, to power utilities, regional and multilateral bodies, the private sector, as well as civil society.

NORFUND - Renewable Energy

Norfund is the development finance institution that serves as the commercial investment instrument of Norway's development policy. Through investment in profitable companies and the transfer of knowledge and technology, it helps to reduce poverty and to stimulate economic progress in poor countries.

Norfund wishes to promote renewable energy production as a basis for economic growth and enhanced quality of life in developing countries. This is best done by investing in equity, mobilising other capital and combining this investment with expertise and insight into the sector. Norfund's collaboration with Norwegian energy producers such as Statkraft, TrønderEnergi and BKK are examples of this. A few examples of Norfund's investments in the reporting period follow below.

SN Power was established in 2002 as a joint venture between Norfund and Norwegian Statkraft. The company is a leading commercial investor and developer of hydropower projects in emerging markets. SN Power's mission is to become a leading hydro power company in emerging markets, helping to bring about economic growth and sustainable development. Currently Statkraft owns 60 per cent of the shares and Norfund 40 per cent.

Key numbers:

- 39 plants in 9 countries
- Presence in 14 countries
- Net installed capacity in 2012: 1303 MW
- Two projects under development
- Is working to develop a portfolio in the range of 3000 MW of hydropower plants by 2015

- Producing electricity equivalent to the consumption of 11 million people in the relevant countries

SN Power has invested more than USD 1800 million in equity through acquisitions and development of hydropower projects in Asia, Latin America and Africa. Currently, SN Power is involved in hydropower generation in the Philippines, Nepal, India, Chile, Sri Lanka and Peru and in addition SN Power owns one wind farm in Chile. Hydropower projects are under construction and/or assessment in Peru, Brazil, Nepal, India, Vietnam and the Philippines. SN Power's share of installed capacity in these operating plants and construction projects amounts to 1303 MW, and an annual mean generation of more than 5 TWh.

A new company, now named *Agua Imara*, was established in January 2009 to focus on hydropower development in Africa and Central America. Agua Imara's business is to develop, build, acquire, own and operate sustainable renewable energy projects on commercial terms, with a main focus on hydropower, throughout sub-Saharan Africa and Central America. The strategic goal is to have a portfolio of 700 MW equity hydropower capacity by the end of 2015. Norfund is engaged in Agua Imara both through its ownership in SN Power, and directly through its ownership share.

Interact Climate Change Facility (ICCF) is a co-investment facility involving the European Development Finance Institutions (EDFIs), Agence Française de Développement (AFD) and the European Investment Bank (EIB). ICCF will make climate-friendly investments in the private sector in poor countries. It will demonstrate to private sector investors the financial attractiveness of climate-friendly projects in developing countries and will catalyze long-term investments. The initiative promotes the use of clean technology as an integral part of economic development. ICCF builds on the successful model of European Financing Partners S.A. AFD, EIB and the EDFIs have committed EUR 300 million to the fund, of which Norfund EUR 5 million.

Hidro Santa Cruz is a run-of-the-river hydroplant in Barillas, Guatemala. This is Norfund first direct investment in a small hydro project in Central America. Norfund's committed amount is NOK 30.2 million. The funding of the debt and quasi-equity component was done jointly with CIFI[1]. The main sponsor is Ecoener of Spain which specialises in developing, building and operating small hydros. The project will help Guatemala decrease its reliance in fossil fuels for its energy needs, where 50 per cent of its generation come from these.

Hydel Hydropower is developing three 5 MW hydropower plants in Kenya. Norfund invested NOK 8.4 million in 2011, but construction has not yet started.

The Lake Turkana Wind Power Project (LTWP) aims to provide 300MW of reliable, low cost wind power to the Kenya national grid, equivalent to approximately 20 per cent of the currently installed electricity generating capacity. The Project is of significant strategic benefit to Kenya, and at Ksh75 billion (€582 million) will be the largest single private investment in Kenya's history. The Project will comprise 365 wind turbines (each with a capacity of 850 kW), the associated overhead electric grid collection system and a high voltage substation. The Kenya Electricity Transmission Com-

1. About CIFI: CIFI provides consulting, advisory and financing for corporation and infrastructure projects promoted by the private sector in Latin America. Norfund has a 9 per cent equity stake in CIFI, and has lent to CIFI USD 35 million.

pany Ltd (Ketraco), with concessional funding from the Spanish Government, is constructing a double circuit 400kv, 428km transmission line to deliver the LTWP electricity along with power from other future plants to the national grid. Norfund's committed amount is NOK 13.6 million.
Nam Sim is a 9 MW hydropower plant in Laos. The project is developed together with Norad and Norfunds Finnish sister fund - Finnfund. Norfund's committed amount is NOK 21.4 million.

Scatec Solar is one of the world's leading independent project developers and Engineering Procurement and Construction providers for utility-scale solar photovoltaic (PV) power plants. Norfund has committed to invest NOK 111 million in equity in Scatec Solar's first three PV projects in South Africa: Kalkbult (75MW) and Linde (40MW) in Northern Cape, and Dreunberg (75MW) in Eastern Cape. Scatec Solar has been awarded the projects through the first and second round of the South African energy programme aiming to increase the utilization of the country's major renewable energy resources. The three solar plants will produce about 370 million kWh annually, enough to supply more than 88 000 South African households with electricity. Harvesting solar power through the plants represents CO_2 abatements of almost 315 000 tonnes per year. Norfund has signed a memorandum of understanding with Scatec Solar, where Norfund will invest up to NOK 190 million in Scatec Solar's solar PV projects in South Africa.

EnDev

Norway is one of the contributors to the partnership Energising Development (EnDev), which has reached more than 10 million people with modern energy services in eight years. EnDev has achieved this at an average cost of less than 20 Euro per person. This partnership was established by the Netherlands and Germany in 2005, and is also supported by UK, Australia and Switzerland. Through efficient, multi-donor partnerships more than 10 million people, 11.000 social institutions and 24.000 small enterprises have benefitted from access to modern energy services through EnDev programmes. Sustainability is one of EnDevs key criteria for support, both regarding the climate, the environment and commercially. Norway's contribution to is NOK 184million in the period 2011-2015.

IRENA (International Energy Agency)

Norway has been an active supporter of IRENA since the early planning stage, and signed the statutes in January 2009. We ratified in the fall of 2009, as the 6th country to do so. The Ministry of Petroleum and Energy (MPE) is the Focal Point in Norway for IRENA, and 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 announced a voluntary contribution of UDS 2 million to IRENA in 2014.

INTPOW (Norwegian Renewable Energy Partners)

Intpow is a public-private partnership between three Government Ministries and Norwegian renewable energy companies. The aim is to promote Norwegian renewable energy competence in international markets. Intpow has carried out capacity building activities in Turkey, Georgia, Ghana, Angola and Mozambique. The Norwegian Ministry of Petroleum and Energy has co-funded INTPOW with NOK 4 million every year since 2009.

International Centre for Hydropower (ICH)
The 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 promote 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. The Norwegian Ministry of Petroleum and Energy has been a long-standing financial contributor to ICG's activities.

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 23 governments participating in CEM initiatives are Australia, Brazil, Canada, China, Denmark, the European Commission, Finland, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Norway, Russia, South Africa, Spain, Sweden, the United Arab Emirates, the United Kingdom, and the United States.

The CEM focuses on three global climate and energy policy goals:

- Improveing energy efficiency worldwide
- Enhancing clean energy supply
- Expanding clean energy access

The main object is to improve policies and enhance deployment of clean energy technologies is the main objective. 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.

Climate Technology Initiative
The Climate Technology Initiative (CTI) is a multilateral cooperative activity that supports implementation of the UNFCCC by fostering international cooperation for accelerated development and diffusion of climate-friendly technologies and practices. CTI was originally established at the first Conference of the Parties to the UNFCCC in 1995. Since July 2003, CTI has been operating under an implementing agreement of the International Energy Agency that includes the United States, Austria, Canada, Finland, Germany, Japan, Norway, Republic of Korea, Sweden, and the United Kingdom. Through a variety of capacity-building activities, CTI has promoted technology transfer to and among developing and transition countries. In addition to their current and future environmental benefits, these efforts are promoting near- and long-term global economic and social stability.

WMO Global Framework for Climate Services
The Framework was established in 2010, and Norway is so far the largest donor. We see climate services as a fundamental tool for climate change adaptation and disaster risk reduction. We support a programme

on strengthening climate services in Africa, including the *Integrated Strategy on Meteorology* under *the African Ministerial Conference on Meteorology* (AMCOMET), and specific projects on climate services for fishermen and farmers. The support is NOK 60 million for 2011-2014, which also includes support for GFCS Administration. In addition, we recently launched another GFCS Programme focusing on partnerships and securing relevant climate information and services to users in some African countries. The programme is being conducted by WMO, WHO, WFP, CGIAR, IFRC, Cicero and CMI, as well as local partners including National Met services. Our contribution is scheduled to be NOK 60 million for 2013-2015.

World Bank Partnership for Market Readiness

Norway is one of the contributing participants in the World Bank Partnership for Market Readiness (PMR). The PMR brings together most of the world's major market players, and consists of 28 developing and developed countries and the European Commission. The PMR is made up of Contributing Participants who provide financial support to the PMR trust fund and Implementing Country Participants who receive PMR funding. Together, the participants have created a global platform for discussions on new market instruments and how best to create and build market solutions for GHG mitigation.

The PMR provides funding and technical assistance for the development of domestic carbon market instruments to scale up emission reduction efforts and support low carbon growth. In addition, the PMR runs technical workshops, policy dialogues and virtual knowledge platforms on components of carbon market instruments such as data management, measurement, reporting and verification systems, and the creation of policy and regulatory frameworks. This support helps countries create effective enabling environments for private sector action on climate change and may provide an incentive to the private sector to realign investment and production behaviour towards low emissions development.

The PMR is country-led buildings on countries' own mitigation priorities and allows countries to develop their Market Readiness Programmes in line with their specific national circumstances and sustainable development priorities. During the period 2010-2011 Norway contributed NOK 32 million to the PMR.

Oil for Development

The Oil for Development (OfD) programme was launched by the Norwegian Government in 2005, and has a considerable element of technology transfer and capacity-building. The operative goal of the programme is "economically, environmentally and socially responsible management of petroleum resources which safeguards the needs of future generations". With an increased focus on revenue management and environmental management, OfD represents a thematic broadening of the petroleum sector development assistance that Norway had provided since the early 1980s through an increased focus on revenue management and environmental management.

Decades of experience in the oil and gas sector have given Norway valuable expertise on how to manage petroleum resources in a sustainable way. OfD is hence a unique programme where Norway can make a real difference based on our experiences.

Central elements are long-term capacity building and institutional cooperation between relevant ministries in Norway and the host country within the three pillars of Resource Management, Revenue Management and Environmental Management. Shorter term cooperation include seminars, exchange of delegations and limited packages of capacity building and advice.

Assistance within environmental management includes assistance with development of basic legislation, regulations and guidelines covering environmental dimensions of petroleum sector management, and systems for monitoring the domestic and international oil industry. Environmental and social impact assessments, risk reduction measures and action plans to reduce accidental pollution are particularly important tools for environmental management.

A main objective is to enable national authorities in the cooperating countries to introduce some policy instruments and measures that will stimulate the most cost-effective solutions for reducing emissions of greenhouse gases. Potential climate measures could be implemented either as an integral part of petroleum activities or as a purely environmental measure.

While most OfD assistance is provided within a bilateral setting, Norway also supports the efforts of the Global Gas Flaring Reduction Partnership (GGFR). Natural gas is released when oil is produced, but is less profitable, especially in countries that lack sufficient regulations, infrastructure and markets for it. Solving the challenge of bringing this wasted gas to productive use is the mission of a unique partnership led by the World Bank Group.

Through the Global Gas Flaring reduction partnership major oil companies (including Statoil) and governments are now working together to minimise this waste by jointly overcoming the barriers that inhibit more gas utilisation, as well as sharing global best practices and implementing country specific programmes.

Assistance is demand-driven. Competence building and institutional development of government agencies are driving tools of the OfD assistance. The OfD programme does not seek to export a single solution to sound petroleum governance. The assistance provided to a partner country shall be tailor-made to domestic conditions and demands

Core countries in OfD are: Angola, Bolivia, Ghana, Mozambique, Sudan, South-Sudan, Timor-Leste and Uganda. In the period 2010-2012 Norway has contributed NOK 767 million to OfD.

Timor-Leste

In East Timor petroleum cooperation, for establishment of an oil fund based on the Norwegian model (democratic and transparent administration of oil revenues), will formally conclude in September 2013. The program is considered very successful by the government and has wide support in the parliament.

The programme is an extensive capacity programme and a number of workshops and seminars have been held within legal areas, geophysics, management and environment. Several Norwegian experts have participated with expertise in these areas. A grant program with Norway's support has also contributed important expertise building for officials who have now reached central positions. Under this programme work in the area of the environment is progressing; and in 2012 efforts have concentrated also on creating an environmental atlas for the southern coast of the country. The government in East Timor has decided to electrify the country with two diesel plants (total capacity 240 MW). Norway's support in 2012 has been concentrated on completion and repair of the hydropower plant Gariuai. Draft water resources legislation has been prepared. It has been decided to conclude cooperation for the hydropower plant in 2013. Norway coordinates its efforts with other donors, including New Zealand.

Uganda

In Uganda OfD provides technical support in the implementation of the national oil and gas strategy. Transfer of know-how and assistance for development of legislation are the keywords. Two legislation drafts have been prepared and are now under consideration in the parliament. There has also been a re-organisation of the petroleum sector, and a proposal for a new organisational structure is in place. One of the biggest challenges associated with petroleum activity in Uganda is appropriate environmental management.

Ghana

In 2012, Norad completed an evaluation of Oil for Development globally. The programme in Ghana was praised in the report for emphasising good governance, and for contributing in a decisive manner to preparation of legislation governing this sector in Ghana and to significant capacity and competence building. The Ghana Programme generally appears as one of the most successful programmes so far. The programme's contributions in 2012 included the following:

- Raising the expertise of approximately 100 public employees within the petroleum sector
- Collecting and analysing environmental data in the oceans around petroleum installations
- Developing guidelines for environmental consequences
- Developing standards within environmental management as well as improving the work on health, environment and safety

CO_2 Capture and storage (CCS)

Both the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change have pointed out that CO_2 capture and storage will be an important mitigation tool. This requires many countries to invest in technology and expertise development, and to develop CO_2 capture and storage projects. By building on our experiences from the Sleipner and Snøhvit projects (see 4.3), Norway wishes to support technology development, dissemination and deployment. The transfer of knowledge and experiences from Norwegian projects to other countries has been a priority for Norway.

In line with the broad political agreement on climate in the Norwegian Parliament from 2008, an action plan for international efforts to promote capacity building and technology transfer was developed and adopted by the Parliament in 2009. The main objective is the dissemination and deployment of CO_2 capture and storage internationally.

The action plan contains a set of short-term and long-term action items. The priority tasks in the short term are to improve understanding of what CO_2 capture and storage is, to help build capacity of other countries' authorities and other relevant stakeholders and to promote cooperation on the development of regulatory frameworks for CO_2 capture and storage.

In the longer term, focus should be on the transfer of knowledge and experience from the CO_2 Technology Centre at Mongstad and participate in pilot projects in developing countries. 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 Carbon Sequestration Leadership Forum, the Four-Kingdom Initiative and the Global Carbon Capture and Storage Institute. Norway is also working with international organisations like the International Energy Agency (IEA) and the United Nations' Industrial Development organisation (UNIDO). Norway has funded UNIDO's work on developing a road map for CCS in industrial applications.

A set of priority countries such as China, Indonesia, the Persian Gulf States (Saudi Arabia, Kuwait, Qatar and the United Arab Emirates), and countries in southern Africa has been identified. In addition the Norwegian petroleum company Statoil ASA, which operates the Norwegian storage projects, is a partner in the Algerian carbon capture and storage project in Salah. The South African energy company Sasol is a partner in the CO_2 Technology Centre at Mongstad.

In China, Norway is cooperating closely with the European Commission and the Chinese Ministry of Science and technology and China's Agenda 21on the Near Zero Emission Coal project in China. Phase IIA of this project is fully funded by Norway (€1.6 million).

In South Africa, Norway has co-funded the South African Center for CCS with 6 million Rand and will co-fund the Center's future work on a pilot for test injection of CO_2. NOK 32 million was allocated to this pilot in 2013.

International cooperation on CCS

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: In 2009, Norway was the largest donor to the establishment of the World Bank CCS Capacity Building Trust Fund. The Fund's purpose is to strengthen the opportunities of developing countries to promote economic growth with low CO_2 emissions through technology cooperation that promotes the use of CO_2 capture and storage technologies in industry and the energy sector. The total support of NOK 83 million (primarily development assistance funds), will help to strengthen technology cooperation between industrialised countries and developing countries.

The Global Carbon Capture and Storage Institute: The Global Carbon Capture and Storage Institute (GCCSI) was established on 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 Ministry of Petroleum and Energy is a member of the institute.

The Four Kingdoms Initiative: In 2008, energy ministers of Saudi Arabia, Norway, the UK and the Netherlands established co-operation on alternative uses of CO_2, known as the Four Kingdoms Initiative. The Initiative's *modus operandi* is to hold workshops where institutions, organisations and companies from the four countries meet and discuss issues related to alternative uses of CO_2.

The technology centre for CO2 capture at Mongstad: The CO_2 Technology Centre at Mongstad was initiated in order to create an arena for targeted development, testing and qualification of CO_2-capture technologies. International dissemination of the centre's experiences and results is important so as to reduce the costs and risks associated with large-scale CO_2 capture.

Cooperation on the development, construction, ownership and operation of the technology centre at Mongstad has been organised through a participant agreement and the technology company TCM DA. The owners of the technology company formed TCM DA in the spring of 2009. The investment decision relating to the technology centre was made at the same time. The Norwegian State has an ownership interest of 75.12 per cent, while Statoil (Norway) has a share of 20 per cent and Sasol (South Africa) and Shell (the Netherlands/UK) have shares of 2.44 per cent each. The State may invite additional companies to become partners in TCM DA.

The intention is that the four companies, through their ownership of the technology centre, will gain not only industrial and technological expertise but also new knowledge, capital and experience in the implementation of large CCS projects. The companies will bring experience and knowledge for CO_2 capture back to their own countries and organisations for use in future CO_2 capture and storage projects. Statoil, Shell and Sasol's participation in the development and implementation of the technology centre is important for the project, and underlines its international relevance. They are potential end-users of CO_2 capture technology, and thus have a shared interest in ensuring both that the technology becomes commercially available in the long term and that there is competition in the market for CO_2 capture technologies. The three companies have seconded staff to the centre.

The technology centre started operations in 2012. Initially, a test period of five years has been agreed. The total construction costs for the technology centre have been estimated at approximately NOK 5.2 billion excluding value added tax. Around one-third of the investment costs are linked to the two CO_2 capture plants, while about two-thirds of the investment relate to infrastructure and auxiliary systems. The technology centre has been constructed with sufficient infrastructure and capacity to support several technologies simultaneously, and will be robust enough to have an operating life of several decades.

The technology centre has been designed to have a capture capacity of 100,000 tonnes of CO_2 per year, and is the largest demonstration facility of its kind in the world. The size of the facility, its flexibility and its design allow different types of tests to be performed. The technology centre has access to flue gas produced by the thermal power station and the cracking plant at the oil refinery. The CO_2 content of the gases from these sources is 3.5 per cent and 13 per cent respectively. Both sources of flue gas can be piped to both the amine-based and the ammonia-based CO_2 capture plants. In addition, the facility is able to adjust the concentration of CO_2 in the flue gas by enriching exhaust gas from the thermal power station with captured CO_2. This allows testing of the CO_2 captured from flue gases with different concentrations of CO_2. The technology centre is therefore able to test CO_2 capture technologies relevant to coal- and gas-fired power stations, as well as refineries and other industrial operations.

Initially, two different technologies are tested. One technology, from Alstom, uses chilled ammonia, while the other, from Aker Clean Carbon, uses amines. During this first period of operation, the plants will primarily be used to complete the test programmes of the two technology suppliers.

The planning and construction of the technology centre has already generated knowledge about both technical and commercial challenges linked to the development of new technology. This applies, for example, to the experience gained from design, construction method, scaling-up and process design in the context of connecting a CO_2 capture plant to a power plant and refinery which are in operation. This is useful experience, which may be important in future projects involving retrofits of full-scale CO_2 capture technology. Further, experience has been gained of commercial conditions connected to the development and use of untested technology. Even though competition is envisaged for contracts to supply such new technology, it will be difficult to secure extensive guarantees from suppliers in respect of costs and functionality. This means that developers of such projects will probably have to be willing to assume the risk of increased costs during the development and implementation of a project.

The decision to test and demonstrate two technologies for capturing CO_2 after combustion was made because such technologies can be retrofitted to existing plants. The chosen types of technology are also considered the most mature, and have improvement potential in the areas of energy consumption and environmental effect. The largest cost element in connection with the operation of CO_2 capture plants is linked to the energy needs of the process. Reducing energy needs may therefore secure important cost reductions.

8 Research and systematic observation

8.1 General policy on research and systematic observation

The most recent white paper on research in Norway *Long-term perspectives – knowledge provides opportunity (*Meld.St. 18, 2012 – 2013, to the Storting) puts global challenges high on the agenda. It lists five strategic objectives among them global challenges in the areas of the environment, climate change, oceans, food safety and energy in particular.

Norwegian public funding of research was NOK 24,2 billion in 2012. Nearly one-third of this was channelled through the Research Council of Norway, with a budget of approximately NOK 7.4 billion in 2012. The other channel consists of basic funding to universities and institutes. The Research Council supports basic research, strategic basic and applied research in addition to research for innovation and technology, and covers all disciplines. Unlike most other countries, Norway has one research council which is the national strategic and funding agency for research activities.

The Research Council has four key objectives (challenges):

- 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 (distribution) of responsibility and structures in the research system.
- To transform (translate) research results into action.

As regards climate-related sciences, the Research Council covers all disciplines and the broad areas which climate research can be divided into, 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. Of the latter, research on the development of technology to reduce greenhouse gas emissions and the development of new renewable or alternative energy sources, are given high priority.

Norwegian climate researchers are active in international research cooperation, e.g. under the Nordic framework, EU Framework programmes, initiatives and programmes related to ERA (European Research Area) and the new Future Earth initiative. Norwegian scientists take part in the EU 7th Framework Programme projects and participate in one third of all EU projects under "Environment (including Climate Change)". They are also preparing for the programme Horizon 2020. As regards ERA, Norway participates in all ten JPIs (Joint Programming Initiatives) and the

SET-plan (Strategic Energy Technology Plan).

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 national climate research programme NORKLIMA (2004–2013) have 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. To a large extent these programmes are realised through thematic research programmes, such as the climate and energy programmes. (NORKLIMA, KLIMAFORSK and ENERGIX, see below).

In 2012, an international expert committee concluded a large-scale evaluation of Norwegian climate research[1]. The evaluation report provides an up-to-date overview of Norway's position in the landscape of international climate research. The report also provides recommendations on how to organise and prioritise activities to ensure that Norwegian climate research is aligned with the future needs of society.

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 increasing more rapidly than in any other research field. In addition, the number of Norwegian researchers serving as authors for the Intergovernmental Panel on Climate Change (IPCC) working group reports is very high. Nineteen scientists from Norway participate in the preparations of the IPCC Fifth Assessment Report as Coordination Lead Authors, Lead Authors and Review Editors. In addition to these, 20 scientists participate as Contribution Authors. The international citation rate for Norwegian articles on climate research indicates that Norwegian climate research has a widespread international reputation and impact.

According to the report, Norway has developed internationally recognised top competencies in many of the scientific disciplines that are necessary for understanding the current climate and its development The Centre for climate Dynamics at the Bjerknes Centre in Bergen is an excellent centre on an international scale. Climate research related to social science is a relatively new area of research in Norway. Despite this fact, the report concludes that the Norwegian research on this field is of high calibre.

The total funding through the Research Council related to Climate Change, including CCS (but excluding renewable energy technology), was approximately NOK 520 million in 2012, as compared to NOK 380 million in 2008. There are also considerable research efforts funded by the private sector, particularly related to carbon capture and storage. Several petroleum companies fund this kind of research, in addition to basic funding of universities and research institutes. Climate research performed with basic public funding is assumed to be of about the same magnitude as that funded via the Research Council.

8.2 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 organ-

1. Norwegian climate research. An evaluation. 2012

ised under the auspices of research programme. More than 40 of the programmes and other activities at the Research Council includes (elements of) climate research, and the largest and most relevant ones are described below in 8.2.1. – 8.2.5.

8.2.1 Climate research

NORKLIMA, Climate Change and its Impacts in Norway, was launched in 2004 and ended in 2013. The main goals of NORKLIMA were to provide new knowledge related to the climate system, the change in climate in the past, present, and future and direct and indirect effects of climate change on nature and society. Towards the end of the programme period, knowledge base for adaptation policies and measures for reduction of greenhouse gas emissions were also included. Altogether, the programme has funded more than 150 research projects amounting to a total of NOK 947 million (including administration costs). If funds from collaboration programmes are included, such as the China Programme, the India Programme and the Polar Programme, the total budget of NORKLIMA is NOK 1 266 million. Most of the projects have been multi- or interdisciplinary, and more than 70 per cent of them have included international collaboration. The project results have been compiled in a book which puts individual result into the context of the current knowledge framework. The book was launched at the NORKLIMA end conference in October 2013.

The same conference marked the launch of the new climate research programme, called KLIMAFORSK (2014 – 2023). This programme will both be a successor and an expansion of NORKLIMA, aimed at providing new, future-oriented knowledge of national and international significance. At start-up, the programme will have an annual budget of approximately NOK 130 million.

The primary objective of the KLIMAFORSK programme, as set out in the preliminary programme plan, is to generate essential knowledge about the climate to the benefit of society.

The preliminary programme plan divides climate research into three thematic priority areas:

- The climate system and climate change
- The impacts of climate change on the natural environment and society
- Social transformation in response to climate change

The programme plan will be finalised in spring 2014.

8.2.2 Polar research

Norway's interests in the Arctic and Antarctic, and its national as well as international commitments carry with them an added responsibility to develop the knowledge needed to ensure sound management and responsible economic activity in the polar regions. Such knowledge is also crucial to Norway's ability to play a leading role in international negotiations involving issues related to climate, natural resources and the environment.

An important element in this context is to maintain and enhance the knowledge generated during the scientific programme focusing on the Arctic and Antarctic, named the International Polar Year (IPY 2007-2009). The Policy for Norwegian polar research 2010-2013 (http://www.forskningsradet.no/servlet/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition%3A&blobheadervalue1=+attachment%3B+filename%3D%22polarforskningENGweb%282%29.pdf%22&blobkey

=id&blobtable=MungoBlobs&blob-where=1274460449506&ssbinary=true) was formulated on the basis of key challenges and opportunities for Norwegian polar research, new trends in the polar regions, and Norway's overall interests in this context. A new policy for polar research 2014 – 2023 was launched in November 2013.

The Research Council of Norway established the Programme on Polar Research (POLARFORSKNING) in 2011 to address the research-related challenges identified during IPY, in the polar research policy document mentioned above and elsewhere. The Polar Research programme will help safeguard Norway's special responsibility for the research-based knowledge necessary for exercising policy, management and business activity in the polar regions.

Research affiliated with Svalbard has been of highest priority, including the development of Svalbard as a platform for international research cooperation and strengthening international research cooperation and coordination.

Within the Polar Research programme it is estimated that approximately 80 per cent of the projects are within climate research. A large part of the funding for the period 2011-2013 has been announced via the NORKLIMA programme.

8.2.3 Energy research

ENERGIX is the name for the successor to the programme Clean Energy for the Future (RENERGI). The new programme started in 2013 and will span a 10-year period. It encompasses technological, natural and social sciences as well as humanities-related research and development activities.

The ENERGIX programme is designed to provide support for the long-term, sustainable restructuring of the energy system in order to accommodate a greater supply of new renewable energy, and meet the need to improve efficiency and flexibility and facilitate closer energy integration with Europe, with due consideration given to environmental perspectives.

The programme aims to:

- **Ensure Norway's security of supply** in the light of the increasing integration and internationalisation of the energy system, by developing new knowledge, technology and solutions.
- **Achieve sustainable utilisation and consumption of Norway's renewable energy resources** in the short and long term by developing new knowledge, technology and solutions.
- **Reduce Norwegian and global emissions of** greenhouse **gases**
- **Develop Norwegian trade and industry** in areas in which Norwegian players have specific competence
- **Develop Norwegian research communities** in priority areas.

8.2.4 CO_2 capture and storage (CCS)

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 is Norway's public CCS technology R&D programme. CLIMITs objective is to accelerate the commercialization of CCS technologies by providing financial support for research, development and demonstration projects.

This includes

- CO_2 capture from power generation and industrial processes
- CO_2 compression
- CO_2 transport

- Long-term storage of CO_2
- CCS in connection with industrial emissions, i.e. process industry, petrochemical industry as well as conversion of bio mass

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 technology.

8.2.5 Research Infrastructure

The objective of the national financing initiative for research 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-calibre research. In addition, the initiative aims to enhance the Norwegian research community's international reputation as a provider of outstanding research 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 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 involving partners from both Europe and Asia. The essential objective is to establish better coordinated services for the earth system in the Arctic. The SIOS SIOS-Preparatory Phase (2010-2014) is funded by the EU and coordinated by the Research Council of Norway.

8.2.6 North-South Cooperation

The Norway – Global Partner programme (NORGLOBAL at the Research Council of Norway is dedicated to strengthening Norwegian research on and with the South. NORGLOBAL aims to:

- Strengthen research in Norway on development in developing countries, ensuring an effective, flexible, visible and coherent organisation of this research by consolidating much of the effort within the field of development under a single programme, and through cooperation with other programmes.
- Strengthen research for development, through the integration of development perspectives into relevant thematic programme.
- Strengthen the research capacity of developing countries by enhancing research cooperation between researchers

based at institutions in the countries in question and leading Norwegian research projects.

In calls for proposals from thematic programmes, such as NORKLIMA, KLIMAFORSK and ENERGIX, the NORGLOBAL usually provides additional funding in order to involve partners from countries in the South in the research projects.

8.3 Systematic observation

8.3.1 Meteorological and atmospheric observations.

The Norwegian Meteorological Institute 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 Meteorological Institute (met.no) has included 10 existing meteorological surface observing stations and one upper air station (Jan Mayen) 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.

The Norwegian Meteorological Institute 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 Wegner Institute.

The surface-based meteorological network for real time synoptic observations comprises approximately 270 stations, including the manned stations at Jan Mayen, Bjørnøya, Hopen and a number of automatic meteorological stations in the northern part of Svalbard. In addition the Norwegian Meteorological Institute collects data from eight oil rigs and 14 ships in the Norwegian and Barents sea. Many of these stations report on an hourly basis. A synoptic meteorological station has also been set up at the Troll station in the 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 approximately 320 stations. Approximately 70 per cent of these stations report the data on a daily basis. The rest only report on a weekly basis.

The Norwegian Meteorological Institute has operated meteorological observing stations for more than 100 years at a number of locations. The climate data base of the Norwegian Meteorological Institute therefore includes very long records of climate data. This base 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 participates in 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 part of the European Climate Support Network (ECSN) which involves collaboration between the national meteorological services in Western Europe (EUMETNET). 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). Norway is also leading a EUMETNET-project (EUMETGRID) aiming at producing fine-scale climate maps for Europe.

The Norwegian Environmental Agency is responsible for the establishing, management and funding of a number of environmental monitoring programmes including greenhouse gases, aerosols and other air pollutants, ocean acidification and terrestrial observations. These programmes are assigned to research institutions and in some cases combined with observations in the context of research projects. This is elaborated in the following.

NILU - The Norwegian Institute for Air Research has the main responsibility for monitoring greenhouse gases in the atmosphere in Norway. This is performed at two sites in Norway; Birkenes in Southern part of Norway and Zeppelin 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 global changes of the atmosphere. There are few local sources of emissions, and the Arctic location is also 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.

The main objective of the monitoring programme 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 provides relevant information about aerosols observations important for 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 station. They include more than 20 halocarbons and a wide range of halogenated species (including CFC, HFC and HCFC gases, SF_6), methane, N_2O, CO, and tropospheric and stratospheric ozone. In addition, aerosols are monitored with the parameter AOD, describing the total amount of aerosols in the atmosphere above the Zeppelin observatory. From 2012 the measurement programme also includes CO_2. The station is a part of the WMO Global Atmosphere Watch (GAW) programme, and EMEP[2] site under the Convention on Long-Range Transboundary Air Pollution under United Nations Economic Commission for Europe. Furthermore, there are contributions to the Advanced Global Atmospheric Gases Experiment Network (AGAGE) and to the international Network for the Detection of Atmospheric Composition Stratospheric Change (NDACC). NILU measures

2. EMEP: European Monitoring and Evaluation Programme: www.emep.int

CO_2, methane, 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. From 2010, NILU hosts the WMO-GAW World Data Centre for Aerosols archiving all data from the GAW aerosol sites, globally. 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). Finally, NILU hosts the European part of the NDACC CNDSC database and operates the European database for stratospheric ozone (NADIR), which contains data from several projects on stratospheric ozone founded by the European Commission.

The Zeppelin station is also the basis for measurements of CO_2 and particles performed by Stockholm University, funded by the Swedish Environmental Protection Agency, and the Norwegian Polar Institute.

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 nine 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, NIVA and BRCC/GFI have established a programme to investigate causes and trends of ocean acidification by monitoring the carbonate system in the Norwegian Seas, including the areas in northern Barents Sea and Svalbard, since the Arctic is deemed particularly sensitive to ocean acidification. The project started in 2010 and continues through its own programme from 2013.

The Norwegian Polar Institute (NPI) maintains a monitoring programme in Framstrait, monitoring the oceanic output from the Arctic Ocean to sub polar seas. The programme is a collaborative effort with Alfred Wegener Institute for Polar and Marine 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 thicknesses 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 management, this will also provide valuable information on the possible impact of climate change on biodiversity. The programme now covers the whole Norwegian cost.

A Working Group for marine biodiversity was appointed by the Directorate for Nature Management in 2002 and resulted in 2005 in a proposal, for a national programme for monitoring biodiversity in coastal areas. The aim of the programme was to coordinate existing and planned monitoring activities on biodiversity to meet the demands of an ecosystem approach. This work continued in 2008 for the open seas with the same aim. The monitoring plans have not yet been implemented.

There is a lack of data and mapping of species and habitat at a regional and local level.There are now activities as a part of the national programme initiated to improve this. A national programme for mapping of coastal habitats started in 2007 as a joint venture project between the Ministry of Climate and Environment and the Ministry of Fisheries and Coastal affairs. By 2010, half of the Norwegian municipalities along the coast should have been mapped regarding important habitats that are significant for biological diversity.

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 Hydrographic Service (SKSK). The programme initiates a detailed baseline mapping of the physical, chemical, biological environment of the sea bottom areas. The programme started in the Barents Sea in some areas which were given priority (owing to the management plan for the Barents Sea and the Lofoten Island) such as the sea area outside the Lofoten Islands. The programme started mapping the Norwegian Sea in 2012 and has up to 2013 mapped approximately 110.000 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.

8.3.3 Terrestrial observations

Norway participates in the Global Terrestrial Observing System (GTOS) by reporting data from eight study areas of birch forest. 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.

There is no specific national climate change effect monitoring programme in Norway, addressing effects of climate change, only. Climate change effect issues are, however included to a varying degree in the related programmes listed below.

Ongoing monitoring programmes of special interest with respect to climate change:

- Terrestrial Monitoring Programme (TOV) (Norwegian Environment Agency) in birch and coniferous forests
- 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 EEA.
- Monitoring of palsa peatlands (Norwegian Environment Agency)
- Forest-monitoring programme (state/vitality of forest ecosystems) (ICP-forest) (Norwegian Institute for Forest and Landscape)
- National Forest Inventory (inventory on permanent plots all over the country at 5-year intervals) (Norwegian Institute for Forest and Landscape)
- Monitoring of cultural landscapes (3Q) (Norwegian Institute for Forest and Landscape)
- The Norwegian Area Frame Survey of Land Cover and Outfield Land Resources (AR18X18) (Norwegian Institute for Forest and Landscape) which is a national survey of land cover resembling the Eurostat LUCAS survey.
- Environmental monitoring in Svalbard and Jan Mayen. (MOSJ) (Norwegian Polar Institute)

Norway participated in ACIA (Arctic Climate Impact Assessment) under the Arctic Council. The final reports were published in 2004/2005 and include research and observations related to the climate system as well as marine and terrestrial systems. A national project has been conducted to follow up the ACIA-report at a national level. The final report[3] was published in 2010.

Norway participated in SWIPA (Snow, Water, Ice and Permafrost in the Arctic) under AMAP and the Arctic Council. Final reports were published in 2011 and 2012. Norwegian scientists participated as convening lead authors and contributing authors.

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. An interministerial national programme dealing with surveying and

3. http://brage.bibsys.no/npolar/handle/URN:NBN:no-bibsys_brage_16521

monitoring including reporting biodiversity data has been going on since 2002. In connection of implementation of the EU Water Framework Directive in Norway a biological monitoring programme for freshwater and coastal areas is under planning. The intention is that this programme will include some stations with special focus on parameters relevant for climate, emphasising ecological effect of climate change.

Environmental Monitoring of Svalbard and Jan Mayen (MOSJ[4]) was launched in 1999 as a national monitoring system for the Norwegian Arctic. The monitoring system is designed to detect changes in the ecosystem and, if possible, to link changes to human impact or other underlying causes. To achieve this, MOSJ aims at monitoring both the central components of the ecosystem, including climate and the major types of human impact in the region.

Climate parameters monitored in Norway

The programmes described above are not, with the exception of ACIA and NORKLIMA and the palsa mire monitoring, designed solely to observe the effects of climate change. However, some of them include indicators of climate change, while others include general indicators which also may be used to evaluate the effects of climate change. The most useful indicators from these programmes with respect to climate responses are probably mass balance of glaciers and snow distribution in Svalbard, changes in ground vegetation communities and epiphytic lichens in sub alpine birch forests and coniferous forests, changes in populations of passerine birds and small mammals in sub alpine birch forests, palsa mire changes, changes in forest growth and vitality in coniferous forests.

4. www.mosj.npolar.no/en

Reporting of terrestrial observations to international networks/programmes

- The data from eight study areas (birch forests) in the Terrestrial monitoring programme (TOV) are reported to the Global Terrestrial Observing System (GTOS).
- The various data for changes in forests are reported to ICP Forest (ECE).
- Data from two stations are reported to Scantran (Scannet) (Finse, Ny-Ålesund).
- Data from one station is reported to Envinet (NyÅlesund) (within EU programme).
- Forest monitoring (state/vitality of forest ecosystems). Reporting to ICP Forests under the UNECE.
- Forest monitoring (forest resources, Pan-European Criteria & Indicators etc.) Reporting to UNECE/FAO.

The Norwegian Polar Institute monitors glacier mass balance annually on three glaciers on Svalbard, all near Ny-Ålesund. These are long-term measurements; the shortest time series starting in 1986, and the longest in 1966, the latter being the longest Arctic mass balance time series extant. 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 collects and publishes worldwide standardised glacier data.

8.3.4 Space based observing programmes

8.3.4.1 Introduction

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, Galileo and Copernicus, as well as in bilateral contracts with different nations. This cooperation gives the Norwegian research community 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 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 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 which 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, previously known as GMES (Global Monitoring for Environment and Security), 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 in Copernicus through the ESA, and EU's FP7 Space and GMES Initial Operations programmes. The ESA is developing five new missions called Sentinels specifically for the operational needs of the joint EU-ESA 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 will be of great importance to Norway. Met.no takes part in the preoperational activities UERRA (Uncertainties in Ensembles of Regional Re-analyses) and Copernicus-C (Copernicus Climate Information Platform). NERSC chaired the FP7 Space project MONARCH-A (Monitoring and Assessing Regional Climate change in High latitudes and the Arctic).

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.no, 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 the Nansen Environmental and Remote Sensing Centre with Met.no in the project team), aerosol (met.no 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.no). 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 develops NORSAT-1, which will host a Total Solar Irradiance (TSI) instrument of high value for climate research. The foreseen launch is in 2015.
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 theirdynamics (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 data will provide the long-term measurements that climate change science requires.

Geodesic Earth observations

The Norwegian Mapping Authority (NMA) measures changes to and motion of the Earth with an accuracy of millimetres from its geodetic observatory at Ny-Ålesund in Svalbard.

This facility forms part of a global network which establishes 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[5] agenda.

Using geopositioning, one can locate a point or an object as it moves within the terrestrial reference frame on the millimetre 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.

Norway has participated in building the European satellite navigation systems Galileo and European EGNOS (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.

5. Even if Norway and a few other countries are upgrading their geodetic observatories, these efforts will not be sufficient to secure global coverage. The UN Committee of Experts on Global Geospatial Information Management (UN-GGIM) is accordingly paying growing attention to geodetic Earth observation. Work in this committee could now lead to a UN General Assembly Resolution on the importance of the global geodetic reference frame and cooperation. The resolution is to be tabled at the 2013-14 Session of the UN General Assembly.

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.

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 UN Decade for Education for Sustainable Development (2005 – 2014), and we cooperate with the other Nordic countries.

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”.

Our curriculum for primary and secondary schools provides a natural continuation regarding sustainable development and other issues, e.g. related to energy use and climate change. The Curriculum has recently been revised and strengthened with regard to sustainable development. Our strategy for Education for Sustainable Development has been revised in accordance to the UN Decade for Education for Sustainable Development.

The Nature Schoolbag 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 (http://sustain.no/).

The Network is organised as a co-operation between schools at all levels, research institutions and environmental authorities. Participating schools monitor a study site in their neighbourhood. The goal is to com-

Foto: Richard Clark/ Scanpix Danmark/ NTB scanpix bine good environmental 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. The Network works as a meeting ground between students, teachers, environmental management, research institutions and voluntary organisations. The institutions offer professional support and ideas to the teacher on how to organize the environmental education.

9.3 Information

9.3.1 Klimaløftet

The Norwegian Ministry of Climate and Environment launched the public awareness campaign on climate change Klimaløftet in March 2007. It was initiated as a supplementary measure to reduce emissions in a long-term perspective. The purpose is to spread information on the climate issues, based on scientific research, with the ambition and aim to educate the people on the issues. To make an understanding of what is at stake, and that we all have to join efforts to succeed in solving the climate crisis.

The campaign is in a partnership with several stakeholders such as enterprises and businesses, NGO's and the civil society, where all partners do public awareness-campaigns, some of them receive economic contributions from Klimaløftet. A lot of initiatives and efforts from these actors are included in Klimaløftet to emphasize that the campaign is a joint effort.

Two web-based campaigns have focused particulary on what the individual can do to help save the planet, by presenting simple and sensible measures for a climate-friendly lifestyle.

The target groups are the public in general and the 15-25 age group in particular. Other measures in the campaign are courses of lectures around the country, for students and teachers, educational programmes, web-site, newsletters and magazines and web-based competitions for young people.

In 2012 and 2013 the main project has been school lectures on climate change and the transition to a low carbon future held by young ambassadors. The ambassadors tour secondary and upper-secondary schools throughout the country, and the tour Generation Green uses social media as a supplementary tool for engaging the young people.

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 provides all citizens with a legal right to obtain environmental information, both from the public authorities and from public and private enterprises.

The Act involves new obligations for 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.

Not all products create environmental problems in Norway, but production and distribution abroad may be environmental-

1. Norwegian climate research. An evaluation. 2012

ly harmful. The new Act gives citizens the right to ask for this kind of information too.

An appeals board has been established to ensure that the Act is complied with and to consider complaints related to the follow-up of this Act by 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 are handled in accordance with the Act.

9.3.3 Public websites

An important website for information on environmental issues to the public is the State of the Environment Norway www.environment.no. The Ministry of Climate and Environment has assigned the production of State of the Environment Norway to the environmental authorities. The Norwegian Environment Agency (former Norwegian Pollution Control Authority) has the overall editorial responsibility. The State of the Environment Norway aims to provide you with the latest facts on the state and development of the environment. The service covers 14 main 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. On most of the pages you will also find further information about legislation and international agreements, environmental targets, references and relevant links.

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 Norway

Statistics Norway, an independent institution administratively placed under the Ministry of Finance, annually compiles statistics on important natural resources and different types of environmental pressures or pollution such as air emissions, waste and wastewater. Statistics Norway has also developed methods and models for analyzing the interactions between the economy and the natural environment (SEEA). Research and statistics on Natural Resources and the Environment are published on the web-sites of Statistics Norway http://www.ssb.no/en/natur-og-miljo.

The air emission inventory is produced by Statistics Norway in close collaboration with the Norwegian Environment Agency. The emission inventory is based on both emission figures calculated by Statistics Norway (estimated from activity data such as fuel consumption and emission factors such as tonnes of CO_2/tonnes of fuel) and measured or estimated emission figures reported from large point sources to the Norwegian Environment Agency. Statistics Norway is responsible for the emission main model, the activity data, the emission calculations and for filling in the reporting tables to the UNFCCC, while the Norwegian Environment Agency is responsible for the emission factors, the point source data, that emissions models such as the road traffic model, methane from landfills is updated and the actual reporting. Statistics Norway publishes all statistics on their website. New statistics are analyzed and presented as soon as they are published. More detailed figures are available to the public in an interactive database free of charge.

9.3.5 CICERO Center for International Climate and Environmental Research – Oslo

The climate change research institute CICERO (Center for International Climate and Environmental Research – Oslo) combines the natural, political and social sciences to provide solutions to society's need for responses to climate change. The institute delivers innovative research and plays a key role in communicating climate research to the public and to decision makers. CICEROs work is based on two main objectives:

- To conducts research on and provide information and expert advice on national and international issues related to climate change and climate policy.
- To keep politicians, government, business, educational systems, media, the public and the international community informed about developments in international climate research.

Active involvement in the public debate on climate issues is of special importance for CICERO. Six times a year, CICERO publishes the popular climate science magazine Klima, which has a circulation of 10.000 mainly among ministries, directorates, local government, the business sector, research institutions, universities and schools. This magazine reports on developments in both science and policy related to climate change, and is written in popular scientific style in order to appeal to a wide audience. CICERO also provides regular updates on major events in the international climate negotiations. Twice a week CICERO issues a web-based climate news service in English and Norwegian.

CICERO plays a national role in the dissemination of climate research, and in this capacity, undertakes information projects for a wide variety of research institutions, government and industry. The Ministry of Climate and Environment contributes financially to the information activities of the research institute.

Since 1994 CICERO has organised Climate Forum, which brings together representatives from industry and business as well as government and researchers. Climate Forum provides information on development trends in international climate research and policies, and aims to improve the dialogue between the various parties involved. In addition, CICERO often organises press briefings, seminars and national and international conferences.

CICERO has established ECCO, a network of European Climate Communication Officers in an effort to increase the capacity of its members to communicate climate science efficiently. CICERO is increasingly involved in research on how to improve the communication of climate change and the transformation to a low carbon society.

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 71 product groups for which it is deemed that eco-labelling will be beneficial, and around 480 of the licenses awarded are valid (both figures as per November 2009). 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

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

Together with the other countries in the European Economic Area, Norway has introduced a system of energy labelling of products. Regulations relating to energy labelling of televisions, lighting, refrigerators, freezers and their combinations, tumble driers, washing machines and combined washer-driers, and air-conditioners have, so far, been introduced in Norway. Following the Energy Labelling Directive (2010/30/EU), further types of energy-related products will be energy labelled in the future. Regulated products are required to carry a label showing their energy efficiency class and energy consumption. Further information is contained in product brochures. Energy efficiency labelling is an important means of increasing public awareness of energy consumption by different products.

In accordance with the Energy Performance of Buildings Directive (2002/91/EC) Norway has also introduced a system of energy labelling of buildings. The requirement was introduced on 1 July 2010 to the effect that all residential and commercial buildings now built, sold or let out must have an energy certificate. The energy certification scheme aims to put energy on the agenda in the market for residences and other buildings, as well as in the planning of new buildings, and to stimulate implementation of energy efficiency measures.

9.5 Environmental and Social Responsibility in Public Management and Procurement

Norway wants to reduce the environmental impacts caused by the activities of the public administration, and environmental management is considered an effective instrument for achieving this goal. The Agency for Public Management and eGovernment (Difi) is responsible for strengthening the government's work in renewing the public sector and improving the efficiency of government administration and public procurement.

Environmental management systems are important for promoting environmental considerations in public procurement. They help to identify the environmental impacts of operations and activities and at the same time give management a tool to follow up environmental efforts. Work on environmental management in the public sector includes the implementation of third-party certified environmental management systems (like EMAS and ISO 14001) in agencies with significant environmental challenges. The environmental reporting system "Miljørapp" is a tool that ministries can use to monitor the environmental performance in subordinate agencies. Throughout this system agencies report on relevant environmental data related to energy consumption, transport routines, waste disposal and green procurement. Difi provides support through the development and improvement of guidelines, workshops, statistics, best practices etc.

The public sector is to contribute to social benefits by ensuring the most efficient use of resources in public procurement, based on good commercial practices and equitable treatment. These principles are laid down in the Norwegian Public Procurement Act. The Public Procurement Act from 2001 provides an important basis for work on environmental and social responsibility in public procurement. The Act requires public procurers, when planning purchases, to take into account the life cycle costs and environmental impact of each purchase (Section 6 of the Act).

Environmental and ethical/social considerations in public procurement may help to ensure an efficient public sector and a competitive business sector. A stated goal is to minimise the environmental impact of public purchases. Products and services should be chosen on the basis of life cycle costs, quality and environmental properties. Priority should be given to products and services which are energy efficient, have low content of hazardous chemicals, have a low pollutant emissions and low resource consumption.

Tools for green public procurement must be simple to use. The environmental demands should be ambitious, but still safeguard sufficient competition. The tools must include benefits and gains for the procurers and the environmental demands should not lead to any significant increase in total costs (life cycle cost).

9.6 Networks 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 4.3.3.

9.7 Inclusion of Non-governmental organisations (NGOs) in the policymaking

Norway aims to have a high degree of transparency 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. 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.

Norway also has an EEA environment reference group, where NGOs are 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.

10 Annexes

10.1 Annex 1 Summary tables on emission trends

This Annex contains the summary tables on emission trends as reported in the CRF table 10.

The tables are drawn from the resubmission of the CRF to the UNFCCC on the 11th of November 2013.

These tables are also the Biennial Report's Common Tabular Format (CTF) table 1.

The following tables are included:

CRF TABLE 10S1: NORWAY'S EMISSIONS AND REMOVALS OF CARBON DIOXIDE (CO_2) DURING THE PERIOD 1990-2011

CRF TABLE 10S2: NORWAY'S EMISSIONS OF METHANE (CH_4) DURING THE PERIOD 1990-2011

CRF TABLE 10S3: NORWAY'S EMISSIONS OF NITROUS OXIDE (N_2O) DURING THE PERIOD 1990-2011

CRF TABLE 10S4: NORWAY'S EMISSIONS OF INDUSTRIAL GREENHOUSE GASES (HCFS, PFCS AND SF_6) DURING THE PERIOD 1990-2011

CRF TABLE 10S5: NORWAY'S TOTAL EMISSIONS AND REMOVALS OF GREENHOUSE GASES DURING THE PERIOD 1990-2011

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990) (Gg)	1991 (Gg)	1992 (Gg)	1993 (Gg)	1994 (Gg)
1. Energy	**28 529.519**	**27 584.812**	**28 377.796**	**29 488.877**	**31 010.967**
A. Fuel Combustion (Sectoral Approach)	25 869.802	25 478.681	25 965.163	26 952.073	28 347.711
1. Energy Industries	6 891.484	7 260.885	7 833.245	8 104.755	8 787.584
2. Manufacturing Industries and Construction	3 522.038	3 351.847	3 266.796	3 510.565	4 074.395
3. Transport	10 862.677	10 748.079	10 984.392	11 633.879	11 485.320
4. Other Sectors	4 137.414	3 712.116	3 393.816	3 336.083	3 492.763
5. Other	456.189	405.754	486.913	366.790	507.649
B. Fugitive Emissions from Fuels	2 659.718	2 106.131	2 412.634	2 536.804	2 663.256
1. Solid Fuels	7.370	7.839	6.511	7.220	7.199
2. Oil and Natural Gas	2 652.348	2 098.292	2 406.123	2 529.584	2 656.056
2. Industrial Processes	**6 147.969**	**5 647.403**	**5 648.458**	**6 174.924**	**6 555.819**
A. Mineral Products	728.658	684.996	734.831	919.759	937.883
B. Chemical Industry	1 189.860	1 061.733	1 006.313	1 061.320	1 150.005
C. Metal Production	4 145.914	3 774.324	3 774.177	4 041.985	4 329.035
D. Other Production	77.303	120.286	119.848	126.959	125.637
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	6.234	6.063	13.288	24.900	13.258
3. Solvent and Other Product Use	**155.648**	**136.622**	**140.807**	**141.227**	**151.794**
4. Agriculture					
A. Enteric Fermentation					
B. Manure Management					
C. Rice Cultivation					
D. Agricultural Soils					
E. Prescribed Burning of Savannas					
F. Field Burning of Agricultural Residues					
G. Other					
5. Land Use, Land-Use Change and Forestry[(2)]	**-15 361.966**	**-16 473.326**	**-16 436.855**	**-18 205.697**	**-17 120.823**
A. Forest Land	-18 148.331	-19 341.504	-19 352.782	-21 255.042	-20 194.327
B. Cropland	2 342.987	2 314.661	2 275.909	2 285.952	2 239.133
C. Grassland	-17.938	-13.307	-8.533	-1.892	3.904
D. Wetlands	-58.457	-62.200	-62.224	-68.159	-64.806
E. Settlements	507.848	613.532	693.477	814.340	870.901
F. Other Land	1.806	3.612	5.417	7.223	9.029
G. Other	10.120	11.880	11.880	11.880	15.342
6. Waste	**0.189**	**0.189**	**0.190**	**0.162**	**0.178**
A. Solid Waste Disposal on Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
B. Waste-water Handling					
C. Waste Incineration	0.189	0.189	0.190	0.162	0.178
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total CO_2 emissions including net CO_2 from LULUCF	**19 471.360**	**16 895.700**	**17 730.395**	**17 599.492**	**20 597.935**
Total CO_2 emissions excluding net CO_2 from LULUCF	**34 833.325**	**33 369.026**	**34 167.251**	**35 805.190**	**37 718.757**
Memo Items:					
International Bunkers	**2 097.520**	**1 811.799**	**2 169.530**	**2 312.086**	**2 462.265**
Aviation	619.470	559.651	602.866	635.144	616.568
Marine	1 478.051	1 252.148	1 566.664	1 676.942	1 845.697
Multilateral Operations	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass	4 478.180	4 381.072	4 104.044	4 420.308	4 738.778

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1995 (Gg)	1996 (Gg)	1997 (Gg)	1998 (Gg)	1999 (Gg)
1. Energy	**30 895.039**	**34 135.652**	**33 969.035**	**34 071.350**	**34 953.376**
A. Fuel Combustion (Sectoral Approach)	28 267.056	31 084.942	31 170.936	31 183.448	31 448.984
1. Energy Industries	8 646.768	9 694.357	10 061.181	9 749.729	9 714.301
2. Manufacturing Industries and Construction	3 801.450	4 320.847	4 210.334	4 374.538	3 951.749
3. Transport	11 880.618	12 452.317	12 698.902	12 861.629	13 460.418
4. Other Sectors	3 484.034	4 210.821	3 775.950	3 837.983	3 930.953
5. Other	454.187	406.600	424.569	359.569	391.563
B. Fugitive Emissions from Fuels	2 627.983	3 050.710	2 798.099	2 887.901	3 504.392
1. Solid Fuels	7.087	7.244	6.342	6.592	8.466
2. Oil and Natural Gas	2 620.896	3 043.466	2 791.757	2 881.309	3 495.926
2. Industrial Processes	**6 748.090**	**6 748.701**	**7 022.325**	**7 147.450**	**7 018.029**
A. Mineral Products	983.708	985.513	1 042.685	1 019.074	986.847
B. Chemical Industry	1 166.332	1 167.641	1 219.182	1 052.279	874.653
C. Metal Production	4 449.031	4 440.649	4 590.045	4 952.251	5 056.323
D. Other Production	133.882	135.434	152.138	102.811	79.281
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	15.138	19.464	18.274	21.034	20.925
3. Solvent and Other Product Use	**147.792**	**156.060**	**150.596**	**150.935**	**148.079**
4. Agriculture					
A. Enteric Fermentation					
B. Manure Management					
C. Rice Cultivation					
D. Agricultural Soils					
E. Prescribed Burning of Savannas					
F. Field Burning of Agricultural Residues					
G. Other					
5. Land Use, Land-Use Change and Forestry(2)	**-19 800.872**	**-19 387.905**	**-19 014.850**	**-19 898.662**	**-14 879.127**
A. Forest Land	-23 021.258	-22 650.029	-22 390.632	-23 297.122	-18 731.422
B. Cropland	2 249.495	2 208.419	2 234.184	2 169.332	2 225.404
C. Grassland	3.191	5.838	14.571	7.950	115.911
D. Wetlands	-73.617	-72.412	-71.550	-74.345	-61.778
E. Settlements	1 011.677	1 083.107	1 156.914	1 256.037	1 530.460
F. Other Land	10.835	12.641	14.447	16.252	16.252
G. Other	18.805	24.531	27.217	23.233	26.045
6. Waste	**0.145**	**0.133**	**0.140**	**0.148**	**0.124**
A. Solid Waste Disposal on Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
B. Waste-water Handling					
C. Waste Incineration	0.145	0.133	0.140	0.148	0.124
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total CO_2 emissions including net CO_2 from LULUCF	**17 990.194**	**21 652.641**	**22 127.246**	**21 471.219**	**27 240.479**
Total CO_2 emissions excluding net CO_2 from LULUCF	**37 791.066**	**41 040.546**	**41 142.096**	**41 369.882**	**42 119.607**
Memo Items:					
International Bunkers	**2 841.184**	**3 171.594**	**3 772.863**	**3 687.429**	**3 619.856**
Aviation	585.566	691.438	770.887	821.391	941.674
Marine	2 255.618	2 480.157	3 001.976	2 866.038	2 678.182
Multilateral Operations	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass	4 846.908	4 870.157	5 080.990	4 710.311	4 895.942

Note: All footnotes for this table are given at the end of the table on sheet 5.

	2000 (Gg)	2001 (Gg)	2002 (Gg)	2003 (Gg)	2004 (Gg)	2005 (Gg)	2006 (Gg)	2007 (Gg)	2008 (Gg)
	34 201.329	**35 983.574**	**35 670.433**	**36 940.010**	**36 838.057**	**36 303.028**	**37 133.332**	**38 895.615**	**37 578.171**
	30 486.751	32 565.424	32 753.230	34 110.149	34 147.410	33 704.347	34 616.042	35 166.135	34 543.226
	10 653.051	11 888.814	12 131.268	12 831.265	12 939.339	13 207.787	13 193.767	13 529.314	13 557.681
	3 784.261	3 864.680	3 641.469	3 942.762	3 685.598	3 425.288	3 740.861	3 466.625	3 476.785
	12 635.276	12 926.455	12 768.704	13 118.739	13 584.981	13 503.486	14 122.120	14 897.719	14 345.776
	3 236.002	3 590.565	3 758.558	4 044.927	3 607.344	3 278.634	3 281.660	3 062.957	2 910.484
	178.160	294.911	453.231	172.455	330.148	289.152	277.634	209.521	252.500
	3 714.578	3 418.150	2 917.202	2 829.861	2 690.647	2 598.680	2 517.290	3 729.480	3 034.945
	9.246	8.389	7.745	11.894	7.612	6.775	5.365	8.591	5.915
	3 705.332	3 409.761	2 909.458	2 817.967	2 683.035	2 591.906	2 511.925	3 720.889	3 029.030
	7 447.741	**7 031.639**	**6 464.947**	**6 557.370**	**7 066.024**	**6 613.901**	**6 198.845**	**6 453.377**	**6 705.449**
	993.919	954.145	981.113	1 032.441	844.383	906.972	944.695	1 003.922	1 026.992
	1 130.718	1 091.019	969.350	1 014.389	1 059.083	814.450	909.043	836.819	897.969
	5 070.585	4 747.795	4 260.558	4 256.236	4 888.468	4 653.896	4 096.160	4 400.646	4 535.313
	232.015	217.259	233.604	231.572	242.968	200.350	210.300	165.226	198.775
	20.504	21.421	20.322	22.733	31.123	38.233	38.648	46.765	46.401
	141.695	**144.316**	**147.113**	**149.889**	**153.125**	**142.494**	**131.569**	**133.025**	**127.430**
	-15 012.908	**-18 655.089**	**-21 207.119**	**-23 243.292**	**-26 747.651**	**-26 827.611**	**-21 715.054**	**-21 708.639**	**-24 522.149**
	-18 881.108	-22 578.223	-25 649.504	-27 489.449	-30 741.432	-31 351.016	-26 116.225	-25 599.962	-28 956.927
	2 032.069	2 180.206	2 034.274	2 232.880	1 993.656	2 099.492	1 985.472	1 937.484	1 943.596
	217.230	164.633	63.244	262.296	61.633	140.921	144.975	113.366	276.474
	-34.441	-44.839	-48.742	-54.529	-70.048	-43.518	-26.207	-24.571	-52.969
	1 610.658	1 583.070	2 358.838	1 754.599	1 960.194	2 276.983	2 245.832	1 816.090	2 215.995
	16.252	16.252	16.252	32.505	32.505	32.505	32.505	32.505	32.505
	26.433	23.812	18.519	18.407	15.841	17.021	18.594	16.448	19.177
	0.073	**0.073**	**0.043**	**0.043**	**0.043**	**0.043**	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**
	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
	0.073	0.073	0.043	0.043	0.043	0.043	IE,NA,NO	IE,NA,NO	IE,NA,NO
	NO	NO	NO	NO	NO	NO	NO	NO	NO
	NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
	26 777.930	**24 504.513**	**21 075.417**	**20 404.022**	**17 309.599**	**16 231.854**	**21 748.692**	**23 773.378**	**19 888.901**
	41 790.838	**43 159.602**	**42 282.536**	**43 647.313**	**44 057.250**	**43 059.466**	**43 463.746**	**45 482.017**	**44 411.050**
	3 514.907	**3 428.957**	**2 808.043**	**2 803.691**	**2 815.916**	**3 343.659**	**3 508.392**	**3 235.169**	**3 232.223**
	912.876	835.424	739.740	747.476	846.909	1 080.012	1 244.259	1 158.066	1 150.311
	2 602.031	2 593.533	2 068.303	2 056.215	1 969.007	2 263.647	2 264.133	2 077.103	2 081.913
	NO	NO	NO	NO	NO	NO	NO	NO	NO
	4 743.565	5 186.939	5 309.735	5 429.737	5 212.680	5 336.315	5 419.807	5 602.653	5 848.907

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2009 (Gg)	2010 (Gg)	2011 (Gg)	Change from base to latest reported year %
1. Energy	**37 480.775**	**39 175.429**	**38 402.340**	**34.606**
A. Fuel Combustion (Sectoral Approach)	35 080.320	36 528.716	35 772.205	38.278
1. Energy Industries	14 313.413	14 727.779	14 324.487	107.858
2. Manufacturing Industries and Construction	3 209.315	3 413.049	3 287.910	-6.648
3. Transport	14 172.404	14 762.743	14 870.587	36.896
4. Other Sectors	3 121.590	3 358.315	3 047.039	-26.354
5. Other	263.597	266.830	242.183	-46.912
B. Fugitive Emissions from Fuels	2 400.456	2 646.713	2 630.134	-1.112
1. Solid Fuels	4.600	4.107	5.078	-31.094
2. Oil and Natural Gas	2 395.856	2 642.606	2 625.056	-1.029
2. Industrial Processes	**5 315.625**	**6 176.646**	**6 110.256**	**-0.613**
A. Mineral Products	1 012.143	1 031.398	1 005.132	37.943
B. Chemical Industry	785.684	857.811	819.461	-31.130
C. Metal Production	3 291.068	4 027.931	4 053.802	-2.222
D. Other Production	180.760	207.268	179.591	132.319
E. Production of Halocarbons and SF_6				
F. Consumption of Halocarbons and SF_6				
G. Other	45.970	52.237	52.270	738.467
3. Solvent and Other Product Use	**106.344**	**126.702**	**136.508**	**-12.297**
4. Agriculture				
A. Enteric Fermentation				
B. Manure Management				
C. Rice Cultivation				
D. Agricultural Soils				
E. Prescribed Burning of Savannas				
F. Field Burning of Agricultural Residues				
G. Other				
5. Land Use, Land-Use Change and Forestry(2)	**-22 242.207**	**-23 602.320**	**-27 595.830**	**79.637**
A. Forest Land	-26 725.271	-28 680.968	-32 379.793	78.417
B. Cropland	1 912.673	1 977.962	1 923.716	-17.895
C. Grassland	274.515	100.313	175.522	-1 078.493
D. Wetlands	-60.040	-81.519	-83.286	42.473
E. Settlements	2 306.765	3 021.630	2 704.281	432.498
F. Other Land	32.505	48.220	46.952	2 500.000
G. Other	16.645	12.042	16.778	65.791
6. Waste	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**	**-100.000**
A. Solid Waste Disposal on Land	NA,NO	NA,NO	NA,NO	0.000
B. Waste-water Handling				
C. Waste Incineration	IE,NA,NO	IE,NA,NO	IE,NA,NO	-100.000
D. Other	NO	NO	NO	0.000
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**0.000**
Total CO_2 emissions including net CO_2 from LULUCF	**20 660.537**	**21 876.457**	**17 053.273**	**-12.419**
Total CO_2 emissions excluding net CO_2 from LULUCF	**42 902.744**	**45 478.777**	**44 649.103**	**28.179**
Memo Items:				
International Bunkers	**2 854.171**	**2 769.245**	**2 653.218**	**26.493**
Aviation	1 093.526	1 300.956	1 172.433	89.264
Marine	1 760.646	1 468.289	1 480.785	0.185
Multilateral Operations	NO	NO	NO	0.000
CO_2 Emissions from Biomass	5 407.504	6 467.583	6 339.467	41.563

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990) (Gg)	1991 (Gg)	1992 (Gg)	1993 (Gg)	1994 (Gg)
1. Energy	**30.572**	**31.844**	**36.309**	**41.073**	**42.946**
A. Fuel Combustion (Sectoral Approach)	12.652	12.021	11.879	12.604	12.974
1. Energy Industries	2.356	2.476	2.641	2.727	2.809
2. Manufacturing Industries and Construction	0.496	0.502	0.469	0.492	0.544
3. Transport	3.964	3.793	3.656	3.623	3.484
4. Other Sectors	5.813	5.229	5.088	5.743	6.116
5. Other	0.024	0.021	0.025	0.019	0.021
B. Fugitive Emissions from Fuels	17.920	19.822	24.430	28.468	29.972
1. Solid Fuels	2.690	2.861	2.376	2.635	2.627
2. Oil and Natural Gas	15.230	16.961	22.054	25.834	27.345
2. Industrial Processes	**0.477**	**0.407**	**0.421**	**0.425**	**0.459**
A. Mineral Products	NA	NA	NA	NA	NA
B. Chemical Industry	0.428	0.365	0.379	0.378	0.406
C. Metal Production	0.050	0.042	0.042	0.047	0.053
D. Other Production					
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	NA	NA	NA	NA	NA
3. Solvent and Other Product Use					
4. Agriculture	**125.486**	**125.712**	**126.748**	**125.022**	**126.978**
A. Enteric Fermentation	110.322	110.374	111.701	109.900	111.860
B. Manure Management	14.199	14.579	14.634	14.551	14.709
C. Rice Cultivation	NO	NO	NO	NO	NO
D. Agricultural Soils	NO	NO	NO	NO	NO
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.965	0.759	0.413	0.571	0.410
G. Other	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	**0.053**	**0.089**	**0.082**	**0.015**	**0.017**
A. Forest Land	0.053	0.089	0.082	0.015	0.017
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
C. Grassland	NO	NO	NO	NO	NO
D. Wetlands	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
E. Settlements	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
F. Other Land	NO	NO	NO	NO	NO
G. Other	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
6. Waste	**82.995**	**82.394**	**80.752**	**80.201**	**79.809**
A. Solid Waste Disposal on Land	82.065	81.504	79.901	79.390	79.040
B. Waste-water Handling	0.929	0.889	0.849	0.809	0.768
C. Waste Incineration	0.001	0.001	0.002	0.002	0.002
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total CH_4 emissions including CH_4 from LULUCF	**239.583**	**240.446**	**244.311**	**246.736**	**250.210**
Total CH_4 emissions excluding CH_4 from LULUCF	**239.530**	**240.357**	**244.229**	**246.721**	**250.193**
Memo Items:					
International Bunkers	**0.111**	**0.095**	**0.118**	**0.127**	**0.140**
Aviation	0.004	0.004	0.005	0.006	0.007
Marine	0.107	0.090	0.113	0.121	0.133
Multilateral Operations	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass					

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1995 (Gg)	1996 (Gg)	1997 (Gg)	1998 (Gg)	1999 (Gg)
1. Energy	**42.160**	**43.746**	**47.057**	**44.600**	**43.325**
A. Fuel Combustion (Sectoral Approach)	12.710	13.142	13.450	12.820	12.637
1. Energy Industries	2.818	3.008	3.183	3.074	2.864
2. Manufacturing Industries and Construction	0.553	0.548	0.579	0.551	0.559
3. Transport	3.351	3.165	3.076	2.875	2.759
4. Other Sectors	5.970	6.402	6.592	6.302	6.437
5. Other	0.018	0.019	0.020	0.018	0.017
B. Fugitive Emissions from Fuels	29.450	30.604	33.608	31.780	30.689
1. Solid Fuels	2.587	2.644	2.315	2.406	3.090
2. Oil and Natural Gas	26.863	27.960	31.293	29.375	27.599
2. Industrial Processes	**0.483**	**0.473**	**0.564**	**0.574**	**0.479**
A. Mineral Products	NA	NA	NA,NO	NA,NO	NA,NO
B. Chemical Industry	0.428	0.414	0.503	0.511	0.418
C. Metal Production	0.055	0.058	0.062	0.063	0.061
D. Other Production					
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	NA	NA	NA	NA	NA
3. Solvent and Other Product Use					
4. Agriculture	**127.022**	**128.550**	**127.260**	**127.938**	**131.070**
A. Enteric Fermentation	111.550	112.757	111.594	112.056	115.361
B. Manure Management	14.963	15.239	15.267	15.464	15.332
C. Rice Cultivation	NO	NO	NO	NO	NO
D. Agricultural Soils	NO	NO	NO	NO	NO
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.508	0.554	0.399	0.419	0.376
G. Other	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	**0.007**	**0.047**	**0.051**	**0.019**	**0.004**
A. Forest Land	0.007	0.047	0.051	0.019	0.004
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
C. Grassland	NO	NO	NO	NO	NO
D. Wetlands	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
E. Settlements	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
F. Other Land	NO	NO	NO	NO	NO
G. Other	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
6. Waste	**77.930**	**76.225**	**74.307**	**69.096**	**63.528**
A. Solid Waste Disposal on Land	77.202	75.539	73.662	68.493	62.967
B. Waste-water Handling	0.726	0.683	0.641	0.598	0.555
C. Waste Incineration	0.002	0.003	0.004	0.005	0.006
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total CH_4 emissions including CH_4 from LULUCF	**247.602**	**249.040**	**249.239**	**242.227**	**238.406**
Total CH_4 emissions excluding CH_4 from LULUCF	**247.595**	**248.994**	**249.188**	**242.209**	**238.402**
Memo Items:					
International Bunkers	**0.170**	**0.188**	**0.227**	**0.218**	**0.207**
Aviation	0.007	0.009	0.010	0.011	0.013
Marine	0.163	0.179	0.217	0.207	0.194
Multilateral Operations	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass					

Note: All footnotes for this table are given at the end of the table on sheet 5.

2000 (Gg)	2001 (Gg)	2002 (Gg)	2003 (Gg)	2004 (Gg)	2005 (Gg)	2006 (Gg)	2007 (Gg)	2008 (Gg)
48.745	**53.785**	**50.770**	**53.551**	**54.872**	**48.717**	**45.298**	**51.540**	**48.354**
12.792	13.275	14.164	14.498	14.212	14.052	14.013	14.976	15.407
3.138	3.486	3.629	3.889	4.052	3.960	3.968	4.006	4.195
0.515	0.545	0.519	0.539	0.524	0.509	0.542	0.541	0.559
2.599	2.398	2.234	2.327	2.388	2.360	2.286	3.383	3.641
6.529	6.826	7.767	7.729	7.234	7.212	7.207	7.038	6.999
0.013	0.020	0.015	0.014	0.014	0.010	0.011	0.009	0.014
35.953	40.511	36.606	39.053	40.660	34.665	31.284	36.564	32.947
3.374	3.062	2.827	4.341	2.778	2.013	1.958	3.136	2.159
32.579	37.449	33.780	34.712	37.882	32.653	29.326	33.429	30.788
0.480	**0.491**	**0.555**	**0.385**	**0.355**	**0.343**	**0.333**	**0.302**	**0.308**
NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA	NA	NA
0.418	0.436	0.509	0.342	0.303	0.298	0.304	0.267	0.264
0.062	0.055	0.046	0.043	0.052	0.045	0.030	0.034	0.043
NA	NA	NA	NA	NA	NA	NA	NA	NA
126.060	**124.309**	**124.041**	**125.976**	**123.327**	**122.785**	**120.083**	**119.265**	**118.207**
110.461	109.172	109.276	111.088	108.311	107.598	105.332	104.165	103.009
15.199	14.821	14.528	14.689	14.793	15.000	14.596	14.952	15.042
NO	NO	NO	NO	NO	NO	NO	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
0.401	0.316	0.237	0.199	0.223	0.187	0.156	0.148	0.157
NO	NO	NO	NO	NO	NO	NO	NO	NO
0.008	**0.003**	**0.016**	**0.034**	**0.007**	**0.019**	**0.179**	**0.013**	**0.274**
0.008	0.003	0.016	0.034	0.007	0.019	0.179	0.013	0.274
IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
NO	NO	NO	NO	NO	NO	NO	NO	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	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
65.554	**62.770**	**59.746**	**58.899**	**58.495**	**54.948**	**55.741**	**54.616**	**52.243**
65.038	62.299	59.321	58.533	58.057	54.499	55.281	54.136	51.768
0.511	0.466	0.421	0.361	0.434	0.446	0.456	0.476	0.470
0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.004	0.004
NO	NO	NO	NO	NO	NO	NO	NO	NO
NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
240.848	**241.358**	**235.128**	**238.846**	**237.055**	**226.813**	**221.634**	**225.736**	**219.386**
240.840	**241.355**	**235.112**	**238.811**	**237.048**	**226.794**	**221.455**	**225.723**	**219.112**
0.201	**0.199**	**0.160**	**0.159**	**0.154**	**0.179**	**0.181**	**0.167**	**0.167**
0.013	0.012	0.011	0.011	0.012	0.015	0.018	0.017	0.016
0.188	0.187	0.150	0.149	0.142	0.164	0.164	0.150	0.150
NO	NO	NO	NO	NO	NO	NO	NO	NO

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2009 (Gg)	2010 (Gg)	2011 (Gg)	Change from base to latest reported year %
1. Energy	**47.255**	**49.468**	**46.348**	**51.602**
A. Fuel Combustion (Sectoral Approach)	16.030	17.359	16.595	31.161
1. Energy Industries	4.502	4.610	4.522	91.949
2. Manufacturing Industries and Construction	0.469	0.562	0.573	15.459
3. Transport	3.858	4.059	4.312	8.783
4. Other Sectors	7.185	8.018	7.080	21.783
5. Other	0.016	0.110	0.109	359.005
B. Fugitive Emissions from Fuels	31.225	32.109	29.753	66.034
1. Solid Fuels	1.679	1.499	1.853	-31.094
2. Oil and Natural Gas	29.547	30.610	27.899	83.188
2. Industrial Processes	**0.250**	**0.314**	**0.302**	**-36.690**
A. Mineral Products	NA	NA	NA	0.000
B. Chemical Industry	0.211	0.254	0.247	-42.308
C. Metal Production	0.038	0.060	0.055	11.690
D. Other Production				
E. Production of Halocarbons and SF_6				
F. Consumption of Halocarbons and SF_6				
G. Other	NA	NA	NA	0.000
3. Solvent and Other Product Use				
4. Agriculture	**114.064**	**113.589**	**111.241**	**-11.352**
A. Enteric Fermentation	98.959	98.493	96.338	-12.675
B. Manure Management	15.007	14.984	14.818	4.365
C. Rice Cultivation	NO	NO	NO	0.000
D. Agricultural Soils	NO	NO	NO	0.000
E. Prescribed Burning of Savannas	NO	NO	NO	0.000
F. Field Burning of Agricultural Residues	0.097	0.112	0.084	-91.248
G. Other	NO	NO	NO	0.000
5. Land Use, Land-Use Change and Forestry	**0.050**	**0.077**	**0.010**	**-80.543**
A. Forest Land	0.050	0.077	0.010	-80.543
B. Cropland	IE,NO	IE,NO	IE,NO	0.000
C. Grassland	NO	NO	NO	0.000
D. Wetlands	NE,NO	NE,NO	NE,NO	0.000
E. Settlements	NE,NO	NE,NO	NE,NO	0.000
F. Other Land	NO	NO	NO	0.000
G. Other	NA,NO	NA,NO	NA,NO	0.000
6. Waste	**52.998**	**51.964**	**51.511**	**-37.935**
A. Solid Waste Disposal on Land	52.551	51.507	51.046	-37.798
B. Waste-water Handling	0.444	0.453	0.462	-50.311
C. Waste Incineration	0.004	0.003	0.003	334.502
D. Other	NO	NO	NO	0.000
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**0.000**
Total CH_4 emissions including CH_4 from LULUCF	**214.617**	**215.411**	**209.412**	**-12.593**
Total CH_4 emissions excluding CH_4 from LULUCF	**214.567**	**215.334**	**209.402**	**-12.578**
Memo Items:				
International Bunkers	**0.143**	**0.125**	**0.124**	**11.575**
Aviation	0.016	0.019	0.017	300.162
Marine	0.127	0.106	0.107	0.263
Multilateral Operations	NO	NO	NO	0.000
CO_2 Emissions from Biomass				

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990) (Gg)	1991 (Gg)	1992 (Gg)	1993 (Gg)	1994 (Gg)
1. Energy	**1.031**	**1.026**	**1.026**	**1.042**	**1.144**
A. Fuel Combustion (Sectoral Approach)	1.017	1.016	1.016	1.032	1.133
1. Energy Industries	0.088	0.101	0.109	0.108	0.115
2. Manufacturing Industries and Construction	0.137	0.142	0.144	0.156	0.191
3. Transport	0.502	0.498	0.489	0.502	0.568
4. Other Sectors	0.271	0.257	0.248	0.249	0.237
5. Other	0.020	0.018	0.026	0.016	0.022
B. Fugitive Emissions from Fuels	0.014	0.010	0.010	0.011	0.011
1. Solid Fuels	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
2. Oil and Natural Gas	0.014	0.010	0.010	0.011	0.011
2. Industrial Processes	**6.706**	**6.196**	**4.424**	**5.130**	**5.311**
A. Mineral Products	NA	NA	NA	NA	NA
B. Chemical Industry	6.689	6.182	4.409	5.114	5.293
C. Metal Production	0.017	0.014	0.015	0.016	0.018
D. Other Production					
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**0.115**	**0.114**	**0.114**	**0.116**	**0.124**
4. Agriculture	**7.960**	**7.956**	**7.937**	**7.802**	**7.762**
A. Enteric Fermentation					
B. Manure Management	0.530	0.554	0.555	0.535	0.557
C. Rice Cultivation					
D. Agricultural Soils	7.411	7.387	7.374	7.256	7.197
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.019	0.015	0.008	0.011	0.008
G. Other	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	**0.043**	**0.048**	**0.048**	**0.047**	**0.048**
A. Forest Land	0.041	0.045	0.045	0.042	0.042
B. Cropland	0.001	0.002	0.003	0.005	0.006
C. Grassland	NO	NO	NO	NO	NO
D. Wetlands	0.000	0.000	0.000	0.000	0.000
E. Settlements	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
F. Other Land	NO	NO	NO	NO	NO
G. Other	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
6. Waste	**0.378**	**0.376**	**0.375**	**0.384**	**0.401**
A. Solid Waste Disposal on Land					
B. Waste-water Handling	0.378	0.376	0.375	0.384	0.401
C. Waste Incineration	0.000	0.000	0.000	0.000	0.000
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total N_2O emissions including N_2O from LULUCF	**16.232**	**15.715**	**13.925**	**14.522**	**14.791**
Total N_2O emissions excluding N_2O from LULUCF	**16.190**	**15.668**	**13.876**	**14.475**	**14.743**
Memo Items:					
International Bunkers	**0.057**	**0.049**	**0.058**	**0.062**	**0.066**
Aviation	0.020	0.018	0.019	0.020	0.020
Marine	0.037	0.031	0.039	0.042	0.046
Multilateral Operations	NO	NO	NO	NO	NO
CH_4 Emissions from Biomass					

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1995 (Gg)	1996 (Gg)	1997 (Gg)	1998 (Gg)	1999 (Gg)
1. Energy	**1.213**	**1.324**	**1.345**	**1.207**	**1.304**
A. Fuel Combustion (Sectoral Approach)	1.201	1.310	1.332	1.194	1.287
1. Energy Industries	0.116	0.123	0.124	0.122	0.122
2. Manufacturing Industries and Construction	0.200	0.200	0.206	0.162	0.137
3. Transport	0.634	0.735	0.750	0.645	0.771
4. Other Sectors	0.229	0.236	0.231	0.239	0.237
5. Other	0.022	0.016	0.021	0.026	0.020
B. Fugitive Emissions from Fuels	0.012	0.014	0.013	0.013	0.017
1. Solid Fuels	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
2. Oil and Natural Gas	0.012	0.014	0.013	0.013	0.017
2. Industrial Processes	**5.300**	**5.240**	**5.199**	**5.462**	**6.204**
A. Mineral Products	NA	NA	NA,NO	NA,NO	NA,NO
B. Chemical Industry	5.281	5.221	5.178	5.441	6.184
C. Metal Production	0.019	0.020	0.021	0.021	0.021
D. Other Production					
E. Production of Halocarbons and SF_6					
F. Consumption of Halocarbons and SF_6					
G. Other	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**0.126**	**0.127**	**0.127**	**0.127**	**0.130**
4. Agriculture	**7.865**	**7.923**	**7.897**	**7.899**	**7.817**
A. Enteric Fermentation					
B. Manure Management	0.563	0.568	0.552	0.549	0.562
C. Rice Cultivation					
D. Agricultural Soils	7.293	7.344	7.336	7.342	7.247
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.010	0.011	0.008	0.008	0.007
G. Other	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	**0.049**	**0.051**	**0.053**	**0.054**	**0.055**
A. Forest Land	0.042	0.043	0.043	0.043	0.043
B. Cropland	0.007	0.008	0.009	0.010	0.011
C. Grassland	NO	NO	NO	NO	NO
D. Wetlands	0.000	0.000	0.000	0.000	0.000
E. Settlements	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
F. Other Land	NO	NO	NO	NO	NO
G. Other	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
6. Waste	**0.411**	**0.409**	**0.413**	**0.415**	**0.417**
A. Solid Waste Disposal on Land					
B. Waste-water Handling	0.411	0.408	0.413	0.414	0.417
C. Waste Incineration	0.000	0.000	0.000	0.000	0.000
D. Other	NO	NO	NO	NO	NO
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**NA**	**NA**
Total N_2O emissions including N_2O from LULUCF	**14.964**	**15.074**	**15.034**	**15.164**	**15.926**
Total N_2O emissions excluding N_2O from LULUCF	**14.915**	**15.023**	**14.981**	**15.110**	**15.871**
Memo Items:					
International Bunkers	**0.075**	**0.084**	**0.100**	**0.098**	**0.097**
Aviation	0.019	0.022	0.024	0.026	0.030
Marine	0.057	0.062	0.075	0.072	0.067
Multilateral Operations	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass					

Note: All footnotes for this table are given at the end of the table on sheet 5.

2000 (Gg)	2001 (Gg)	2002 (Gg)	2003 (Gg)	2004 (Gg)	2005 (Gg)	2006 (Gg)	2007 (Gg)	2008 (Gg)
1.178	**1.275**	**1.249**	**1.297**	**1.332**	**1.187**	**1.266**	**1.379**	**1.334**
1.162	1.261	1.238	1.287	1.321	1.176	1.256	1.358	1.314
0.119	0.127	0.132	0.143	0.135	0.133	0.137	0.137	0.149
0.125	0.146	0.137	0.142	0.138	0.120	0.129	0.131	0.137
0.679	0.716	0.704	0.740	0.781	0.655	0.726	0.830	0.767
0.227	0.259	0.250	0.256	0.256	0.259	0.255	0.252	0.248
0.012	0.013	0.015	0.005	0.010	0.009	0.009	0.007	0.013
0.016	0.014	0.011	0.010	0.011	0.010	0.010	0.022	0.020
NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
0.016	0.014	0.011	0.010	0.011	0.010	0.010	0.022	0.020
5.610	**5.447**	**6.176**	**5.534**	**5.981**	**6.322**	**5.259**	**4.454**	**3.028**
NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA	NA	NA
5.590	5.429	6.161	5.520	5.964	6.309	5.249	4.445	3.016
0.020	0.018	0.015	0.014	0.017	0.014	0.009	0.009	0.012
NA	NA	NA	NA	NA	NA	NA	NA	NA
0.129	**0.129**	**0.129**	**0.131**	**0.133**	**0.134**	**0.137**	**0.136**	**0.138**
7.812	**7.603**	**7.610**	**7.700**	**7.699**	**7.714**	**7.595**	**7.703**	**7.621**
0.570	0.571	0.566	0.514	0.507	0.509	0.506	0.519	0.531
7.234	7.026	7.040	7.182	7.187	7.201	7.086	7.181	7.087
NO	NO	NO	NO	NO	NO	NO	NO	NO
0.008	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003
NO	NO	NO	NO	NO	NO	NO	NO	NO
0.055	**0.061**	**0.061**	**0.063**	**0.064**	**0.069**	**0.069**	**0.070**	**0.073**
0.041	0.042	0.042	0.040	0.040	0.040	0.041	0.040	0.043
0.013	0.019	0.019	0.023	0.024	0.029	0.029	0.029	0.030
NO	NO	NO	NO	NO	NO	NO	NO	NO
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
0.376	**0.382**	**0.355**	**0.378**	**0.377**	**0.387**	**0.399**	**0.422**	**0.431**
0.376	0.382	0.355	0.378	0.377	0.387	0.399	0.422	0.431
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NO	NO	NO	NO	NO	NO	NO	NO	NO
NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
15.160	**14.897**	**15.580**	**15.103**	**15.586**	**15.812**	**14.725**	**14.164**	**12.625**
15.105	**14.837**	**15.519**	**15.040**	**15.522**	**15.743**	**14.655**	**14.094**	**12.552**
0.094	**0.092**	**0.076**	**0.075**	**0.076**	**0.091**	**0.096**	**0.089**	**0.089**
0.029	0.027	0.023	0.024	0.027	0.034	0.040	0.037	0.037
0.065	0.065	0.052	0.052	0.050	0.057	0.057	0.052	0.052
NO	NO	NO	NO	NO	NO	NO	NO	NO

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2009 (Gg)	2010 (Gg)	2011 (Gg)	Change from base to latest reported year %
1. Energy	**1.264**	**1.417**	**1.462**	**41.741**
A. Fuel Combustion (Sectoral Approach)	1.253	1.405	1.451	42.650
1. Energy Industries	0.157	0.165	0.158	78.805
2. Manufacturing Industries and Construction	0.107	0.135	0.136	-0.198
3. Transport	0.725	0.832	0.895	78.271
4. Other Sectors	0.250	0.257	0.248	-8.279
5. Other	0.014	0.015	0.014	-29.546
B. Fugitive Emissions from Fuels	0.011	0.012	0.011	-24.002
1. Solid Fuels	NA,NO	NA,NO	NA,NO	0.000
2. Oil and Natural Gas	0.011	0.012	0.011	-24.002
2. Industrial Processes	**1.499**	**1.166**	**0.948**	**-85.866**
A. Mineral Products	NA	NA	NA	0.000
B. Chemical Industry	1.487	1.149	0.933	-86.046
C. Metal Production	0.012	0.016	0.014	-14.480
D. Other Production				
E. Production of Halocarbons and SF_6				
F. Consumption of Halocarbons and SF_6				
G. Other	NA	NA	NA	0.000
3. Solvent and Other Product Use	**0.143**	**0.143**	**0.142**	**23.946**
4. Agriculture	**7.220**	**6.959**	**7.202**	**-9.522**
A. Enteric Fermentation				
B. Manure Management	0.526	0.526	0.520	-1.816
C. Rice Cultivation				
D. Agricultural Soils	6.692	6.430	6.680	-9.865
E. Prescribed Burning of Savannas	NO	NO	NO	0.000
F. Field Burning of Agricultural Residues	0.002	0.002	0.002	-91.248
G. Other	NO	NO	NO	0.000
5. Land Use, Land-Use Change and Forestry	**0.072**	**0.073**	**0.073**	**71.405**
A. Forest Land	0.041	0.040	0.040	-2.712
B. Cropland	0.030	0.032	0.033	2 782.546
C. Grassland	NO	NO	NO	0.000
D. Wetlands	0.000	0.000	0.000	0.000
E. Settlements	NE,NO	NE,NO	NE,NO	0.000
F. Other Land	NO	NO	NO	0.000
G. Other	NA,NO	NA,NO	NA,NO	0.000
6. Waste	**0.447**	**0.441**	**0.450**	**19.102**
A. Solid Waste Disposal on Land				
B. Waste-water Handling	0.447	0.441	0.450	19.112
C. Waste Incineration	0.000	0.000	0.000	2.438
D. Other	NO	NO	NO	0.000
7. Other (as specified in Summary 1.A)	**NA**	**NA**	**NA**	**0.000**
Total N_2O emissions including N_2O from LULUCF	**10.645**	**10.198**	**10.277**	**-36.688**
Total N_2O emissions excluding N_2O from LULUCF	**10.573**	**10.125**	**10.204**	**-36.973**
Memo Items:				
International Bunkers	**0.079**	**0.078**	**0.074**	**31.082**
Aviation	0.035	0.041	0.037	89.264
Marine	0.044	0.037	0.037	0.263
Multilateral Operations	NO	NO	NO	0.000
CO_2 Emissions from Biomass				

Note: All footnotes for this table are given at the end of the table on sheet 5.

10 EMISSION TRENDS HFCS, PFCS AND SF_6 (PART 1 OF 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990) (Gg)	1991 (Gg)	1992 (Gg)	1993 (Gg)	1994 (Gg)
Emissions of HFCs[3] – (Gg CO_2 equivalent)	**0.050**	**9.013**	**18.124**	**28.454**	**44.200**
HFC-23	NA,NO	NA,NO	NA,NO	NA,NO	0.000
HFC-32	NA,NO	0.000	0.000	0.000	0.000
HFC-41	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-43-10mee	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-125	0.000	0.000	0.000	0.000	0.001
HFC-134	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-134a	0.000	0.007	0.014	0.021	0.029
HFC-152a	0.000	0.001	0.001	0.001	0.001
HFC-143	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-143a	0.000	0.000	0.000	0.000	0.001
HFC-227ea	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-236fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-245ca	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed HFCs[4] - (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of PFCs[3] – (Gg CO_2 equivalent)	**3 370.401**	**2 992.915**	**2 286.919**	**2 297.723**	**2 032.473**
CF4	0.467	0.417	0.322	0.324	0.287
C2F6	0.036	0.031	0.021	0.021	0.018
C 3F8	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C4F10	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
c-C4F8	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C5F12	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C6F14	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed PFCs[4] – (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of SF_6[3] - (Gg CO_2 equivalent)	**2 199.782**	**2 079.151**	**705.033**	**737.715**	**877.980**
SF_6	0.092	0.087	0.029	0.031	0.037

Note: All footnotes for this table are given at the end of the table on sheet 5.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1995 (Gg)	1996 (Gg)	1997 (Gg)	1998 (Gg)	1999 (Gg)
Emissions of HFCs[3] – (Gg CO_2 equivalent)	**80.338**	**112.224**	**164.809**	**209.782**	**270.781**
HFC-23	0.000	0.000	0.000	0.000	0.000
HFC-32	0.000	0.001	0.001	0.001	0.001
HFC-41	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-43-10mee	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-125	0.005	0.009	0.015	0.020	0.027
HFC-134	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-134a	0.037	0.044	0.052	0.062	0.070
HFC-152a	0.001	0.001	0.002	0.002	0.002
HFC-143	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-143a	0.004	0.007	0.012	0.015	0.022
HFC-227ea	NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
HFC-236fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-245ca	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed HFCs[4] - (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of PFCs[3] – (Gg CO_2 equivalent)	**2 007.957**	**1 829.456**	**1 633.246**	**1 485.798**	**1 388.695**
CF4	0.283	0.259	0.230	0.210	0.196
C2F6	0.018	0.016	0.015	0.013	0.012
C 3F8	0.000	0.000	0.000	0.000	0.000
C4F10	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
c-C4F8	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C5F12	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C6F14	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed PFCs[4] – (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of SF_6[3] - (Gg CO_2 equivalent)	**607.791**	**574.099**	**579.862**	**726.739**	**873.958**
SF_6	0.025	0.024	0.024	0.030	0.037

Note: All footnotes for this table are given at the end of the table on sheet 5.

2000 (Gg)	2001 (Gg)	2002 (Gg)	2003 (Gg)	2004 (Gg)	2005 (Gg)	2006 (Gg)	2007 (Gg)	2008 (Gg)
327.321	**403.067**	**491.788**	**475.145**	**507.563**	**524.052**	**579.456**	**612.109**	**691.954**
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.002	0.003	0.003	0.004	0.005	0.006	0.008	0.010	0.012
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	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
0.034	0.044	0.054	0.051	0.055	0.056	0.062	0.063	0.068
NA,NO	NA,NO	0.000	0.000	0.001	0.001	0.001	0.001	0.003
0.077	0.085	0.100	0.106	0.112	0.123	0.142	0.169	0.203
0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.003	0.001
NA,NO	NA,NO	0.000	0.000	0.000	0.001	0.002	0.002	0.001
0.029	0.038	0.047	0.043	0.046	0.045	0.048	0.046	0.052
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
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	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	NA,NO
1 318.112	**1 328.812**	**1 437.763**	**909.248**	**880.062**	**828.711**	**742.505**	**820.938**	**772.747**
0.186	0.188	0.201	0.126	0.122	0.117	0.102	0.112	0.105
0.012	0.012	0.014	0.010	0.009	0.008	0.009	0.010	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	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	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	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
934.421	**791.204**	**238.304**	**227.855**	**276.049**	**312.032**	**212.088**	**76.237**	**65.395**
0.039	0.033	0.010	0.010	0.012	0.013	0.009	0.003	0.003

10 EMISSION TRENDS HFCS, PFCS AND SF_6 (PART 3 OF 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2009 (Gg)	2010 (Gg)	2011 (Gg)	Change from base to latest reported year %
Emissions of HFCs[(3)] – (Gg CO_2 equivalent)	**736.469**	**914.444**	**950.212**	**1 917 097.303**
HFC-23	0.000	0.000	0.000	100.000
HFC-32	0.016	0.020	0.022	100.000
HFC-41	NA,NO	NA,NO	NA,NO	0.000
HFC-43-10mee	NA,NO	NA,NO	NA,NO	0.000
HFC-125	0.073	0.093	0.098	244 984 779 848.750
HFC-134	0.002	0.002	0.002	100.000
HFC-134a	0.229	0.263	0.278	198 896 411 000.000
HFC-152a	0.001	0.004	0.002	378.765
HFC-143	0.001	0.001	0.001	100.000
HFC-143a	0.050	0.069	0.065	161 703 332 383.750
HFC-227ea	IE,NA,NO	IE,NA,NO	IE,NA,NO	0.000
HFC-236fa	NA,NO	NA,NO	NA,NO	0.000
HFC-245ca	NA,NO	NA,NO	NA,NO	0.000
Unspecified mix of listed HFCs[(4)] - (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	0.000
Emissions of PFCs[(3)] – (Gg CO_2 equivalent)	**376.717**	**205.076**	**225.726**	**-93.303**
CF4	0.050	0.027	0.030	-93.603
C2F6	0.006	0.003	0.003	-90.556
C 3F8	NA,NO	NA,NO	NA,NO	0.000
C4F10	NA,NO	NA,NO	NA,NO	0.000
c-C4F8	NA,NO	NA,NO	NA,NO	0.000
C5F12	NA,NO	NA,NO	NA,NO	0.000
C6F14	NA,NO	NA,NO	NA,NO	0.000
Unspecified mix of listed PFCs[(4)] – (Gg CO_2 equivalent)	NA,NO	NA,NO	NA,NO	0.000
Emissions of SF_6[(3)] - (Gg CO_2 equivalent)	**61.455**	**75.382**	**60.716**	**-97.240**
SF_6	0.003	0.003	0.003	-97.240

Note: All footnotes for this table are given at the end of the table on sheet 5.

10 EMISSION TRENDS – SUMMARY (PART 1 OF 3)

GREENHOUSE GAS EMISSIONS	Base year (1990) CO_2 equivalent (Gg)	1991 CO_2 equivalent (Gg)	1992 CO_2 equivalent (Gg)	1993 CO_2 equivalent (Gg)	1994 CO_2 equivalent (Gg)
CO_2 emissions including net CO_2 from LULUCF	19 471.360	16 895.700	17 730.395	17 599.492	20 597.935
CO_2 emissions excluding net CO_2 from LULUCF	34 833.325	33 369.026	34 167.251	35 805.190	37 718.757
CH_4 emissions including CH4 from LULUCF	5 031.248	5 049.365	5 130.537	5 181.449	5 254.412
CH_4 emissions excluding CH4 from LULUCF	5 030.133	5 047.491	5 128.817	5 181.134	5 254.056
N_2O emissions including N2O from LULUCF	5 032.042	4 871.748	4 316.621	4 501.965	4 585.274
N_2O emissions excluding N2O from LULUCF	5 018.808	4 856.997	4 301.644	4 487.349	4 570.312
HFCs	0.050	9.013	18.124	28.454	44.200
PFCs	3 370.401	2 992.915	2 286.919	2 297.723	2 032.473
SF_6	2 199.782	2 079.151	705.033	737.715	877.980
Total (including LULUCF)	**35 104.881**	**31 897.893**	**30 187.628**	**30 346.798**	**33 392.274**
Total (excluding LULUCF)	**50 452.499**	**48 354.593**	**46 607.787**	**48 537.564**	**50 497.778**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990) CO_2 equivalent (Gg)	1991 CO_2 equivalent (Gg)	1992 CO_2 equivalent (Gg)	1993 CO_2 equivalent (Gg)	1994 CO_2 equivalent (Gg)
1. Energy	29 491.280	28 571.527	29 458.389	30 674.561	32 267.574
2. Industrial Processes	13 807.059	12 657.757	10 038.804	10 838.108	11 166.500
3. Solvent and Other Product Use	191.181	171.927	176.017	177.164	190.292
4. Agriculture	5 102.754	5 106.209	5 122.309	5 044.190	5 072.811
5. Land Use, Land-Use Change and Forestry(5)	-15 347.618	-16 456.700	-16 420.159	-18 190.766	-17 105.504
6. Waste	1 860.225	1 847.172	1 812.268	1 803.541	1 800.601
7. Other	NA	NA	NA	NA	NA
Total (including LULUCF)(5)	**35 104.881**	**31 897.893**	**30 187.628**	**30 346.798**	**33 392.274**

10 EMISSION TRENDS HFCS, PFCS AND SF_6 (PART 2 OF 3)

GREENHOUSE GAS EMISSIONS	1995 CO_2 equivalent (Gg)	1996 CO_2 equivalent (Gg)	1997 CO_2 equivalent (Gg)	1998 CO_2 equivalent (Gg)	1999 CO_2 equivalent (Gg)
CO_2 emissions including net CO_2 from LULUCF	17 990.194	21 652.641	22 127.246	21 471.219	27 240.479
CO_2 emissions excluding net CO_2 from LULUCF	37 791.066	41 040.546	41 142.096	41 369.882	42 119.607
CH_4 emissions including CH4 from LULUCF	5 199.642	5 229.843	5 234.018	5 086.775	5 006.517
CH_4 emissions excluding CH4 from LULUCF	5 199.499	5 228.865	5 232.944	5 086.385	5 006.434
N_2O emissions including N2O from LULUCF	4 638.863	4 672.879	4 660.526	4 700.788	4 937.154
N_2O emissions excluding N2O from LULUCF	4 623.624	4 657.073	4 644.237	4 684.102	4 920.162
HFCs	80.338	112.224	164.809	209.782	270.781
PFCs	2 007.957	1 829.456	1 633.246	1 485.798	1 388.695
SF_6	607.791	574.099	579.862	726.739	873.958
Total (including LULUCF)	**30 524.786**	**34 071.142**	**34 399.707**	**33 681.101**	**39 717.585**
Total (excluding LULUCF)	**50 310.276**	**53 442.262**	**53 397.195**	**53 562.687**	**54 579.637**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1995 CO_2 equivalent (Gg)	1996 CO_2 equivalent (Gg)	1997 CO_2 equivalent (Gg)	1998 CO_2 equivalent (Gg)	1999 CO_2 equivalent (Gg)
1. Energy	32 156.375	35 464.602	35 374.147	35 382.162	36 267.440
2. Industrial Processes	11 097.273	10 898.955	11 023.886	11 274.927	11 484.839
3. Solvent and Other Product Use	186.736	195.568	190.038	190.449	188.275
4. Agriculture	5 105.752	5 155.575	5 120.405	5 135.430	5 175.629
5. Land Use, Land-Use Change and Forestry(5)	-19 785.490	-19 371.121	-18 997.487	-19 881.586	-14 862.053
6. Waste	1 764.139	1 727.563	1 688.719	1 579.719	1 463.455
7. Other	NA	NA	NA	NA	NA
Total (including LULUCF)(5)	30 524.786	34 071.142	34 399.707	33 681.101	39 717.585

2000 CO_2 equivalent (Gg)	2001 CO_2 equivalent (Gg)	2002 CO_2 equivalent (Gg)	2003 CO_2 equivalent (Gg)	2004 CO_2 equivalent (Gg)	2005 CO_2 equivalent (Gg)	2006 CO_2 equivalent (Gg)	2007 CO_2 equivalent (Gg)	2008 CO_2 equivalent (Gg)
26 777.930	24 504.513	21 075.417	20 404.022	17 309.599	16 231.854	21 748.692	23 773.378	19 888.901
41 790.838	43 159.602	42 282.536	43 647.313	44 057.250	43 059.466	43 463.746	45 482.017	44 411.050
5 057.811	5 068.526	4 937.688	5 015.757	4 978.158	4 763.080	4 654.324	4 740.457	4 607.108
5 057.638	5 068.455	4 937.361	5 015.035	4 978.018	4 762.671	4 650.562	4 740.176	4 601.353
4 699.608	4 618.206	4 829.938	4 682.035	4 831.591	4 901.804	4 564.608	4 390.786	3 913.689
4 682.555	4 599.424	4 811.026	4 662.484	4 811.805	4 880.405	4 543.141	4 369.198	3 891.064
327.321	403.067	491.788	475.145	507.563	524.052	579.456	612.109	691.954
1 318.112	1 328.812	1 437.763	909.248	880.062	828.711	742.505	820.938	772.747
934.421	791.204	238.304	227.855	276.049	312.032	212.088	76.237	65.395
39 115.203	**36 714.329**	**33 010.898**	**31 714.062**	**28 783.022**	**27 561.533**	**32 501.673**	**34 413.906**	**29 939.794**
54 110.885	**55 350.565**	**54 198.778**	**54 937.079**	**55 510.747**	**54 367.338**	**54 191.498**	**56 100.677**	**54 433.563**

2000 CO_2 equivalent (Gg)	2001 CO_2 equivalent (Gg)	2002 CO_2 equivalent (Gg)	2003 CO_2 equivalent (Gg)	2004 CO_2 equivalent (Gg)	2005 CO_2 equivalent (Gg)	2006 CO_2 equivalent (Gg)	2007 CO_2 equivalent (Gg)	2008 CO_2 equivalent (Gg)
35 590.264	37 508.389	37 123.798	38 466.537	38 403.191	37 693.950	38 476.906	40 405.581	39 007.033
11 776.797	11 253.731	10 558.910	9 893.326	10 591.262	10 245.802	9 370.132	9 349.787	9 180.570
181.736	184.357	187.216	190.581	194.313	183.961	173.997	175.057	170.298
5 068.882	4 967.495	4 963.988	5 032.501	4 976.561	4 969.781	4 876.077	4 892.387	4 844.963
-14 995.682	-18 636.235	-21 187.880	-23 223.017	-26 727.725	-26 805.804	-21 689.825	-21 686.771	-24 493.770
1 493.207	1 436.594	1 364.866	1 354.134	1 345.419	1 273.844	1 294.386	1 277.865	1 230.700
NA	NA	NA	NA	NA	NA	NA	NA	NA
39 115.203	36 714.329	33 010.898	31 714.062	28 783.022	27 561.533	32 501.673	34 413.906	29 939.794

10 EMISSION TRENDS HFCS, PFCS AND SF_6 (PART 2 OF 3)

GREENHOUSE GAS EMISSIONS	2009	2010	2011	Change from base to latest reported year
	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)
CO_2 emissions including net CO_2 from LULUCF	20 660.537	21 876.457	17 053.273	-12.419
CO_2 emissions excluding net CO_2 from LULUCF	42 902.744	45 478.777	44 649.103	28.179
CH_4 emissions including CH4 from LULUCF	4 506.959	4 523.639	4 397.653	-12.593
CH_4 emissions excluding CH4 from LULUCF	4 505.906	4 522.016	4 397.436	-12.578
N_2O emissions including N2O from LULUCF	3 299.847	3 161.322	3 185.864	-36.688
N_2O emissions excluding N2O from LULUCF	3 277.656	3 138.653	3 163.181	-36.973
HFCs	736.469	914.444	950.212	1 917 097.303
PFCs	376.717	205.076	225.726	-93.303
SF_6	61.455	75.382	60.716	-97.240
Total (including LULUCF)	**29 641.984**	**30 756.320**	**25 873.444**	**-26.297**
Total (excluding LULUCF)	**51 860.948**	**54 334.348**	**53 446.374**	**5.934**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2009	2010	2011	Change from base to latest reported year
	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)	CO_2 equivalent (Gg)
1. Energy	38 864.963	40 653.421	39 828.855	35.053
2. Industrial Processes	6 960.310	7 739.459	7 647.066	-44.615
3. Solvent and Other Product Use	150.590	170.885	180.550	-5.561
4. Agriculture	4 633.489	4 542.576	4 568.657	-10.467
5. Land Use, Land-Use Change and Forestry(5)	-22 218.964	-23 578.027	-27 572.930	79.656
6. Waste	1 251.595	1 228.007	1 221.246	-34.350
7. Other	NA	NA	NA	0.000
Total (including LULUCF)(5)	29 641.984	30 756.320	25 873.444	-26.297

(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) Enter actual emissions estimates. If only potential emissions estimates are available, these should be reported in this table and an indication for this be provided in the documentation box. Only in these rows are the emissions expressed as CO_2 equivalent emissions.

(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 Gg of CO_2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.

(5) Includes net CO_2, CH_4 and N_2O from LULUCF.

Documentation box:

- Parties should provide detailed explanations on emissions trends in Chapter 2: Trends in Greenhouse Gas Emissions and, as appropriate, in the corresponding Chapters 3 - 9 of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.
- Use the documentation box to provide explanations if potential emissions are reported.

10.2 Annex 2 Methodology

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.

The MSG model

MSG is a general equilibrium model developed by Statistics Norway[1]. The model is a dynamic, integrated economy and emission model. The main determinants of growth are capital accumulation, labour supply, availability of natural resources and the of technological change. Together with restrictions on current account developments and public sector absorption of resources, capacity is determined by sustainable paths for household consumption. With the assumption of full resource utilisation, the model is not designed for analysing short-term adjustments.

The model gives a detailed description of the structures of production and consumption in the Norwegian economy. The model specifies 60 commodities and 44 industries (33 private production sectors and 11 government sectors) classified to capture important substitution possibilities with environmental implications. The model includes 39 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.

The main production factors are material inputs, labour, three types of real capital, two types of energy and various types of polluting and non-polluting transport services. A certain degree of substitution between production factors is assumed in the model depending on changes in their relative prices and the exogenous assumptions about factor productivity developments.

Producer behaviour at home is characterised by monopolistic competition. On the world market, however, prices are fixed, suggesting that producers are exposed to free competition and act as price takers in export markets. In each sector, real capital formation is determined so that expected return on capital equals an exogenously given return on capital.

The model provides a relatively detailed description of the markets for energy and transport. A detailed emission model is incorporated into the MSG, turning it into an effective tool for assessing environmental consequences of changes in economic activity. Twelve pollutants (six GHG and six air pollutants) disaggregated by source and sector are specified in the model. The disaggregated approach in MSG with emphasis on environmentally important sectors is a clear advantage when studying environmental issues.

CO_2 emissions from the petroleum sector

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 fore-

1. Heide et al. (2004) and Bye (2008) give more detailed descriptions of the MSG6 model, its empirical fundament, and applications. http://www.ssb.no/a/publikasjoner/pdf/rapp_200418/rapp_200418.pdf http://www.ssb.no/a/english/publikasjoner/pdf/doc_200814_en/doc_200814_en.pdf

casts 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 CO_2 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.

Emissions of other greenhouse gases

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:

- Methane emissions: 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. Methane emissions from the agricultural sector are expected to remain stable as the emissions are little affected by short-term economic cycles. The number of animals is stable except for poultry and swine that is assumed will increase.
- 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 2011. In the projections, the emissions are assumed to remain at the same level as in 2011. 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 2011. Emissions projections of SF_6 mainly follow electricity production.
- 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 2011, the carbon stock changes on forest land excluding non-CO_2 emissions amounted to a net removals of 32.4 million tonnes of CO_2. In addition, net emissions from other LULUCF-sources were estimated at close to 5 million tonnes of CO_2 equiva-

1. Norwegian climate research. An evaluation. 2012

lents. Settlements and cropland contributed the most to these emissions.

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 m^3 today, to around 13 million m^3 by 2020. It is assumed a further increase in the mean harvest to 15 million m^3 by 2100. Based on these assumptions, the annual net CO_2 sequestration on forest land is expected to decrease to 24.8 million tonnes of CO_2 by2020. In the longer run a more disaggregated model is used. Using this model, CO_2 sequestration is projected to decrease to 22.5 million tonnes of CO_2 in 2030 and further to below 10 million tonnes by the end of the century.

The projections have carried out by the Norwegian Forest and Landscape Institute, using the method described in Antón-Fernández and Astrup (2012) for projections of growth in biomass and felling. While the soil model Yasso has been used for projections of carbon in soil and dead organic materials.[2] 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.

Emissions from the other land use categories have not been projected. As an approximation it is assumed that the net emissions from these land use categories will remain at 2.6 million tonnes of CO_2 equivalents in the future, which is the same level as the average for the past 10 years

Since the projections are based on historical data, the recalculation of the historical time-series in NIR 2013 will probably also lead to changes in the expected CO_2 removals in the future.

Assessment of the effects of policies and measures

The method used to assess the effect of policies and measures is mainly based on bottom-up or micro analyses. Only the impact on emissions of the CO_2 tax in mainland sectors is analysed using the macroeconomic model MSG. Effects are monitored more systematically in some sectors than in others. The assessment of aggregate effects of policies and measures, which is required by the UNFCCC guidelines, is not complete and to some extent qualitative, building on information on the main policies and measures.

Because the economy is not static, changes in policy instruments will in addition to the direct effect of the measure also have repercussions on the economy. For example,money saved on energy efficiency measures will be spent on something else, possibly even on an increase in the indoor temperature, leaving the total effect on energy use uncertain. When estimating the effect of a measure using a microeconomic approach it is challenging to assess such repercussion effects. In the calculations in chapter 4 such effects are only to a small extent taken into account. When estimating the impact on emissions of tax measures (for example in the transport sector) elasticities are being used. This means that dynamic effects are to some extent taken into account in the calculations.

The estimated effects of measures in the manufacturing industries and in oil and gas extraction are based on specific technologies being implemented and the dynamic repercussions back on the economy are

2. Antón-Fernández and Astrup (2012) "Empirical harvest models and their use in regional business-as-usual scenarios of timber supply and carbon stock development", Scandinavian Journal of Forest Research, No 27. http://www.skogoglandskap.no/publikasjon/empirical_harvest_models_and_their_use_in_regional_business_as_usual_scenarios_of_timber_supply_and_carbon_stock_development

probably limited. In the calculations of the effects of measures it is however tried to take into account that efficiency gains already exist in the baseline. This means that even without measures, efficiency improvements would occur. Separating general efficiency from efficiency gains of policies is difficult.

One other challenge is double counting when policies are seen independently. For example, the CO_2 tax, the base tax on heating oil, subsidies from Enova to convert from the use of oil boilers and the building code will all impact on the use of heating oil and subsequently emissions. With a conservative approach to the effect of multiple measures and the fact that several measures are not estimated (NE) the total effect of policies and measures might be at the low end.

10.3 Annex 3 Key macroeconomic assumptions

Long-term projections are being developed using Statistics Norway's MSG general equilibrium model, (see Annex 1).

The long-term macroeconomic projections in this report were presented in *Long-term Perspectives on the Norwegian Economy 2013* (Meld. St. 12 (2012–2013) Report to the Storting (white paper)). A summary in English can be found here:

http://www.regjeringen.no/pages/38323623/PDFS/STM201220130012000EN_PDFS.pdf

Assumptions central to projections are:

International economy and petroleum activity

- The prices of traditional export and import goods will increase by 1.75 per cent measured as an annual average.
- 4 per cent expected annual real return on the capital in the Government Pension Fund Global.
- Oil and gas prices are assumed to be NOK 525 per barrel and NOK 1.93 per Sm3, respectively, measured in fixed 2013 NOK for the projection period.
- In 2030, oil (including LNG) and gas production will total 75 per cent and 85 per cent, respectively, of the level in 2011.
- Following a very short-term increase, the investment demand of the petroleum sector will fall to close to 3 per cent of mainland Norway GDP by 2060. In 2011, 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 2012.
- The labour force participation rates of different demographic sub-groups (sex, age and immigrant background), remain unchanged from 2015-levels.
- The unemployment rate and average working hours per employed person will remain unchanged after 2015.
- 1.6 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 4 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 design of Norwegian climate policy will be retained, including the scope and rates of the CO_2 tax.
- The price of quotas in the EU quota system has been set to rise to NOK 100 per tonne of CO_2 by 2020. After 2020, the price of quotas in the EU quota system will increase by 4 per cent annually in real terms.
- In certain areas, the technology parameters of the model have been adjusted to reflect, for example, technology changes in manufacturing industry, the use of catalytic converters in vehicles and CCS

3. Owing to costs and uncertainties, the development of large scale CO_2-capture at Mongstad was discontinued in 2013. Projected emissions in 2020 might therefore be somewhat underestimated.

4. http://www.vista-analyse.no/site/assets/files/6090/bilavgifters_virkninger.pdf

in gas-fired power plants. A high degree of CCS is assumed in power and heat production in the future.[3]

- Emissions from road traffic are based on information from Statistics Norway's road traffic model. Diesel passenger cars will in the projections continue to account for around 70 per cent of new private car sales. Per capita traffic growth will be positive but declining during the projection period. In line with a report by Vista Analyse, emissions from new cars will average around 110 grams of CO_2 per km in 2020, from 134 grams in 2011.[4] Emissions from new cars will fall further after 2020, albeit at a slower rate. The use of biofuel will continue at the current rate of 3.5 per cent.
- Electricity consumption by energy-intensive industries will remain approximately unchanged up to 2030.

Table A.1 lists key macroeconomic projections underpinning the Norwegian emission projections. In the baseline scenario average annual GDP growth is estimated at 2.9 per cent in 2011-2020 and at 1.8 per cent in 2020-2030. Growth in the mainland

A.1 KEY MACROECONOMIC ASSUMPTIONS

	2011	2020	2030
	Billion NOK	Annual average growth rate	
Gross domestic product	2 750	2.9	1.8
- Petroleum activities and ocean transport	660	0.4	-1.9
- Mainland Norway	2 090	3.4	2.4
Manufacturing	195	3.5	3.1
Consumption	1 723	4.0	2.9
Gross fixed capital formation	537	2.3	0.2
- Petroleum activities and ocean transport	154	1.5	-4.0
- Mainland Norway	383	2.6	1.5
Population in 1000	4 986	1.2	0.9
Number of persons employed in 1000	2 625	1.2	0.4
	Level		
Oil price (2011-NOK)	621	505	505
EU ETS price (2011-NOK)	100	100	150
Electricity price (NOK/KWh 2011-NOK)	0.36	0.40	0.46
Net domestic energy use		Annual average growth rate	
- Petroleum products (Mtonnes)	9 843[1]	0.1	0.4
- Electricity (TWh)	114	1.3	0.4

[1] Including energy-sectors and excluding sea transport in international waters. Figure for 2009, as the classification in MSG may differ from energy accounts.

Sources: Statistics Norway and Ministry of Finance.

economy, i.e. total GDP excluding petroleum activities and ocean transport, is estimated at 3.4 per cent in 2010-2020 and 2.4 per cent in 2020-2030.

The high population growth rate from the past years, of about 1 per cent annually, is projected to continue. From 2011 to 2020 the population is estimated to increase by 1.2 per cent annually. Up to 2030 the growth rate is somewhat lower at close to 1 per cent. All in all the population is estimated to increase by around 20 per cent during the projection period.

The producer price of crude oil is assumed to fall from NOK 621 in 2011 to NOK 505, measured in 2011 prices, in a couple of years before stabilising at this level thereafter. The wholesale price of electricity is assumed to increase from NOK 0.36 per KWh in 2011 to NOK 0.40 per KWh in 2020 measured in 2011 prices, and further increase to just above NOK 0.45 per KWh in 2030. Projected supply and demand of electricity is expected to close to balance in 2020 and 2030. In the baseline scenario, the EU ETS quota price is assumed to increase to NOK 100 by 2020, measured in 2011-prices. In 2030 the price will increase to NOK 150 measured in 2011-prices.

Domestic consumption of petroleum products is projected to increase by 0.1 per cent until 2020 and by 0.4 per cent annually from 2020 to 2030. In the forecast, electricity consumption is projected to grow by 1.3 per cent per year from 2011 to 2020 and 0.4

A.2 NET DOMESTIC USE OF TRANSPORT AND HEATING OIL MILLION TONNES[1]

	2009	2020	2030
Transport oil	7.0	7.5	7.8
Heating oil	2.8	2.5	2.5

[1] Including energy-sectors and excluding sea transport in international waters. The classification in MSG may differ from energy accounts. Therefor no account figures for 2011 are supplied.

Sources: Statistics Norway and Ministry of Finance.

A.3 NET DOMESTIC USE OF TRANSPORT AND HEATING OIL MILLION TONNES[1]

	2009	2020	2030
Total supply	16.9	14.4	16.4
Production	15.0	12.4	14.3
Import	1.9	2.0	21
Export	10.2	7.2	8.9
Statistical differences/ changes in inventories	-0.3	-0.3	-0.3
Net domestic use	7.0	7.5	7.8

[1] Results from technical model simulations.

Sources: Statistics Norway and Ministry of Finance.

per cent from 2020 to 2030. These forecasts are based on continued improvements in average energy efficiency. A more detailed picture of estimated supply and demand of different petroleum products is given in table A.2 and A.3. The use of heating oil is projected to be around 10 per cent lower in 2020 and 2030.

Demand for electricity and oil for transport and heating, measured per unit of production is shown in tables A.4-A.6. These figures are determined by several factors in the model such as production factor substitution, changes in relative growth between different production and consumption sectors and autonomous energy efficiency improvements. The rate of autonomous improvement in energy efficiency differs between sectors but is roughly 1.5 per cent a year in the projection period for electricity and transport oil. Energy efficiency in heating oil is higher at over 2.5 per cent annually in the decades to come.

A.4 ELECTRICITY PER UNIT OF PRODUCTION MWH/MILLION 2009-NOK

	2011	2020	2030
Total	48	41	36
Mainland Norway	56	46	38

Sources: Statistics Norway and Ministry of Finance.

A.5 HEATING OIL PER UNIT OF PRODUCTION. TONNES PER MILLION 2009-NOK

	2009	2020	2030
Total	1.2	0.8	0.7
Mainland Norway	1.3	0.8	0.6

Sources: Statistics Norway and Ministry of Finance.

A.6 TRANSPORT OIL PER UNIT OF PRODUCTION. TONNES PER MILLION 2009-NOK

	2009	2020	2030
Total	3.0	2.4	2.1
Mainland Norway	3.4	2.5	2.1

Sources: Statistics Norway and Ministry of Finance.

10.4 Annex 4 Main differences in projections between current and previous communication

Norwegian emissions in 1990 were recently increased by 0.7 million tonnes of CO_2 equivalents, to 50.4 million tonnes, primarily as the result of higher estimated digestive emissions from livestock, cf. higher emissions from of methane and N_2O in the first column in Table A.7 and from agricultural in A.8.

Emissions in 2010 turned out to be 3 million tonnes of CO_2 equivalents lower than estimated in the previous communication. Lower emissions from transport and industrial processes contributed most to the downward adjustment. In the previous communication emissions from fugitives were not reported separately. Most of these emissions take place in the oil and gas industry. The sectoral division has changed for other emissions as well, so great care should be taken in interpreting the changes on a disaggregated level.

Compared with the projections in the previous communication this report envisages a reduction in emissions by 2020 of 2 million tonnes of CO_2 equivalents. This downward adjustment in Norway's projected emissions in 2020 has been made despite an increase of close to 3 per cent in the estimated 2020 population of Norway. In isolation, a higher population would suggest higher activity levels and increased emissions of greenhouse gases.

As has been discussed in chapter 5 the main revisions in 2020 stem from:

- Lower emissions from manufacturing industry, by almost 3 million tonnes of CO_2 equivalents. Measures in the fertiliser industry have among others, lowered the emissions of N_2O both in 2010 and 2020. Moreover, observed lower activity and emission in refining has led to a downward revision also for future activity.

A.7 CHANGES IN GHG EMISSIONS COMPARED WITH THE 5TH NATIONAL COMMUNICATION BY GAS. MILLIONS TONNES OF CO_2 EQUIVALENTS

	1990	2010	2020
Total emissions (excluding LULUCF)	0.7	-3.0	-2.1
CO_2	0.0	-2.1	-1.2
Other greenhouse gases	0.6	-0.9	-0.9
CH_4	0.4	0.2	0.2
N2O	0.2	-0.8	-1.2
HFC	0.0	0.4	0.5
PFC	0.0	-0.6	-0.3
SF6	0.0	0.0	0.0

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

A.8 CHANGES IN GHG EMISSIONS COMPARED WITH THE 5TH NATIONAL COMMUNICATION BY SECTOR. MILLIONS TONNES OF CO_2 EQUIVALENTS

	1990	2010	2020
Total Energy	0.0	-1.7	-0.6
- Oil and gas production	-2.8	-3.8	-0.3
- Fugitives	3.0	3.3	3.2
- Transport	-0.2	-0.7	-1.4
- Other sectors	-0.1	-0.5	-2.0
Industrial Processes	0.1	-1.4	-1.4
Agriculture	0.6	0.2	0.0
Waste	0.0	-0.2	-0.2
Total emission (excluding LULUCF)	0.7	-3.0	-2.1

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

- Lower emissions from road transport, by close 1 ½ million tonnes of CO_2 equivalents. This prolongs an already observed trend where growth in emissions from road transport has flattened out, partly owing to changes in car taxation during the past 5-6 years.
- Lower emissions from use of heating oil in households. Emissions have been falling steadily for the past 20 years. In addition, a step up in the use of measures in recent years suggests that the expected household consumption of heating oil will continue to fall in future.
- On the other hand are emissions from oil and gas extraction in 2020 have been revised upwards by close to 2 million tonnes of CO_2 equivalents. The revision is due to several changes in conditions, among others estimated longer lifetime of fields in production, postponed start-up of some projects under development and new emission factors for flaring.

10.5 Annex 5 Biennial Report for Norway

Contents

1 INTRODUCTION

This report is Norway's first Biennial Report (BR1).

The "UNFCCC biennial reporting guidelines for developed country Parties" as contained in annex 1 to decision 2/CP.17 have been used for the preparation of this report. The common tabular format (CTF) tables contained in the report 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. Since the BR1 is submitted in conjunction with Norway's sixth National Communication (NC6), the BR1 refers to information in the NC6 in order to avoid duplication.

2 INFORMATION ON GREENHOUSE GAS EMISSIONS AND TRENDS

2.1 Emission trends for aggregated greenhouse gas emissions

The Norwegian inventory 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 1990-2011 was submitted to the UNFCCC Secretariat 12 April 2013. The CRF tables were resubmitted to the UNFCCC on 11 November 2013 and the summary tables in Annex I (that are also the Biennial Report's Common Tabular Format (CTF) table 1) are from the resubmitted CRF tables.

Section 3.1 of Norway's sixth National Communication and Norway's NIR for 2013 provide detailed information on the greenhouse gas emissions and trends. Only a brief summary is included here in the Biennial Report.

Norway's total emissions of greenhouse gases (without LULUCF), measured as CO_2 equivalents, were about 53.4 million tonnes in 2011. Between 1990 and 2011 the total greenhouse gas emissions have increased by almost 3 million tonnes, or by more than 6 per cent. 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 million tonnes in 2007.

Norway's total net emissions of greenhouse gases (with LULUCF), measured as CO_2 equivalents, were about 25.8 million tonnes in 2011.[5] This is 9.2 million tonnes of CO_2 equivalents lower than in 1990. From 1990 to 2011, the total net sequestration of CO_2 from forest land increased by 79 per cent. The explanation for this growth is an increase in standing volume and gross increment due to an active forest management policy over the last 60-70 years, while the amount of CO_2 emissions due to harvesting and natural losses have been quite stable.

2.2 National inventory arrangements and changes

Norway's national inventory arrangements/national system for the GHG inventory are based on close cooperation between the Norwegian Environment Agency[6], Statistics Norway and the Norwegian Forest and Landscape Institute. The Norwegian Environment Agency has been appointed as the national entity and is in charge of approving the inventory before official submission to the UNFCCC. See chapter 3.2 of the sixth National Communication for further details.

5. Accounting relevant to the Kyoto Protocol is covered in the NC chapter 5.4. Only a limited part of the contribution from the LULUCF sector in Norway is recognised as basis for issuance of Kyoto units.

6. Former names are "Climate and Pollution Agency" and "Norwegian Pollution Control Authority".

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. Norway therefore summarises the most important changes since it reported its fifth National Communication in 2010. This is based on our reporting of changes in the national system in chapter 13 of our NIRs in 2013, 2012, 2011 and 2010. Comprehensive information regarding the national system is reported annually as an Annex to the NIR.

Changes reported in the 2013 NIR:

- Enhanced routines are implemented for quality control of the common reporting format data that includes more rounds with checks by the Climate and Pollution agency, the Forest and Landscape Institute and Statistics Norway to ensure the correctness of the data and the consistency between the data provided in the NIR and in the CRF tables.
- A LULUCF-specific plan for QA/QC was developed internally at the Forest and Landscape Institute. The plan had two objectives 1) to ensure that emission estimates and data contributing to the inventory are of high quality and 2) to facilitate an assessment of the inventory, in terms of quality and completeness.

Changes reported in the 2012 NIR:

- New routines for input data control were completed and implemented. Reported emissions, emission factors and activity data for the latest inventory year are routinely compared with those of the previous inventory year. In addition, implied emissions factors are calculated for emission from stationary combustion at point sources and are compared with the previous inventory year.
- A reorganisation at Statistics Norway that merges the emission inventory group with the energy statistics.
- The Climate and Pollution Agency has started to build up a physical and electronic library with the most important methodology reports.

Changes reported in the 2011 NIR:

No changes were reported.

Changes reported in the 2010 NIR:

- The *National entity* with overall responsibility for the inventory and reporting has changed name from the "Norwegian Pollution Control Authority" to the "Climate and Pollution Agency". There have been no other changes to the institutional arrangements or the responsibilities of the institutions involved in the preparation and production of the inventory.
- Table 1 in Section 2.6 of Annex VI, describing *the inventory production plan* has been changed. This is to better reflect the working procedures that have been developed and have been adjusted to national publishing dates for the emission inventories, including emissions of precursors and indirect greenhouse gases.
- The description of *the LULUCF model* in Section 4.5 of Annex IV has been changed to reflect further development of the model since 2006.
- Small *editorial changes*, including improved Figure 1.

3 QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET

Norway's climate policy is founded on the objective of the Convention on Climate Change and the Kyoto Protocol and the scientific understanding of the greenhouse effect set out in the reports from IPCC. Section 4.1 of Norway's sixth National Communication describes inter alia the Norwegian policymaking process, the broad political agreement on climate policy and the policy instruments.

The political agreement on climate of 2012 states the following emission targets:

- Norway will over achieve the Kyoto commitment within the first Kyoto Protocol commitment period by 10 percentage points.
- During the period up to 2020, Norway will commit to cutting global emissions of greenhouse gases equivalent to 30 per cent of Norway's emissions in 1990. Following the political agreement on climate, Norway has made a commitment under the second commitment period of the Kyoto Protocol (KP 2). Under KP 2, Norway is committed to an emission reduction that corresponds to average annual emissions over the period 2013-2020 at 84 per cent of the 1990 emission level. The commitment under KP 2 is consistent with the Norwegian target of 30 per cent reduction of emissions by 2020, compared with 1990
- Norway will be carbon-neutral in 2050.
- As part of an ambitious global climate agreement where other developed nations also undertake ambitious commitments, Norway will adopt a binding goal of carbon neutrality no later than 2030. This means that Norway will commit to achieving emission reductions abroad equivalent to Norwegian emissions by 2030.

In this biennial report, Norway finds it relevant to report on the target under the Kyoto Protocol's second commitment period (2013-2020). CTF table 2 therefore describes relevant information for Norway's implementation of its KP 2 commitment. The information provided in CTF table 2 does not prejudge Norway's post-2020 approach.

For the Kyoto Protocol's second commitment period, Norway will report and account for all the seven mandatory gases or groups of gases. 1990 will be used as the base year, but the base year for NF_3 has not yet been decided. All mandatory sectors will be included and the global warming potential values from the Fourth Assessment Report of the IPCC will be used. An activity-based approach will be used for the LULUCF sector, but it has not yet decided whether activities other than forest management under article 3.4 will be used. All currently available mechanisms under the Convention may be used to meet the target. Future mechanisms will be considered, but a decision on this must first be taken by the COP, and if applicable, by the CMP.

CTF table 2a DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: BASE YEAR [a]

NORWAY

Base year/base period	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6: 1990, NF_3: not yet decided	
Emission reduction target	% of base year 84%	% of 1990[b]
Period for reaching target	2013-2020	

[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] Optional

CTF table 2b DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: GASES AND SECTORS COVERED [a]

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	Not yet decided	
Other gases	NA	
Sectors covered [b]	Energy	Yes
	Transport [c]	Yes
	Industrial processes [d]	Yes
	Agriculture	Yes
	LULUCF	Yes
	Waste	Yes
	Other (specify)	NA

[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] More than one selection will be allowed. If Parties use sectors other than those indicated above, the explanation of how these sectors relate to the sectors defined by the IPCC should be provided.

[c] Transport is reported as a subsector of the energy sector.

[d] Industrial processes refer to the industrial processes and solvent and other product use sectors.

CTF table 2c	DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: GLOBAL WARMING POTENTIAL VALUES (GWP)[a]

Gases	GWP values [b]
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
SF6	Fourth Assessment Report of the IPCC
NF_3	Fourth Assessment Report of the IPCC
Other gases	NA

Abbreviations: GWP = global warming potential

[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] Please specify the reference for the GWP: Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) or the Fourth Assessment Report of the IPCC.

CTF table 2d	DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: APPROACH TO COUNTING EMISSIONS AND REMOVALS FROM THE LULUCF SECTOR [a]

Role of LULUCF	LULUCF in base year level and target	Included
	Contribution of LULUCF is calculated using	Activity-based approach

Abbreviations: LULUCF = land use, land-use change and forestry.

[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.

CTF table 2e I — DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: MARKET-BASED MECHANISMS UNDER THE CONVENTION [a]

	Possible scale of contributions (estimated kt CO_2 eq)
CERs	All currently available mechanisms under the Convention may be used to meet the target. Future mechanisms will be considered, but first a decision on this must be taken by the COP, and if applicable, by the CMP. Possible scale of contribution: NE
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 2e II — DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: OTHER MARKET-BASED MECHANISMS [a]

	Possible scale of contributions (estimated kt CO_2 eq)
NA	Other market-based mechanisms that are not under the Convention will not be used for meeting Norway's target for KP 2.

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

CTF table 2f — DESCRIPTION OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET: ANY OTHER INFORMATION [a,b]

[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 reductwion targets.

[b] This information could include information on the domestic legal status of the target or the total assigned amount of emission units for the period for reaching a target. Some of this information is presented in the narrative part of the biennial report.

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 sixth National Communication describe these policies and measures and estimate the effect these have had on the historical and projected emissions. According to the estimates, the projected GHG emissions in 2010 would have been 12.6-15.2 million tonnes of CO_2 equivalents higher than observed, if these policies and measures had not been implemented. GHG emissions would be 17.1-20.1 million tonnes higher in 2020 and

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]
Emission trading 2013-2020	Energy, industry and air traffic	CO_2, N2O and PFCs	Pricing emissions gives incentives to cut emissions using measures with equivalent costs.	Economic	Implemented. Coverage of existing system further expanded, covering new sectors and gases
CO_2 tax	Energy	CO_2	Reduce emissions	Economic	Implemented
CO_2 tax on domestic aviation	Energy	CO_2	Reduce emissions	Economic	Implemented
CO_2 tax on natural gas and LPG	Energy	CO_2	Reduce emissions and avoid substitution	Economic	Implemented
CO_2 tax on fishing and catching in inshore waters	Energy	CO_2	Reduce emissions	Economic	Implemented
CO_2 tax offshore	Oil and gas extraction	CO_2	Reduce emissions	Economic	Implemented. To keep up the incentives to reduce emissions
Base tax on mineral oils	Energy	CO_2	Avoid substitution,	Economics	Implemented

17.8-20.5 million tonnes higher in 2030. 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 identifies the policies and measures already described in chapter 4 of Norway's sixth National Communication, but that are new or changed since Norway reported its fifth National Communication.

For the policies and measures included in CTF table 3 and for which the mitigation effect has been quantified, the total effect in 2020 is estimated at 1070-1120 kilotonnes of CO_2 equivalents respectively.

Brief description [e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2 eq)	
			2020	2030 [f]
The EU ETS is a market for selling and buying emission allowances as a measure to reduce emissions. See NC 4.3.1.4 for further details.	2013	Norwegian Environment Agency	NE	NE
Increase in the general CO_2 tax of NOK 100	2014	Ministry of Finance	NE	NE
Increase in the CO_2 tax on domestic aviation of NOK 50	2014	Ministry of Finance	NE	NE
Expand the CO_2 tax to include natural gas and LPG	2010	Ministry of Finance	0-50	0-50
Abolish the exempt for mineral oil used for fishing and catching in inshore waters and replace it by a low rate of NOK 0.13 per litre	2013	Ministry of Finance	NE	NE
Increase in the CO_2 tax for the petroleum activities by NOK 200 per tonne CO_2	2013	Ministry of Finance	NE	NE
Increase in base tax on mineral oils of NOK 539 per litre	2014	Ministry of Finance	NE	NE

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]
The Norwegian Energy fund, Enova	Multiple sectors, i.e.energy and industry, services, households	All six gases	Contribution to an environmentally friendly change in the consumption and production of energy and the development of energy and climate technologies	Economic	Implemented in 2002 and extended in 2012.
Energy requirement in the building code	Reduce use of fossil fuels and energy demand in new buildings	CO_2	Reduce emissions and energy use	Regulatory	Implemented 2007, strengthened 2010
CO_2-dependent registration tax for vehicles	Transport	CO_2	Reduce emissions from new cars	Economic	Implemented. Adjusted annually 2009-2013
Increase the requirement of bio fuels in road transport	Transport	CO_2	Reduce emissions	Regulatory	Implemented in 2009 (2.5%) and increased in 2010 (3.5%)
EU emission standards for passenger cars	Transport	CO_2	Reduce emissions per km driven	Regulatory	Adopted and partly implemented
N_2O reduction, production of nitric acid	Industry	N_2O	Reduce emissions	Voluntary	Implemented, reductions since 2010

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.

Brief description [e]	Start year of imple-mentation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2 eq)	
			2020	2030 [f]
The mandate now includes support of development and introduction of new energy and climate technologies.	2002	Enova SF	900	NE
		Ministry of Local Gov-ernment and Modern-isation	IE	
In all years since NC5 there has been added more weight on CO_2 emissions in the registration tax	2010, 2011, 2012, 2013	Ministry of Finance	NE	NE
In order to increase the use of biofuels, a mandatory turnover is in place	2010	Ministry of Climate and Environment	100	100
New emissions standards on new vehicles		European commission	NE	NE
Further emission reductions in the production of nitric acid	2010	NA	70	70

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.

Section 4.2, cf 4.3 of Norway's sixth National Communication describes the current domestic institutional arrangements. There have not been any changes to these arrangements since Norway reported its fifth National Communication.

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. Norway's approach to minimisation of adverse impacts of mitigation actions in accordance with Articles 2.3 and 3.14 of the Kyoto protocol is described in NC6 4.1.

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 be promoted.

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

Section 4.1 of this Biennial report and chapters 4 and 5.3 of Norway's sixth National Communication describe policies and measures that have reduced or will reduce Norway's national emissions. Section 5.4 and table 5.6 of Norway's sixth National Communication explains Norway's accounting under the Kyoto Protocol and the essence is included in this chapter to explain the roles of market-based mechanisms and the LULUCF sector.

First commitment period (2008-2012)

Norway's Assigned Amount Unit (AAU) under the Kyoto Protocol's first commitment period (2008-2012) of 1 per cent above the 1990-level, equals an annual average of about 50.1 million tonnes of CO_2 equivalents. The final number of units required to be retired for Norway's commitment under the first commitment period (2008-2012) of the Kyoto Protocol will only be known after the submission and review of the final annual report. However, the emissions levels for the period 2008-2012 are well known and the difference between average emissions and assigned amount is about 3.2Mt.

CTF tables 4 and 4(a)II reflect that the contributions from the LULUCF sector in Norway will be based on the accounting approach under the Kyoto Protocol and Norway reports on afforestation/reforestation and deforestation under article 3.3 of the Kyoto Protocol and on forest management under article 3.4 of the Kyoto Protocol. Norway does not expect any issuance of Removal Units (RMUs) pursuant to Article 3.3, but expects to issue about 1.5 million RMUs under Article 3.4 owing to forest management calculated as an annual average. Further, in line with what was stated in Norway's "Initial report" in 2006, these RMUs issued by Norway will not be used to meet the commitment under Article 3.1. If these units had been used for compliance, the need for net acquisition of Kyoto units would have been 1.7 Mt/year. In CTF table 4, the actual contribution from LULUCF to meet the commitment under Article 3.1 for the first commitment period is 0.

CTF table 4 REPORTING ON PROGRESS [a,b]

Year [c]	Total emissions excluding LULUCF (kt CO_2 eq)	Contribution from LULUCF [d] (kt CO_2 eq)[e]	Quantity of units from market based mechanisms under the Convention ((kt CO_2 eq)[f]	Quantity of units from other market based mechanisms (number of units and kt CO_2 eq)
1990	50 453	NA	NA	NA
2010	54 334	0	19 217	NA
2011	53 446	0	19 333	NA
2012	NA[g]	NA	19 133	NA

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

[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 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.

[c] Parties may add additional rows for years other than those specified below.

d Information in this column should be consistent with the information reported in table 4(a)I or 4(a)II, as appropriate. The Parties for which all relevant information on the LULUCF contribution is reported in table 1 of this common tabular format can refer to table 1.

[e] RMUs issued by Norway will not be used to meet the commitment under Article 3.1.

[f] Units from marked-based mechanisms correspond to the units surrendered by the installations in Norway that are covered by the EU ETS.

[g] The emissions for 2012 will be reported in April 2014.

Installations in Norway are covered by the European Union Emissions Trading System (EU ETS). International transfers within the EU ETS is also part of the emissions trading scheme under the Kyoto Protocol since each unit issued in the scheme is backed by an AAU in 2008-2012. The Norwegian installations have on average delivered 4.1 million more units (AAUs, ERUs and CERs)[7] annually to the Norwegian government than Norway has allocated free of charge or through sale under the EU ETS. This implies that the participation in the EU ETS in itself has led to a net acquisition of Kyoto units that has more than closed the gap between Norway's emissions and its commitment under the Kyoto Protocol's first commitment period. Thus, Norway meets its Kyoto commitment for the period 2008-2012 without any need for government purchases of Kyoto units.

In CTF table 4(b), Parties are asked to report on the amounts of units surrendered by that Party for that year that have not been previously surrendered by that or any other Party. Norway's interpretation of this is that Parties should report on the number of units transferred to its retirement account each year. This information is provided in Norway's Standard Electronic Format (SEF) tables that were submitted to the UNFCCC along with the submission of Norway's NIR.[8] The totals for each year in CTF table 4b are the same as the figures in the fourth column of CTF table 4. These units correspond to the units surrendered by the installations in Norway that are covered by the EU ETS for those particular years.

7. Installations are allowed to use about 3 Mt CERs and/or ERUs annually for compliance in 2008-2012, but have used less than 2Mt/year.

8. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php

CTF table 4b REPORTING ON PROGRESS [a, b, c]

Kyoto Protocol units [d] (kt CO_2 eq)			
AAUs			
2009	2010	2011	2012
19135	18680	15962	19132

	2009
Total	19342

Note: 20XX is the latest reporting year

Abbreviations: AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, lCERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.

[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.

[e] Additional columns for each market-based mechanism should be added, if applicable.

	Kyoto Protocol units d (kt CO_2 eq)												Other units d,e (kt CO_2 eq)			
	ERUs				CERs				tCERs		lCERs		Units from market-based mechanisms under the Convention		Units from other market-based mechanisms	
	2009	2010	2011	2012	2009	2010	2011	2012	2009	2010	2009	2010	2009	2010	2009	2010
	0	205	138	0	206	331	3232	0	0	0	0	0	0	0	0	0
			2010										**2011**			**2012**
			19217										19333			19133

Further units will be retired in due course. Parties will have a specific period of 100 days that is to occur after the completion of the review of the final annual report for the commitment period in order for Parties to continue making transactions for the purpose of 'truing up' any remaining differences between Parties' total emissions during the commitment period and units retired for compliance. SEF table 4 reported in April 2013 shows the number of units in the Norwegian registry and there are more than enough units available to meet Norway's commitment under the Kyoto Protocol's first commitment period.

Norway has voluntarily chosen to overachieve the Kyoto commitment for 2008-2012 by 10 per cent, which is equivalent to 5 million tonnes per year. In addition Norway will buy 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 EEA in 2012, as well as emissions related to the CCS test centre at Mongstad. The government needs to buy 4.3 million units annually for Norway to realise an overachievement, of 6.6 Mt when taking into acount RMUs issued under Article 3.4 of the Kyoto Protocol.

A governmental procurement programme for Kyoto units was established under the Ministry of Finance in 2007. About 30 Mt Kyoto units, mostly CERs, have been contracted in respect of the first commitment period. By end December 2013 22 million units were delivered, which is above the expected delivery volume and more than sufficient to realise the overachievement, for which 21.5 Mt is seen as needed. The total expenditure for the 2008-2012 portfolio is estimated at NOK 1,447 million (EUR 175 mill). 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.

CTF table 4a II	CTF TABLE 4(A)II PROGRESS IN ACHIEVEMENT OF THE QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGETS – FURTHER INFORMATION ON MITIGATION ACTIONS RELEVANT TO THE COUNTING OF EMISSIONS AND REMOVALS FROM THE LAND USE, LAND-USE CHANGE AND FORESTRY SECTOR IN RELATION TO ACTIVITIES UNDER ARTICLE 3, PARAGRAPHS 3 AND 4, OF THE KYOTO PROTOCOL [a,b, c]

Greenhouse gas source and sink activities	BY(5)	2008	2009
A. Article 3.3 activities			
A.1. Afforestation and Reforestation			
A.1.1. Units of land not harvested since the beginning of the commitment period [7]		-566.007	-696.261
A.1.2. Units of land harvested since the beginning of the commitment period [7]			
01-Norway		-18.028	-18.028
A.2. Deforestation		2 402.908	2 423.599
B. Article 3.4 activities			
B.1. Forest Management (if elected)		-28 412.245	-26 061.015
3.3. offset [7]			
FMcap [7]			
B.2. Cropland Management (if elected)	0.000	NA	NA
B.3. Grazing Land Management (if elected)	0.000	NA	NA
B.4. Revegetation Management (if elected)	0.000	NA	NA

Note: 1 kt CO_2 eq equals 1 Gg CO_2 eq.

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[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] Developed country Parties with a quantified economy-wide emission reduction target as communicated to the secretariat and contained in document FCCC/SB/2011/INF.1/Rev.1 or any update to that document, that are Parties to the Kyoto Protocol, may use table 4(a)II for reporting of accounting quantities if LULUCF contributes to the attainment of that target.

[c] Parties can include references to the relevant parts of the national inventory report, where accounting methodologies regarding LULUCF are further described in the documentation box or in the biennial reports.

[d] Net emissions and removals in the Party's base year, as established by decision 9/CP.2.

[e] All values are reported in the information table on accounting for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, of the CRF for the relevant inventory year as reported in the current submission and are automatically entered in this table.

[f] Additional columns for relevant years should be added, if applicable.

[g] Cumulative net emissions and removals for all years of the commitment period reported in the current submission.

Net emissions/removals(I)			Accounting Parameters?	Accounting Quantity?
2010	2011	Total?		
(Gg CO_2 equivalent)				
				-2 547.597
-678.666	-606.664	-2 547.597		-2 547.597
				0.000
173.515	-48.769	88.689		0.000
2 972.090	2 813.054	10 611,651		10 611.651
-28 220.154	-31 673.078	-114 366,501		-7 333.333
			8 064.054	0.000
			7 333.333	-7 333.333
NA	NA	NA	0.000	0.000
NA	NA	NA	0.000	0.000
NA	NA	NA	0.000	0.000

[h] The values in the cells "3.3 offset" and "Forest management cap" are absolute values.

[i] The accounting quantity is the total quantity of units to be added to or subtracted from a Party's assigned amount for a particular activity in accordance with the provisions of Article 7, paragraph 4, of the Kyoto Protocol.

[j] In accordance with paragraph 4 of the annex to decision 16/CMP.1, debits resulting from harvesting during the first commitment period following afforestation and reforestation since 1990 shall not be greater than the credits accounted for on that unit of land.

[k] In accordance with paragraph 10 of the annex to decision 16/CMP.1, for the first commitment period a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3 paragraph 3, may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[l] In accordance with paragraph 11 of the annex to decision 16/CMP.1, for the first commitment period of the Kyoto Protocol only, additions to and subtractions from the assigned amount of a Party resulting from Forest management under Article 3, paragraph 4, after the application of paragraph 10 of the annex to decision 16/CMP.1 and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

Second commitment period (2013-2020)

Norway's commitment implies that average annual emissions of greenhouse gases are to be limited to 84 per cent of emissions in 1990. This is in line with the target of reducing emissions by 30 per cent by 2020.

The exact number of AAUs Norway can issue for the period 2013-2020 pursuant to the commitment under Article 3.1 is not yet known. Norway expects to be eligible to issue RMUs corresponding to 3.5 per cent of total greenhouse gas emissions in 1990 from forest management (Article 3.4), or about 14 Mt for the entire period. The real increase in carbon stocks is expected to be much higher. The net changes in greenhouse gas emissions by sources and removals by sinks resulting from land-use change under Art. 3.3 (afforestation, reforestation and deforestation), measured as verifiable changes in carbon stocks in the commitment period, are accounted for in their entirety. It is uncertain whether this contribution will amount to a net reduction or a net emission. It is uncertain how and to what extent the participation in the EU ETS will contribute to the fulfilment of the commitments for 2013-2020.

Policies and measures that will ensure compliance with the commitment for the second commitment period under the Kyoto Protocol will, to a large extent, represent a continuation of an established system, which is well integrated into Norwegian climate policy. The current guidelines for the procurement programme for Kyoto units will continue during the period 2013-2020. The programme will only acquire UN-approved credits and contribute to the development of a global carbon market.

The carbon market is currently 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 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 will, as in the restrictions in the EU ETS, refrain from purchasing units from so-called industrial HFC projects. Furthermore, Norway will not purchase units from coal-based energy production without carbon capture and storage. A small part of the portfolio will be procured from the UN Adaptation Fund.

Norway has allocated funds for acquisitions and has also contracted the Nordic Environment Facility Cooperation (NEFCO) to acquire 30 million tonnes on its behalf.

CTF table 4(a)I

This table is not relevant for Norway since we will use an activity-based approach, see CTF table 4(a)II.

5 PROJECTIONS

The baseline scenario

Total greenhouse gas emissions excluding LULUCF are projected to remain relatively stable during the period up to 2020, before declining somewhat by 2030,(see CTF 6(a)). This projection profile reflects that emissions from the petroleum industry are expected to rise for some years to come before declining towards 2030. According to Statistics Norway's population projections (mean projection) the high immigration over the past years is assumed to continue, leaving the population in 2030 some 20 per cent higher than at present. Despite continued strong economic growth and population growth, emissions from the mainland economy are projected to remain at approximately the same level as in the past couple of years. Emissions per capita are thus projected to fall by 20 per cent by 2030 compared with 2011, both in the total and mainland economy. In the years since 1990, emissions per capita have been reduced by 10 per cent (in the mainland economy the reduction has been close to 20 per cent).

Net CO_2 sequestration is expected to decline. This is due to a combination of an assumed increase in logging and ageing of the Norwegian forests. Nevertheless, sequestration in forest and other land areas are projected to equal about two-fifths of the aggregate greenhouse gas emissions from Norwegian territory in 2030.

Emissions of greenhouse gases other than CO_2 were in 2011 reduced to just above half the level in 1990. Only a slight further decrease is projected for the next two decades; see CTF 6(a). However, during the period up to 2020, the projections show that lower emissions of methane will to some extent be offset by higher emissions of HFC gases owing to the increased use of cooling appliances containing HFCs.

The emission path from oil and gas extraction is based on the expected production profile of oil and gas. In 2030, emissions from the petroleum sector are projected to be 15 per cent lower than in 2020. Compared with the previous national communication, emissions in 2020 are expected to be somewhat higher owing to an estimated longer lifetime of fields in production, postponed start-up of some projects under development and new emission factors for flaring. Estimates for 2030 were not given in the previous national communication.

CTF table 5 SUMMARY OF KEY VARIABLES AND ASSUMPTIONS USED IN THE PROJECTIONS ANALYSIS [a]

Key underlying assumptions	Historical b			Projected	
	1990	2000	2011	2020[c]	2030[d]
	Million NOK. Fixed 2005-prices				
Gross domestic product	1 221 175	1 756 996	2 061 807	2 677 835	3 212 241
- Petroleum activities and ocean transport	269 222	487 421	389 785	403 467	332 957
- Mainland Norway	929 055	1 281 285	1 684 451	2 284 509	2 889 388
Consumption	756 556	1 041 930	1 444 246	2 054 255	2 740 279
Gross fixed capital formation	201 691	302 671	421 954	517 496	530 251
- Petroleum activities and ocean transport	64 919	88 473	124 695	142 409	94 806
- Mainland Norway	133 965	213 506	297 701	375 754	434 836
Population in 1000	4 250	4 503	4 986	5 572	6 080
Number of persons employed in 1000	2 059	2 320	2 632	2 924	3 036
Oil price (2011-NOK)	248	328	622	505	505

[a] Parties should include key underlying assumptions as appropriate.

[b] Parties should include historical data used to develop the greenhouse gas projections reported.

[c, d] 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 6a INFORMATION ON UPDATED GREENHOUSE GAS PROJECTIONS UNDER A 'WITH MEASURES' SCENARIO[a]

	GHG emissions and removals[b] (kt CO_2 eq)					
	Base year for each gas (year):	1990	1995	2000	2005	2010
Sector d,e						
Energy	18390	18390	20009	22690	23938	25616
Transport	11102	11102	12148	12900	13756	15106
Industry/industrial processes	13998	13998	11284	11959	10430	7910
Agriculture	5013	5013	5016	4975	4878	4456
Forestry/LULUCF	-15348	-15348	-19785	-14996	-26806	-23578
Waste management/waste	1860	1860	1764	1493	1274	1228
Other (specify)						
Gas						
CO_2 emissions including net CO2 from LULUCF	19471	19471	17990	26778	16232	21945
CO_2 emissions excluding net CO2 from LULUCF	34833	34833	37791	41791	43059	45548
CH_4 emissions including CH4 from LULUCF	5031	5031	5200	5058	4763	4524
CH_4 emissions excluding CH4 from LULUCF	5030	5030	5199	5199	4763	4522
N_2O emissions including N2O from LULUCF	4942	4942	4549	4606	4810	3075
N_2O emissions excluding N2O from LULUCF	4929	4929	4534	4589	4789	3053
HFCs	0	0	80	327	524	914
PFCs	3370	3370	2008	1318	829	205
SF_6	2200	2200	608	934	312	75
Other (specify, e.g. NF_3)						
Total with LULUCFf	35015	35015	30435	39021	27470	30739
Total without LULUCF	50362	50362	50220	54017	54276	54317

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] 20XX 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

		GHG emission projections (kt CO_2 eq)	
2011	20XXc-3	2020	2030
24592		25300	23000
15239		15900	16600
7828		8100	7700
4485		4200	4200
-27573		-23800	-19800
1221		800	700
17055		22400	24700
44651		46200	44500
4398		NE	NE
4397		3900	3700
3102		NE	NE
3079		2900	3000
950		1100	700
226		200	200
61		100	100
25791		30500	32400
53364		54300	52200

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.

The updated emissions projections for the mainland economy for 2020 are almost 4 million tonnes lower than the figures in the previous national communication (NC 5). Lower projected emissions from manufacturing industry, transport and use of heating oil are the main contributors to the downward adjustment. Technical improvements in the production of fertiliser and somewhat stronger efficiency improvements are the most important factors behind the downward adjustment in manufacturing industries. It is assumed that energy-intensive manufacturing industries will consume approximately the same amount of electricity as in 2010. However, as a result of increased productivity, production levels in energy-intensive industries will rise somewhat over time while emissions remain stable. Thus, the emissions per produced unit will continue to fall. The future decline in emission intensity is expected to be in line with historical trends.

Electricity generation in Norway is almost entirely based on hydro. Emissions from this sector are projected to remain at a low level in the decades to come, at about 3 per cent of total emissions. As opposed to other countries, Norway does not have the opportunity to reduce emissions from electricity generation by developing more renewable energy.

Consumption of heating oil is assumed to be lower in 2020 and 2030 than today. Higher oil prices, stricter regulation on the use of heating oil and more generous subsidies for substitution support this development. Use of heating oil in households is projected to be phased out by 2030.

Emissions from transport are projected to increase somewhat. However, compared with the previous national communication,

A.7	CHANGES IN GHG EMISSIONS COMPARED WITH THE 5TH NATIONAL COMMUNICATION BY GAS. MILLIONS TONNES OF CO_2 EQUIVALENTS

	1990	2010	2020
Total emissions (excluding LULUCF)	0.7	-3.0	-2.1
CO_2	0.0	-2.1	-1.2
Other greenhouse gases	0.6	-0.9	-0.9
CH_4	0.4	0.2	0.2
N_2O	0.2	-0.8	-1.2
HFC	0.0	0.4	0.5
PFC	0.0	-0.6	-0.3
SF_6	0.0	0.0	0.0

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

emissions have been adjusted downwards. Future growth in emissions from road transport is expected to decline significantly compared with the trend until the mid-2000s and almost come to a halt, which is in line with the observed trend for the last 5-6 years. The changes in car taxation have significantly contributed to this development. Continued technological improvements and lower per capita traffic growth mean that the low growth is expected to continue. Constant improvements in technology over several decades have ensured a reduction in the emission intensity. Stricter environmental regulation, in the form of high fuel taxes in a number of countries, and more stringent emission standards have supported the development of more fuel-efficient cars. Nevertheless, high population and traffic growth have caused emissions from road traffic to increase in Norway. Retaining the current strong incentives to choose low-emission cars, along with continued technological improvements, will help to ensure continued efficiency improvements of the car fleet in future.

CTF table 6(a). Information on updated greenhouse gas projections under a ‘with measures’ scenario [a]

CTF table 6(b). Information on updated greenhouse gas projections under a ‘without measures’ scenario
Norway does not report projections under a “without measures” scenario.

CTF table 6(c). Information on updated greenhouse gas projections under a ‘with additional measures’ scenario
Main differences in projections between current and previous communication
Norwegian emissions in 1990 were recently increased by 0.7 million tonnes of CO_2 equivalents, to 50.4 million tonnes, primarily as the result of higher estimated digestive emissions from livestock, (cf. higher emissions of methane and N_2O in the first column of Table A.7 and from agricultural in A.8.
Emissions in 2010 turned out to be 3 million tonnes of CO_2 equivalents lower than estimated in the previous communication. Lower emissions from transport and industrial processes contributed most to the downward adjustment. In the previous communication emissions from fugitives were not reported separately. Most of these emissions take place in the oil and gas industry. The sectoral division has changed for other emissions as well, so great care should be taken in interpreting the changes on a disaggregated level.

Compared with the projections in the previous communication this report envisages a reduction in emissions by 2020 of 2 million tonnes of CO_2 equivalents. This downward adjustment of Norway's projected emissions in 2020 has been made despite an increase of close to 3 per cent in the estimated 2020 population of Norway. In isolation, a higher population would suggest higher activity levels and increased emissions of greenhouse gases.

As has been discussed in chapter 5 the main revisions in 2020 stem from:

- Lower emissions from manufacturing industry, by almost 3 million tonnes of CO_2 equivalents. Measures in the fertiliser industry have among others lowered the emissions of N_2O both in 2010 and 2020. Moreover, observed lower activity and emission in refining has led to a downward revision also for future activity.
- Lower emissions from road transport, by close to 1 ½ million tonnes of CO_2 equivalents. This prolongs an already observed trend where growth in emissions from road transport has flattened out, partly owing to changes in car taxation during the past 5-6 years.
- Lower emissions from use of heating oil in households. Emissions have been falling steadily for the past 20 years. In addition, a step up in the use measures in recent years suggests that the expected household consumption of heating oil will continue to fall in future.
- On the other hand emissions from oil and gas extraction in 2020 have been revised upwards by close to 2 million tonnes of CO_2 equivalents. The revision is due to several changes in conditions, among others estimated longer lifetime of fields in production, postponed start-up of some projects under development and new emission factors for flaring.

A.8 CHANGES IN GHG EMISSIONS COMPARED WITH THE 5TH NATIONAL COMMUNICATION BY SECTOR. MILLIONS TONNES OF CO_2 EQUIVALENTS

	1990	2010	2020
Total Energy	0.0	-1.7	-0.6
- Oil and gas production	-2.8	-3.8	-0.3
- Fugitives	3.0	3.3	3.2
- Transport	-0.2	-0.7	-1.4
- Other sectors	-0.1	-0.5	-2.0
Industrial Processes	0.1	-1.4	-1.4
Agriculture	0.6	0.2	0.0
Waste	0.0	-0.2	-0.2
Total emission (excluding LULUCF)	0.7	-3.0	-2.1

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

6 PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY-BUILDING SUPPORT TO DEVELOPING COUNTRY PARTIES

Norway provides a wide range of financial, technological and capacity-building support to developing country Parties in order to build their capacity to reduce carbon emissions and to take action against the negativeeffects of climate change. The budget for climate change mitigation and adaptation assistance has increased strongly over the past 7 years.

The main priorities for Norwegian climate finance in recent years have been reducing emissions from deforestation and forest degradation and promotion of renewable energy and energy conservation/efficiency. Adaptation to climate change is another priority, with particular focus on food security and disaster risk reduction.

In 2006 the share of bilateral climate finance in the overall Official Development Assistance (ODA) budget was around 3 per cent, which by 2012 had increased to 18 per cent. During the same period, the total ODA budget also increased from an already high level.

All figures in this report are ODA contributions; non-ODA contributions to various climate change activities are not included. All Norwegian assistance mentioned in this report is on a grant basis (no loans). The funding is considered to be new and additional because it was drawn from the growing aid programme and did not divert funds from existing development priorities or programmes.

Table 7 PROVISION OF PUBLIC FINANCIAL SUPPORT: SUMMARY INFORMATION IN 2011[a]

Allocation channels	Domestic currency	
	Core/ general[c]	Mitigation
Total contributions through multilateral channels:		
Multilateral climate change funds[g]	194.3	-0.4
Other multilateral climate change funds[h]		
Multilateral financial institutions, including regional development banks	1 665.7	
Specialized United Nations bodies	870.0	
Other multilateral channels		
Total contributions through bilateral, regional and other channels		66.6
Total	2 730.1	66.2

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should provide an explanation on methodology used for currency exchange for the information provided in table 7, 7(a) and 7(b) in the box below.

[c] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[d] Parties should explain in their biennial reports how they define funds as being climate-specific.

The reporting period in this Biennial Report covers the years 2011 and 2012 of Norway's three year fast-start commitment. Funds are, as required, reported in NOK and USD. Figures are based on an average exchange rate of (NOK- 1 USD): 2011: 5.6046 and 2012: 5.8149.

Norway's financial contribution will be elaborated in tables 7(a-b) below. 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. Contributions in the area of capacity building and technology transfer are elaborated in detail in section 7.4 of the sixth National Communication, while tables 8 and 9 provide this information in tabular format.

6.1 National approach to tracking and reporting provision of support

Norway's climate change finance is tracked by the Norwegian Agency for Development Cooperation (Norad), using Norwegian Aid Statistics. The report covers our bilateral (including support to non-governmental organisations) and multilateral support for climate change action in developing countries. It should be noted that the information is based on the OECD/DAC reporting system, which uses markers for climate change mitigation and adaptation. The markers indicate degree of relevance only. Consequently, the figures should be inter-

Year – 2011 (NOK mill) Climate-specific[d]			USD[b] (mill.)				
Adaptation	Cross-cutting[e]	Other[f]	Core/ general	Climate-specific Mitigation	Adaptation	Cross-cutting	Other
			34.7	-0.1			
	733.8		297.2			130.9	
	283.5		155.2			50.6	
	143.8					25.7	
8.6	1 887.9			11.9	1.5	336.8	
8.6	3 049.0		487.1	11.8	1.5	544.0	

[e] This refers to funding for activities which are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

preted with some caution. Since there is no room for distinction between the two values main objective and significant objective, this reporting treats them as equal. This may lead to overestimation of climate change funding. Hence, the figures should be interpreted as "total value of projects that fully, or to a certain degree, target climate change mitigation and adaptation".

It should also be noted that the term "bilateral" includes assistance through public and private sector, as well as NGOs. The figures applied under core-support to multilateral channels, refer to all un-earmarked support to the organisation, regardless of its climate change relevance.

All items in the tables are specified as provided. This means that the amounts are disbursed during the year reported for.

While a large part of our total 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 climate change resilience. Furthermore, renewable energy projects may promote climate change adaptation. In these cases, both markers have been used. This has been part of a conscious effort to ensure more consistent use of (especially) the adaptation marker since 2010. For 2011, we reported that the numbers for adaptation were too low, since not all disaster risk reduction (DRR) assistance was included. In 2012, the adaptation marker was used also for DRR.

6.2 Private Finance

Norway acknowledges that major financial investments – from both public and private sources and guided by smart and equitable policies – are required to transition the world's economy to a low-carbon path, reduce greenhouse gas concentrations to safe levels, and build the resilience of vulnerable countries to climate change. The dominant global capital flows are private, and in order to be able to manage climate change, it is of the utmost importance to link these flows to efforts both to tackle climate change and to adapt to its negative effects.

Many of the efforts undertaken by Norway in the field of climate change are directed at strengthening technical and institutional capacity to support private sector investment. The objective of this is to support institutional capacity-building, the implementation of policy and legal reforms and the establishment of monitoring and reporting systems, which will promote regulatory regimes that provide incentives for commercial investment.

In addition, the Norwegian MFA, Norad and other government actors play an important catalytic role by creating meeting places for an exchange of experience and information, for the development of skills and expertise and also with the aim of preparing for further investment by providing catalytic contributions.

Nevertheless, tracking private climate finance is not a straight forward undertaking. Through the *OECD Research Collaborative on Tracking Private Climate Finance*, Norway, other developed countries and several organisations have partnered to try to fill the knowledge gaps both on the overall architecture and on measurement of private climate finance flows to, between and in developing countries, as well as on determining how developed country public interventions mobilise private finance. The results of this endeavour might in the future help track and attribute finance flows mobilised by public investments.

Table 7 Provision of public financial support: summary information in 2012

Allocation channels	Year – 2012									
	Domestic currency (NOK mill)					USD (mill.)				
	Core/ general	Climate-specific				Core/ general	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels:										
Multilateral climate change funds	162.3					27.9				
Other multilateral climate change funds										
Multilateral financial institutions, including regional development banks	1 634.4			1 388.4		281.1			238.8	
Specialized United Nations bodies	870.0			437.4		149.6			75.2	
Other multilateral channels				138.0					23.7	
Total contributions through bilateral, regional and other channels		272.1	25.3	2 687.0			46.8	4.4	462.1	
Total	2 666.8	272.1	25.3	4 650.8		458.6	46.8	4.4	799.8	

7 A PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH MULTILATERAL CHANNELS IN 2011

Donor funding	Total amount (NOK mill.)		Status	Funding source	Financial instrument	Type of support	Sector
	Core/ general	Climate-specific					
Multilateral climate change funds							
1. Global Environment Facility	106.3		Provided	ODA	Grant	Other	Other
2. Least Developed Countries Fund	53.0		Provided	ODA	Grant	Other	Other
3. Special Climate Change Fund	15.0		Provided	ODA	Grant	Other	Other
4. Adaptation Fund							
5. Green Climate Fund							
6. UNFCCC Trust Fund for Supplementary Activities UNFCCC	20.0	-0.4	Provided	ODA	Grant	Mitigation	Cross-cutting
7. Other multilateral climate change funds							
Subtotal	**194.3**	**-0.4**					
Multilateral financial institutions, including regional development banks							
1. World Bank (excl. IFC)	1 019.0	719.8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation							
3. African Development Bank	534.2		Provided	ODA	Grant	Other	Other
4. Asian Development Bank	71.8		Provided	ODA	Grant	Other	Other
5. European Bank for Reconstruction and Development	37.3	14.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	3.5		Provided	ODA	Grant	Other	Other
7. Other							
Subtotal	**1 665.7**	**733.8**					
Specialized United Nations bodies							
1. United Nations Development Programme	770.0	280.8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	100.0	2.7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. Other							
Subtotal	**870.0**	**283.5**					
Other multilateral channels		**143.8**	**Provided**	**ODA**	**Grant**	**Cross-cutting**	**Cross-cutting**
Total	**2 730.1**	**1 160.8**					

7 A PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH MULTILATERAL CHANNELS IN 2012

Donor funding	Total amount (NOK mill.) Core/ general	Climate-specific	Status	Funding source	Financial instrument	Type of support	Sector
Multilateral climate change funds							
1. Global Environment Facility	106.3		Provided	ODA	Grant	Other	Other
2. Least Developed Countries Fund	20.0		Provided	ODA	Grant	Other	Other
3. Special Climate Change Fund	17.0		Provided	ODA	Grant	Other	Other
4. Adaptation Fund							
5. Green Climate Fund							
6. UNFCCC Trust Fund for Supplementary Activities UNFCCC	19.0		Provided	ODA	Grant	Other	Other
7. Other multilateral climate change funds							
Subtotal	**162.3**						
Multilateral financial institutions, including regional development banks							
1. World Bank (excl. IFC)	1 008.4	1 197.9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation							
3. African Development Bank	533.8	155.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	73.5	20.0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	15.4	15.5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	3.3		Provided	ODA	Grant	Other	Other
7. Other							
Subtotal	**1 634.4**	**1 388.4**					
Specialized United Nations bodies							
1. United Nations Development Programme	770.0	408.9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	100.0	28.6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. Other							
Subtotal	**870.0**	**437.4**					
Other multilateral channels		**138.0**	**Provided**	**ODA**	**Grant**	**Cross-cutting**	**Cross-cutting**
Total	**2 666.8**	**1 963.9**					

7 B	PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH BILATERAL, REGIONAL AND OTHER CHANNELS IN 2011

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	20,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Cameroon	0,3	Provided	ODA	Grant	Mitigation	Energy
	Congo, Dem. Rep.	14,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Eritrea	0,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ethiopia	31,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ghana	3,7	Provided	ODA	Grant	Mitigation	Forestry
	Kenya	24,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Liberia	4,9	Provided	ODA	Grant	Mitigation	Forestry
	Madagascar	6,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malawi	158,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mali	28,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mozambique	52,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Niger	8,2	Provided	ODA	Grant	Adaptation	Other
	Nigeria	0,3	Provided	ODA	Grant	Mitigation	Energy
	South Africa	9,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South of Sahara Regional	83,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South Sudan	9,4	Provided	ODA	Grant	Mitigation	Cross-cutting
	Tanzania	96,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Togo	1,0	Provided	ODA	Grant	Mitigation	Cross-cutting
	Uganda	103,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Zambia	178,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
America	America Regional	2,5	Provided	ODA	Grant	Mitigation	Other
	Brazil	364,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Chile	-68,1	Provided	ODA	Grant	Mitigation	Energy
	Cuba	0,7	Provided	ODA	Grant	Mitigation	Water/ sanitation
	Dominican Republic	0,2	Provided	ODA	Grant	Mitigation	Other
	Guatemala	11,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Guyana	6,0	Provided	ODA	Grant	Mitigation	Cross-cutting
	Haiti	0,4	Provided	ODA	Grant	Cross-cutting	Agriculture
	Nicaragua	24,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Panama	38,8	Provided	ODA	Grant	Mitigation	Energy
	Peru	3,5	Provided	ODA	Grant	Mitigation	Forestry
	St.Vincent & Grenadines	0,7	Provided	ODA	Grant	Mitigation	Other
Asia	Afghanistan	7,0	Provided	ODA	Grant	Mitigation	Energy
	Armenia	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
	Asia Regional	16,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Azerbaijan	2,6	Provided	ODA	Grant	Mitigation	Energy
	Bangladesh	4,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Bhutan	13,8	Provided	ODA	Grant	Mitigation	Cross-cutting
	Cambodia	0,2	Provided	ODA	Grant	Mitigation	Cross-cutting
	China	38,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Georgia	1,5	Provided	ODA	Grant	Mitigation	Energy
	India	42,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Indonesia	15,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Kazakhstan	4,7	Provided	ODA	Grant	Mitigation	Cross-cutting
	Kyrgyz Rep.	0,1	Provided	ODA	Grant	Mitigation	Agriculture
	Laos	38,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malaysia	1,4	Provided	ODA	Grant	Mitigation	Forestry
	Myanmar	0,3	Provided	ODA	Grant	Mitigation	Other
	Nepal	43,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Pakistan	10,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Philippines	45,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Sri Lanka	0,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Tajikistan	7,5	Provided	ODA	Grant	Mitigation	Energy
	Thailand	0,3	Provided	ODA	Grant	Adaptation	Cross-cutting
	Viet Nam	1,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Europe	Belarus	3,8	Provided	ODA	Grant	Mitigation	Cross-cutting
	Europe Regional	6,1	Provided	ODA	Grant	Mitigation	Cross-cutting
	Kosovo	4,1	Provided	ODA	Grant	Mitigation	Forestry
	Macedonia (Fyrom)	8,9	Provided	ODA	Grant	Mitigation	Cross-cutting
	Serbia	0,0	Provided	ODA	Grant	Cross-cutting	Other
	Ukraine	1,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Not geographically allocated	Global Unspecified	419,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Oceania	Papua New Guinea	0,3	Provided	ODA	Grant	Mitigation	Other
The Middle East	Palestine	0,5	Provided	ODA	Grant	Mitigation	Water/sanitation
Total		**1 963,0**					

7 B	PROVISION OF PUBLIC FINANCIAL SUPPORT: CONTRIBUTION THROUGH BILATERAL, REGIONAL AND OTHER CHANNELS IN 2012

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
Africa	Africa Regional	25,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Angola	1,1	Provided	ODA	Grant	Adaptation	Cross-cutting
	Burundi	0,3	Provided	ODA	Grant	Adaptation	Other
	Cameroon	0,8	Provided	ODA	Grant	Mitigation	Energy
	Congo, Dem. Rep.	14,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ethiopia	100,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ghana	1,5	Provided	ODA	Grant	Mitigation	Forestry
	Kenya	19,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Liberia	3,7	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Madagascar	15,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malawi	83,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mali	32,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Mozambique	66,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Namibia	1,8	Provided	ODA	Grant	Adaptation	Other
	Niger	8,4	Provided	ODA	Grant	Adaptation	Other
	Nigeria	3,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Somalia	-0,1	Provided	ODA	Grant	Adaptation	Agriculture
	South Africa	21,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South of Sahara Regional	85,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	South Sudan	11,9	Provided	ODA	Grant	Mitigation	Energy
	Sudan	1,0	Provided	ODA	Grant	Adaptation	Agriculture
	Tanzania	117,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Togo	1,3	Provided	ODA	Grant	Mitigation	Energy
	Uganda	90,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Zambia	72,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
America	America Regional	5,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Brazil	1 186,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Chile	186,8	Provided	ODA	Grant	Mitigation	Energy
	Cuba	12,0	Provided	ODA	Grant	Mitigation	Other
	Guatemala	1,1	Provided	ODA	Grant	Adaptation	Cross-cutting
	Guyana	2,3	Provided	ODA	Grant	Mitigation	Forestry
	Haiti	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Nicaragua	11,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	North & Central America Regional	0,0	Provided	ODA	Grant	Cross-cutting	Other
	Panama	8,8	Provided	ODA	Grant	Mitigation	Energy

Region	Country	Total amount (NOK mill.)	Status	Funding source	Financial instrument	Type of support	Sector
	Peru	9,4	Provided	ODA	Grant	Mitigation	Cross-cutting
Asia	Afghanistan	3,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Armenia	5,9	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Asia Regional	42,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Azerbaijan	2,7	Provided	ODA	Grant	Mitigation	Energy
	Bangladesh	2,3	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Bhutan	4,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Cambodia	0,4	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	China	46,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Georgia	0,9	Provided	ODA	Grant	Mitigation	Energy
	India	107,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Indonesia	33,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Kazakhstan	3,4	Provided	ODA	Grant	Mitigation	Cross-cutting
	Laos	0,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Malaysia	1,2	Provided	ODA	Grant	Mitigation	Forestry
	Myanmar	8,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Nepal	70,6	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	North Korea	10,0	Provided	ODA	Grant	Adaptation	Other
	Pakistan	7,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Philippines	-13,5	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Sri Lanka	4,0	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Tajikistan	11,9	Provided	ODA	Grant	Mitigation	Energy
	Thailand	0,7	Provided	ODA	Grant	Adaptation	Cross-cutting
	Viet Nam	4,2	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Europe	Albania	1,8	Provided	ODA	Grant	Cross-cutting	Energy
	Belarus	1,2	Provided	ODA	Grant	Mitigation	Other
	Europe Regional	2,8	Provided	ODA	Grant	Cross-cutting	Other
	Kosovo	6,5	Provided	ODA	Grant	Mitigation	Forestry
	Macedonia (Fyrom)	9,1	Provided	ODA	Grant	Mitigation	Cross-cutting
	Serbia	1,8	Provided	ODA	Grant	Cross-cutting	Cross-cutting
	Ukraine	0,9	Provided	ODA	Grant	Cross-cutting	Other
Not geographically allocated	Global Unspecified	393,1	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Oceania	Papua New Guinea	0,3	Provided	ODA	Grant	Mitigation	Other
The Middle East	Jordan	0,2	Provided	ODA	Grant	Adaptation	Other
	Palestine	0,9	Provided	ODA	Grant	Adaptation	Other
Total		**2 984,4**					

6.3 Technology Transfer

Transfer of technology and know-how in order to promote development, availability and efficiency of energy constitutes an important element of Norwegian Official Development Assistance (ODA) and has significant environmental co-benefits that are consistent with the promotion of the Framework Convention on Climate Change. In addition Norway supports a wide range of technology transfer and capacity building efforts.

8 PROVISION OF TECHNOLOGY DEVELOPMENT AND TRANSFER SUPPORT[1,2]

Recipient country and region	Targeted area *Mitigation* *Adaptation* *Mitigation and adaptation*	Measures and activities related to technology transfer
Kenya, Bhutan, Liberia, Ethiopia, Maldives, Senegal, Morocco, Tanzania, Nepal, Mali, Grenada, Mozambique	Mitigation and adaptation	**Energy**+ supports development of low-carbon and energy sector strategies, establish reference levels, and 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 and the establishment of monitoring and reporting systems, and will promote regulatory regimes that provide incentives for commercial investments.
Ethiopia, Liberia, Mozambique, Nepal, Tanzania, Timor-Leste, Uganda	Mitigation and adaptation	**The Norwegian Clean Energy for Development Initiative** contributes to the international transfer of energy-related technology by supporting investment in infrastructure and 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.
Angola, Bolivia, Ghana, Mozambique, Sudan, South-Sudan, Timor-Leste, Uganda	Mitigation and adaptation	The **Oil for Developmen**t (OfD) programme was launched by the Norwegian Government in 2005, and has a considerable element of technology transfer and capacity-building. The operative goal of the programme is "economically, environmentally and socially responsible management of petroleum resources which safeguards the needs of future generations".
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 investment in profitable companies and the transfer of knowledge and technology, it helps to reduce poverty and to stimulate economic progress in poor countries.
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.

[1] To be reported to the extent possible

[2] The tables should include measures and activities since the last national communication or biennial report

[3] Parties may report sectoral disaggregation, as appropriate.

Norway is a member of institutions and initiatives that have the exchange of research results and transfer of technology as a main target, e. g. the International Energy Agency and the Climate Technology Initiative. Bilateral assistance projects are another important means for technology transfer, often even if technology transfer is not the main target.

Elaborate information on measures to support technology transfer and access, supported by Norway, can be found in NC6 7.4 and in table 8.

Sector[3] *Energy, Transport Industry, Agriculture Water and sanitation Other*	**Source of the funding for technology transfer** *Private Public Private and public*	**Activities undertaken by** *Private Public Private and public*	**Status** *Implemented Planned*	**Additional Information** [4]
Renewable energy Energy efficiency Energy access	Public	Private and public	Implemented	
Renewable energy Energy efficiency Energy access	Public	Private and public	Implemented	
Energy	Public	Private and public	Implemented	
Renewable energy Energy efficiency Energy access Industry Transport	Private and public	Private and public	Implemented	
Renewable energy Energy efficiency Energy access Industry	Public	Private and public	Implemented	Norway's contribution to EnDev is NOK 184 million the the period 2011-2015.

[4] *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.*

Recipient country and region	Targeted area *Mitigation* *Adaptation* *Mitigation and adaptation*	Measures and activities related to technology transfer
Non-Annex I	Mitigation	Norway has been an active supporter of the **International Renewable Energy Institute** (IRENA) since the early planning 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. We contribute 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 its own renewable energy resources and industries.
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 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 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.
non Annex-I	Mitigation and adaptation	**The Climate Technology Initiative** (CTI) is a multilateral cooperative activity that supports implementation of the UNFCCC by fostering international cooperation for accelerated development and diffusion of climate-friendly technologies and practices. CTI was originally established at the first Conference of the Parties to the UNFCCC in 1995. Since July 2003, CTI has been operating under an implementing agreement of the International Energy Agency.
Botswana, South Africa, China, Kosovo, Indonesia, Egypt, Jordan, Maghreb, and Mexico	Mitigation	**The World Bank CCS Capacity Building Trust Fund for developing countries:** In 2009, Norway was the largest donor to the establishment of the World Bank CCS Capacity Building Trust Fund. The Fund's purpose is to strengthen the opportunities of developing countries to promote economic growth with low CO_2 emissions through technology cooperation that promotes the use of CO_2 capture and storage technologies in industry and the energy sector.
All	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 Ministry of Petroleum and Energy is a member of the institute.

Sector[3]	Source of the funding for technology transfer	Activities undertaken by	Status	Additional Information [4]
Energy, Transport Industry, Agriculture Water and sanitation Other	*Private Public Private and public*	*Private Public Private and public*	*Implemented Planned*	
Renewable Energy	Public	Private and public	Implemented	Norway announced a voluntary contribution to IRENA of USD 2 million in 2014.
Renewable energy Energy efficiency Energy access	Public	Public and Private	Implemented	
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 Improving policies and enhanced deployment of clean energy technologies is the main objective.
Renewable energy Energy efficiency Energy access	Private and Public	Private and Public	Implemented	Through a variety of capacity-building activities, CTI has promoted technology transfer to and among developing and transition countries. In addition to their current and future environmental benefits, these efforts are promoting near- and long-term global economic and social stability.
Energy Industry	Public	Public and private	Implemented	The support of NOK 83 million (primarily development assistance funds), will help to strengthen technology cooperation between industrialised countries and developing countries.
Energy Industry	Public and private	Public and private	Implemented	

Recipient country and region	Targeted area *Mitigation* *Adaptation* *Mitigation and adaptation*	Measures and activities related to technology transfer
All	Mitigation	**The technology centre for CO_2 capture at Mongstad:** The CO_2 Technology Centre Mongstad initiated the technology center to create an arena for targeted development, testing and qualification of CO_2 capture technologies. International dissemination of the center's experiences and results is important so as to reduce the costs and risks associated with large-scale CO_2 capture.
Non Annex I	Mitigation	**The Renewable Energy and Energy Efficiency Partnership (REEEP)** is a market catalyst for clean energy in developing countries and emerging markets. In this role, it acts as a funder, information provider and connector for up-scaling clean energy business models.
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.

Sector[3]	Source of the funding for technology transfer	Activities undertaken by	Status	Additional Information [4]
Energy, Transport Industry, Agriculture Water and sanitation Other	*Private Public Private and public*	*Private Public Private and public*	*Implemented Planned*	
Energy Industry	Private and public	Private and public	Implemented	
Renewable energy Energy efficiency	Public	Private and public	Implemented	Norway has been the 2nd largest donor to the Renewable Energy and Energy Efficiency Partnership (REEEP) since 2006, and has supported with a total of NOK 61.5 million. REEEP has supported 185 projects in 65 different countries.
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. We have supported GEEREF over a period of four years with totally NOK 110 million.

6.4 Capacity building

Countries face a range of challenges in responding to climate change. Capacity development is a critical factor in enabling developing countries to face up to climate change. Capacity is required to receive financial and technology-related support for adaptation and mitigation and to ensure that such support is sustainable.

National expertise and know-how on climate change and its effects is significant, as well as strengthening institutions so that the countries in the longer term will themselves be able to integrate climate change into their planning process and pursue a national climate change policy. The best results are achieved when capacity development is based on countries' own needs and priorities and is a joint learning process owned and operated nationally but taking place in partnership. Capacity building is primarily an integral part of the programmes and projects supported by the Norwegian MFA and Norad. The integrated approach is of key significance since capacity cannot develop in a vacuum and is always linked to the relevant activity.

Detailed information on capacity-building measures, supported by Norway, can be found in NC6 Chapter 7 and in table 9 below.

9 PROVISION OF CAPACITY-BUILDING SUPPORT [1]

Recipient country/ region	Targeted area *Mitigation* *Adaptation* *Technology development and transfer*	Programme or project title	Description of programme or project [2,3]
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 35 member 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. In 2012, Norway contributed USD 32.8 million to the UN-REDD Programme
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 established to provide financial and technical assistance to countries seeking to build their capacity to effectively implement REDD+. In 2012, Norway disbursed approximately USD 150 million for this purpose.
Developing country partners	Mitigation	**Partnership for Market Readiness**	Norway is one of the contributing participants in the World Bank Partnership for Market Readiness (PMR). The PMR brings together most of the world's major market players, and consists of 28 developing and developed countries and the European Commission. The PMR is made up of Contributing Participants who provide financial support to the PMR trust fund and Implementing Country Participants who receive PMR funding. Together, the participants have created a global platform for discussions on new market instruments and how best to create and build market solutions for GHG mitigation.

Recipient country/ region	Targeted area *Mitigation* *Adaptation* *Technology development and transfer*	Programme or project title	Description of programme or project [2,3]
		Global Framework for Climate Services – WMO	The GFCS is a global partnership of governments and organizations that produce and use climate information and services. It seeks to enable researchers and the producers and users of information to join forces to improve the quality and quantity of climate services worldwide, particularly in developing countries. Norway has provided NOK 60 million for the period 2011-2014 for the GFCS secretariat and for activities strengthening weather and climate services in Africa. Furthermore, NOK 60 million is provided for the period 2013-2015 for strengthening the production of user friendly climate services in Africa, mainly Tanzania and Malawi.
Kenya, Bhutan, Liberia, Ethiopia, Maldives, Senegal, Morocco, Tanzania, Nepal, Mali, Grenada, Mozambique	Mitigation Adaptation Technology development and transfer	**Energy+**	Energy+ will support development of low-carbon and energy sector strategies, establish reference levels, and 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 and the establishment of monitoring and reporting systems, and will promote regulatory regimes that provide incentives for commercial investments.
Angola, Bolivia, Ghana, Mozambique, Sudan, South-Sudan, Timor-Leste, Uganda	Mitigation Adaptation	**The Norwegian Oil for development Programme**	The Oil for Development (OfD) programme was launched by the Norwegian Government in 2005, and has a considerable element of technology transfer and capacity-building. The operative goal of the programme is "economically, environmentally and socially responsible management of petroleum resources which safeguards the needs of future generations".
Ethiopia, Liberia, Mozambique, Nepal, Tanzania, Timor-Leste, Uganda	Mitigation Adaptation	**The Norwegian Clean Energy for Development Initiative**	The Norwegian Clean Energy for Development Initiative contributes to the international transfer of energy-related technology by supporting investment in infrastructure and 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.
Turkey, Georgia, Ghana, Angola and Mozambique	Mitigation	**INTPOW (Norwegian Renewable Energy Partners)**	INTPOW is a public-private partnership between three Government Ministries and Norwegian renewable energy companies. The aim is to promote Norwegian renewable energy competence in international markets. Intpow has held capacity building activities in several 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.

Recipient country/ region	Targeted area *Mitigation* *Adaptation* *Technology development and transfer*	Programme or project title	Description of programme or project [2,3]
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 Improving policies and enhanced deployment of clean energy technologies is the main objective.
Both Annex-I and non-Annex-I	Mitigation Technology development and transfer	**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. Norway has contributed with NOK 5 million to this Fund.
Botswana, South Africa, China, Kosovo, Indonesia, Egypt, Jordan, Maghreb, and Mexico	Mitigation Technology development and transfer	**World Bank Trust Fund on Capacity Building on Carbon Capture and Storage in Developing Countries.**	Norway initiated in 2009 the establishment of the World Bank Trust Fund on Capacity Building on Carbon Capture and Storage in Developing Countries. Since then Norway has contributed with NOK 68 million and has been the greatest financial contributors during the first four years. The trust fund has undertaken capacity building activities in about 10 countries.

[1] To be reported to the extent possible

[2] 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.

[3] 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 quantitative emission reduction commitments for the Kyoto Protocol's first and 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 of our sixth National Communication shows that Norway has implemented several policies and measures that have reduced emissions. Moreover, section 5.4 and table 5.6 show how we use the Kyoto mechanisms to fulfill our commitment for the first commitment period (2008-2012). Norway has through its submission of the SEF tables reported the number of units transferred to its retirement account each year so far. This information is provided in CTF tables 4 and 4b. Further units will be retired in due time.

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 and the Greenhouse Gas Emissions Trading Act, see section 4.3 of NC6.

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 does not have any other information to report on this matter in this biennial report.

10.6 Annex 6 Definition of acronyms

AAU	Assigned Amount Unit
ASAP	Automated Shipboard Aerological Programme
BAT	Best Available Techniques
BR	Biennial Report
BRA	Available area
CAEP	Civil Aviation Environment Programme
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
CRF	Common Reporting Format
CSEUR	Consolidated System of European Union Registries
CTF	Common Tabular Format
DDR	Disaster Risk Reduction
DES	Data Exchange Standards
ECAC	European Civil Aviation Conference
ECAS	European Commission Authentication Service
EEA	European Economic Area
ENOVA	The Norwegian Energy Fund
ERU	Emission Reduction Unit
EU	European Union
EU ETS	European Union Emission Trading System
GAW	Global Atmosphere Watch of WMO
GCIAR	Consultative Group on International Agricultural Research
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse gases
GIS	Gas-insulated switchgear
GNI	Gross National Income
GTOS	Global Terrestrial Observation System
GWP	Global Warming Potential
HFC	Hydrofluorcarbon
ICAO	International Civil Aviation Organization
ICSU	International Council for Science
IEA	International Energy Agency
IEF	Implied Emission Factor
IGBP	International Geosphere-Biosphere Programme
IMO	International Maritime Organisation

IPCC	Intergovernmental Panel on Climate Change
ITL	International Transaction Log
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
JI	Joint Implementation
KP	Kyoto Protocol
LDCF	Least Developed Country Fund
LULUCF	Land Use and Land Use Change and Forestry
MW	Megawatt
NC	National Communication
NEFCO	Nordic Environment Finance Corporation
NFI	National Forest Inventory
NGL	Natural Gas Liquids
NILU	Norwegian Institute for Air Research
NIR	National Inventory Report
NMVOC	Non-methane Volatile Organic Compound
NOK	Norwegian Kroner
NORAD	Norwegian Agency for Development Cooperation
NORKLIMA	Climate Change and Impacts in Norway
NOU	Official Norwegian Report
NSDS	National Strategy for Sustainable Development
NTP	National Transport Plan
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PCF	Prototype Carbon Fund
PDO	Plans for Development and Operation
PFC	Perfluorcarbon
PPCR	Pilot Program for Climate Resilience
QA/QC	Quality Assurance/Quality Control
REDD	Reducing emissions from deforestation and forest degradation
RegClim	Regional Climate Development under Global Warming
RMU	Removal Unit
SCCF	Special Climate Change Fund
SD	Sustainable Development
SPF	Specific Fan Power
SWDS	Solid Waste Disposal Sites
TEK	Technical building regulation code
TWh	Terrawatt hour
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USD	US Dollar
VAT	Value Added Tax

VRU	Vapour Recovery Unit
WCRP	World Climate Research Programme
WMO	World Meteorological Organization
WRI	World Resources Institute

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