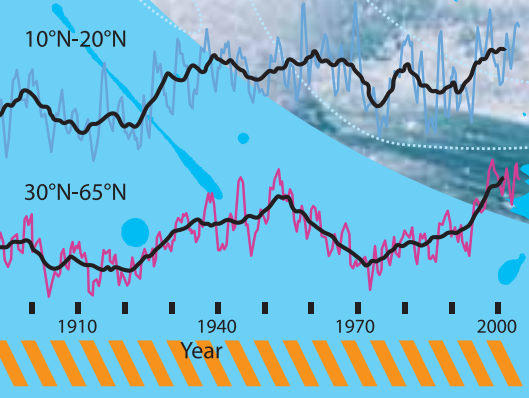
Report

Norway's Report on Demonstrable Progress under the Kyoto Protocol

Status report as of December 2005



MILJØVERNDEPARTEMENTET

Norwegian Ministry of the Environment

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Preface

Climate change is probably the most serious environmental challenge facing the global community. It is already transforming living conditions for people around the world and threatening biological diversity. The poor are most vulnerable to these developments. Climate change may force millions of people to flee their homes and become environmental refugees. The Framework Convention on Climate Change and its Kyoto Protocol call on all of us to respond to this challenge in a variety of ways.

This report seeks to document Norway's progress in meeting its commitments under the Kyoto Protocol, both at home and on the international scene. It gives a snapshot of trends in emissions and describes the policy instruments and measures Norway has implemented, technical and legal steps taken at national level, efforts to enhance international cooperation on technology transfer, research and development and other measures that together form a comprehensive response to climate change.

Reducing man-made climate change will help to limit tensions between peoples and regions. An adequate global response to the problem will also enable poor people to find a more sustainable way of living. Until now, the developed countries have generated by far the largest proportion of emissions, and our historical footprint gives us a moral obligation to cut our emissions now. The entry into force of the Kyoto Protocol was a landmark in global efforts to deal with man-made climate change. The Protocol establishes a framework that will help to limit emissions in Annex B parties and enhance sustainable development throughout the world. We know, of course, that the Protocol alone, with its present commitments is far from sufficent to meet the long-term challenge of climate change. Elements of the Kyoto Protocol can and should play an important role in a more ambitious climate regime after 2012.

Implementation of the Kyoto Protocol is a long and complicated process, and Norway started to prepare for it immediately after the adoption of the Protocol in 1997. The preparations include a great deal of technical and legal work to devise adequate systems for inventories and registries and to establish a legal basis for emissions trading. Most of these elements are now in place in Norway, and even more will be in place when we deliver our pre-commitment period report in 2006.

Since the late 1980s, when Norway started addressing climate change, emissions have been showing an upward trend. This reflects the rapid industrial development and general economic growth. It is also related to the fact that domestic energy use outside the transport sector is largely based on renewables, leaving little room for emission reductions. When Norway undertook its quantitative commitment to limit emissions in 1997, this was equivalent to a reduction of about 5 per cent from the emissions level at the time. Projections suggested that further increases were to be expected. Since then, policy instruments and measures have been applied to a wider range of emissions. As a result, emissions have risen more slowly than expected, but we realize that we still have a long way to go.

Transfers of technology and financial resources through the Kyoto mechanisms are a vital part of an international framework for ensuring sustainable development. Broad-based international cooperation will be essential if we are to succeed in our mitigation and adaptation efforts.

I am confident that the steps towards implementation documented in this round of reporting will demonstrate that the Annex I Parties are ready to comply with their commitments under the Protocol. I believe that these steps will also serve as building blocks for a more comprehensive and ambitious global response to climate change, a response that will contribute to global stability and sustainable development.

Helen Bjørnøy
Minister of the Environment

Contents

1. Introduction

Norway started to develop its response to climate change in the late 1980s, with implementation of a CO_2 tax in 1991 representing the first policy tool strictly aimed at limiting greenhouse gas emissions. This report on demonstrable progress pursuant to Article 3.2 in the Kyoto Protocol, read in conjunction with the Fourth National Communication under the Framework Convention on Climate Change, documents a broad array of responses to Norway's commitments under the Framework Convention and the Kyoto Protocol.

Norway ratified the Framework Convention on Climate Change (UNFCCC) on 9 July 1993 and the Kyoto Protocol on 30 May 2002, and became a Party when the Protocol entered into force on 16 February 2005. Under the Kyoto Protocol, Norway is committed to ensuring that its greenhouse gas emissions do not exceed the 1990-level by more than one per cent in the period 2008-2012.

Norway's distinctive energy and industrial structure means that it has a different point of departure from other countries when it comes to mitigation. Half of all energy use is from renewables, and nearly all electricity is hydropower, which generates virtually no emissions of greenhouse gases. There is an energy-intensive industrial cluster based on the availability of hydropower, which causes substantial process-related emissions. Few technical measures are available for reducing these emissions.

Over the past thirty to forty years, Norway has developed a petroleum sector, and has become the world's third largest exporter of oil. The oil and gas resources also form the basis for an industrial cluster (refineries, petrochemical industry), and the petroleum sector as a whole accounts for about one quarter of Norway's greenhouse gas emissions. Nine tenths of the oil and gas production is exported. A large proportion of this is natural gas that is exported to other countries in Europe, where it may replace more carbon intensive fuels and help to reduce national greenhouse gas emissions. In addition, Norway has significant forest resources, which contain a major stock of carbon and account for a large net uptake. They also provide a basis for industry and represent a considerable renewable energy source. When it comes to other sectors, such as transport, agriculture and waste, Norway's situation is more comparable with other countries in Annex I of the UNFCCC.

Since the Kyoto Protocol was adopted in 1997, the government has been seeking to create an adequate response to the commitments that Norway has undertaken under the Protocol. Various policy instruments and measures, including environmental taxes, direct regulation and agreements, have been in place since the Convention was adopted and have gradually been developed further. In response to the quantitative commitment in Article 3.1 of the Kyoto Protocol, Norway has implemented a domestic emissions trading scheme, linked to the Kyoto mechanisms. Despite the considerable efforts that have already been made at national level, Norway expects to make net acquisitions of "Kyoto units" through the Kyoto mechanisms. In parallel, other policies and measures are being applied to reduce emissions. The government will introduce climate action plans for all relevant sectors, including specific targets for each sector. It has also started a process to consider making changes to legal acts and regulations that have unintended negative impacts on the climate. A strengthened effort is also under way to ensure an adequate adaptation to climate change.

Norway is also making technical preparations to be able to comply with the requirements of the Protocol as set out in the Marrakesh Accords.

The Norwegian Pollution Control Authority is responsible for the national system related to greenhouse gas inventories. To ensure compliance with the reporting requirements under the UNFCCC, and to prepare for the establishment of Norway's Assigned Amount under the Protocol, the Authority is improving the emissions inventory and national system.

The Authority is the Norwegian registry administrator and is establishing a registry that will take account of the specifications in the relevant COP/MoP decisions. Registry software was purchased in early 2005 and has been adapted to Norwegian needs. The registry will also serve the emissions trading scheme, and it will be made operational by linking it to the EU emissions trading scheme.

The government is preparing for the use of the Kyoto mechanisms. The designated national authority is located to the Ministry of Environment. The government has participated in the development of the project-based mechanisms through pilot AIJ projects and through programmes coordinated by the World Bank and NEFCO. It has laid down the necessary legal provisions for use of the Kyoto mechanisms in the national Greenhouse Gas Emission Trading Act, and the regulations under this act provide for the recognition of CERs from the Clean Development Mechanism (CDM) in the period 2005-2007.

Norway has sought to advance the implementation of the Kyoto Protocol through both in-kind and in-cash contribution to the technical preparations at the international level. In particular funding has been provided to support the development of the CDM (by the end of 2005 Norway was the largest contributor of funds in absolute terms), the registry systems and the process related to inventories. These contributions have been used partly for the work of the secretariat and partly to enable non-Annex I participants to take part in workshops, consultations etc.

Implementing the Kyoto Protocol in Norway is an ongoing process. A number of important decisions will be taken successively. These include both policy decisions and decisions on measures to reduce emissions in the sectors that are not included in the emissions trading under the Protocol, some matters related to the Norwegian trading scheme, in particular its scope and the allocation of allowances for 2008-2012, and the government's direct involvement in the use of the Kyoto mechanisms.

The Commission on Low Emissions was established early 2005. The Commision will deliver a report in 2006 with a description of how Norway can cut its emissions by 50-80 per cent by 2050. Based on the report from the Commission, the government will consider long-term targets for the reduction of greenhouse gas emissions.

2. Description of domestic measures

2.1 Overall policy context

Climate change has been a major concern in Norwegian policy making since the late 1980s. Almost all sources of greenhouse gas emissions in Norway are currently being addressed by means of policies and measures to encourage reductions. In most cases economic measures (taxes, emissions trading) that put a price on emissions are being used. The Fourth National Communication gives a detailed description of policies and measures.

Norway has advocated cost-effectiveness across emission sources and sinks, sectors and greenhouse gases both domestically and internationally. This has been a point of departure both for formulating the present climate change policy and for designing and implementing policies and measures that will ensure compliance with the quantitative commitments of the Kyoto Protocol.

2.2 Emissions trading scheme

A system for emissions trading is a particularly suitable response to quantitative commitments under Article 3.1 of the Protocol. Norway started to develop a domestic system for emissions trading in 1998, and on 1 January 2005 the Greenhouse Gas Emission Trading Act entered into force. In the first phase, the pre-commitment period 2005-2007, the system covers industrial sources that account for 10-15 per cent of Norway's greenhouse gas emissions. The main features of the scheme are the same as those of the EU emissions trading scheme. However, one difference for the period 2005-2007 is that Norwegian installations that pay CO_2 tax are not included in the trading scheme even if they would come within the scope of the EU emissions trading scheme. It is estimated that the trading scheme will reduce emissions by about 0.5 million tonnes annually in 2005-2007 but these reductions may not all be realized domestically.

The establishment of a statutory trading scheme for 2005-2007 makes it possible to test various elements of the system (monitoring/reporting, the registry, compliance, penalties etc.) before the commitment period 2008-2012. Since monitoring and reporting systems already exist for most emissions that are not currently covered by the trading scheme, its scope can easily be widened. The effects of the trading scheme for the period 2008-2012 cannot be assessed before decisions on its scope and the allocation of allowances have been made.

The Emission Trading Act gives operators of the installations the option of using units from the Kyoto mechanisms in the same way as Norwegian allowances. For 2005-2007 this applies to CERs from the Clean Development Mechanism. CERs acquired and used by the installations in this period will not be used to fulfill Norway's Commitment under Article 3.1. The details of how the Kyoto mechanisms will be used in the period 2008-2012 have not yet been decided. This decision will i.a. depend on how the link to the European Union's emissions trading scheme will be established.

2.3 Carbon taxes

A tax on CO_2 was introduced in 1991 as the first measure designed only to curb emissions of greenhouse gases. This tax covers about 68 per cent of Norwegian CO_2 emissions (more than half of total greenhouse gas emissions) and rates range up to NOK 337 per tonne. The tax rates for the major sectors covered have only been adjusted for inflation since the Third National Communication was issued. As of 1 January 2006, domestic aviation and shipping as well as supply ships are liable to the same CO_2 tax rate as other users of mineral oil.

The most significant effects of the CO_2 tax have probably been in the offshore petroleum industry, where the CO_2 tax has contributed to making investments in more energy efficient technology profitable. Based on reports from the companies

operating on the Norwegian Continental Shelf it is estimated that emissions of CO_2 from the petroleum sector in 2000 were 2 million tonnes lower than they would have been in the absence of investments in more energy efficient technology. In addition, 1 million tonnes of CO_2 per year (equivalent to 2 per cent of domestic emissions of greenhouse gases) has been separated from gas produced at Sleipner West and reinjected into the Utsira formation (an aquifer) since 1996. The reinjection of CO_2 from the Sleipner field is a direct response to the CO_2 tax. Thus, the tax has contributed to reducing the emissions level by about 3 million tonnes CO_2 in 2000, equivalent to 5 per cent of total greenhouse gas emissions in Norway. Given the lifetime of these measures and the increase in the sector's activity level, it is believed that the CO_2 tax has reduced the emissions level at least as much after 2000.

The scope and rates of Norwegian taxes are decided in the annual State budget. The design of the CO_2 tax in the future will be determined taking the design of the emissions trading scheme into account. However, given the fact that investment decisions have long-lasting effects and depend partly on the taxation regime at the time, today's emissions taxation is bound to have considerable effect on the level of emissions in 2010 almost irrespective of the future design of the tax.

2.4 Other taxes relevant to greenhouse gas mitigation

A tax on import and production of HFCs and PFCs was introduced on 1 January 2003. From 1 July 2004 this tax was supplemented by a reimbursement scheme which applies to all HFCs and PFCs delivered for destruction. The rates are based on the GWP values of the gases in question. Rough estimates suggest that the effect of this tax will be 0.5 million tonnes CO_2 equivalents in 2010, so that emissions will be limited to only half the level expected without this measure.

An environmental tax on final disposal of waste is also used to limit emissions from waste, increase recycling, reduce the quantities of waste and enhance utilisation of emissions for energy purposes.

For the consumer, it is the price levels of relevant goods and services that influence decisions on activities that generate emissions. Thus, for certain uses of fossil fuels other taxes are far more important than the CO_2 tax in reducing emissions. These effects are not estimated here.

2.5 Direct regulation

The Pollution Control Act applies to greenhouse gas emissions. Hence greenhouse gas emissions are included in the discharge permit which for instance industrial installations are obliged to obtain pursuant to the Pollution Control Act.

As a general rule, the emitter is granted a discharge permit for CO_2 corresponding to the amount specified in the application. One of the main reasons for this is that greenhouse gas emissions to a large extent are covered by other specific policy instruments such as the CO_2 tax, the emission trading system and specific agreements with the industry to cap emissions to a certain level. These instruments have been regarded as more efficient tools for reducing greenhouse gas emissions. The Emission Trading Act has reduced the need for specification of emission limits for greenhouse gases. The Pollution Control Act may still be used to specify technological requirements relevant to emissions. However, this option's relevance in practice only applies to the establishment of new gas fired power plants.

In 1999 and 2000, three permits were issued for combined-cycle power plants fuelled by natural gas. These plants may be built without carbon capture and storage facilities. During the parliamentary period 2001-2005, the government decided not to issue any new permits for such conventional gas-fired power plants. As of 2005, only one of the plants that received a permit (at Kårstø, see Section 2.6) is under construction, and the owners of the other two have yet not taken the decision to build the plants.

2.6 New technologies for abatement, including carbon capture and storage

Storage of CO_2 has a huge potential for reducing emissions. Valuable experience has been gained from storage of CO_2 at the Sleipner field in the North Sea. Since 1996, 1 million tonnes of CO_2 produced with the gas has been stored annually in a geological formation 1000 meter beneath the seabed. In 2006, production of LNG from the Snøhvit field is expected to start. The CO_2 produced with the gas on the Snøhvit field, estimated to be 0.7 million tonnes annually, is to be captured and stored 2.6 km beneath the seabed in a water-filled reservoir.

Norway's access to large water-filled reservoirs and fully depleted oil and gas reservoirs off its coast will provide opportunities for large-scale CO_2 storage in the future. CO_2 could also be used for enhanced oil recovery for fields in operation. The government is committed to initiate the process that will make it possible to install carbon capture and storage facilities at the gas-fired power plant at Kårstø at a later stage. The aim is to realize this within 2009, and the government will contribute financially to this. The government will see to that new licences for gas-fired power plants are based on carbon capture technology.

On 1 January 2005, the government established Gassnova, a state centre to promote innovative, sustainable and cost-effective gas technologies. Gassnova is to take a market-oriented approach to enhance co-operation and joint development ventures between government agencies and industry. Gassnova's activities are funded by the returns on a NOK 2 billion fund. In 2005, about NOK 100 million was allocated to Gassnova's activities. Together with the Research Council of Norway, Gassnova manages the CLIMIT-programme, which is designed to promote research, development and demonstration of technologies for natural gas power generation using CO_2 capture and storage. A total of NOK 150 millions has been allocated to the programme in 2005.

The policy platform for the present government (October) states that the government will reinforce various policy instruments and provide public funding to promote the establishment of the necessary infrastructure and facilities for CO_2 capture and storage. Some of these tasks will be the responsibility of a state-owned company. The government intends to establish a "value chain" for carbon capture, transport and storage on the Norwegian continental shelf.

2.7 Agreements and voluntary measures

Voluntary measures and agreements with industry have led to considerable reductions in emissions since 1990, in particular of fluorinated gases from aluminium and magnesium production and of N_2O from fertilizers. The government concluded an agreement with the aluminium industry in 1997. The industry more than achieved its target of reducing greenhouse gas emissions per tonne of aluminium produced by 50 per cent by 2000 compared with the 1990 level, and it is expected that the target of a 55 per cent reduction by 2005 will also be overachieved.

In 2004, in conjunction with the establishment of the emissions trading scheme, the government and the energy-intensive process industry established an arrangement to reduce emissions by 2007. This arrangement also applies to the aluminium industry and thus replaced the agreement mentioned above. Through the arrangement the industry undertook to keep emissions from specified installations below 13.5 million tonnes in 2007, equivalent to a reduction of 1.1 million tonnes CO_2 equivalents compared to the baseline. A proportion of these emissions reductions will be achieved through the emissions trading scheme. The industry has taken steps to ensure that measures are carried out at specific Norwegian installations. A continuation of this arrangement for the period 2008-2012 remains a policy option and will be considered in conjunction with decisions on the scope of the emissions trading scheme and the CO_2 tax.

SF_6 emissions from a magnesium plant – the main source of SF_6 emissions in Norway – were reduced during the 1990s through voluntary measures. In 2002, the government entered into an agreement with industrial enterprises that use and/or produce SF_6 gas-insulated electric switchgear. The targets set have been overachieved and in 2004 the emissions were more than 50 per cent lower than in 2000.

2.8 Waste sector

Emissions from the waste sector are limited by a number of policy instruments and measures. Apart from the tax on final disposal of waste, there are regulations requiring the recovery of landfill gas. Since 1990 there has also been substantial increase in quantities of waste delivered for recovery. These instruments and measures have offset the growth in waste volumes and led to a 20 per cent reduction in emissions between 1990 and 2003. A ban on landfilling of biodegradable waste has been proposed from 2009, which would gradually minimise emissions from landfills.

2.9 Energy use and renewables

Norway has had a comprehensive programme on energy efficiency and the promotion of new renewable energy sources in place since the 1970s. In 2001, a national energy agency called Enova SF was established. Enova is responsible for promoting an integrated strategy for renewable energy and energy saving. Enova's long term goal is to achieve

12 TWh in new renewable energy production and energy savings by 2010.

The most important policy measure administered by Enova is the scheme for investment grants from the Energy Fund. Investment grants are allocated on the basis of competition between all projects that come within the scope of Enova's activities. So far, Enova's activities for the period 2002 to 2004 have resulted in energy savings of 1.4 TWh/year.

Since 2003, the Ministry of Agriculture and Food has been financing a bioenergy programme. Its main objectives are to increase production of bioenergy from agriculture and forest biomass and promote deliveries of heating from the agricultural sector. In addition the government is considering the introduction of measures to increase the production and use of liquid biofuels. The government will promote the use of biofuels in accordance with the targets established in the EU directive on the promotion of the use of biofuels (2003/30/EC). The directive has not been included in the EEA Agreement.

2.10 Local initiatives, long term physical planning, climate action plans

The Planning and Building Act requires that all major projects (infrastructure, settlements) have to go through a planning and approval procedure in which environmental impacts are emphasised. A number of municipalities, including major cities, have prepared local plans for mitigation of climate change (greenhouse gas emissions). The government will introduce climate action plans for all relevant sectors of society, including specific targets for each sector.

3. Trends in, and projections of greenhouse gas emissions

3.1 General observations

Norway's total emissions of greenhouse gases, measured as CO_2 equivalents, were about 54.8 million tonnes in 2003. These emissions rose by about 9 per cent in the period 1990-2003. The main factors behind the growth are CO_2 from the petroleum sector and to a lesser extent transport. In 2003, CO_2 emissions accounted for approximately 80 per cent of total emissions. The growth in CO_2 has to some degree been counteracted by decreased emissions of fluorinated gases from metal plants.

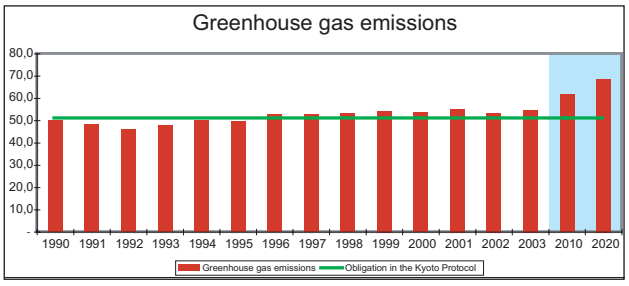

Fig. 3.1 Emissions of greenhouse gases for the years 1990-2003 in million tonnes CO_2 equivalents and projections for 2010 and 2020.
Sources: Norwegian Pollution Control Authority, Statistics Norway and Ministry of Finance

The new government , which took office in October 2005, will present new long-term projections for greenhouse gas emissions in Norway in 2006. These projections will be submitted to the Climate secretariat. The projections presented in this chapter are thus based on preliminary technical assumptions and should be regarded as tentative. It is estimated that with the policy instruments currently in place, the overall rise in total greenhouse gas emissions from 1990 to 2010 will be approximately 23 per cent. The increase is mainly caused by an estimated growth in CO_2 emissions, while the aggregate emissions of non-CO_2 gases are expected to remain stable at the 2003 level. These figures do not reflect the effects of the emissions trading scheme and the arrangement with energy-intensive process industries, which are expected to yield 1.1 million tonnes in reductions combined. They do include emissions of 1 million tonnes CO_2 related to production of electricity by the gas-fired power plant at Kårstø from 2007. The government is committed to initiating the process that will make it possible to install carbon capture and storage facilities at this power plant at a later stage. The aim is to realize this within 2009.

The net uptake of CO_2 from land-use, land-use change and forestry (LULUCF) amounted to 21 million tonnes in 2003. This net uptake increased by 56 per cent during 1990-2003.

Emissions in 2020 will depend strongly on the demand for energy services, and on structural developments,

Table 3.1. Greenhouse gas emissions and projections for 2010 and 2020 by sector. Baseline scenario. Million tonnes CO_2 equivalents and percentage change

	Million tonnes				Percentage change		
	1990	2003	2010	2020	1990-2003	1990-2010	2010-2020
Total Energy	29.3	39.2	44.3	50.7	34 %	51 %	14 %
Oil and gas production[1]	7.6	13.5	14.2	9.9	78 %	87 %	-30 %
Petroleum refining	1.7	2.1	1.9	2.0	22 %	11 %	6 %
Public electricity and heat production[2]	0.3	0.6	1.3	9.9	123 %	344 %	n.a.
Manufacturing industry and construction	3.6	4.0	5.0	5.3	12 %	40 %	6 %
Transport	11.3	14.6	17.6	18.9	28 %	55 %	8 %
Other sectors[3]	4.8	4.4	4.4	4.8	-9 %	-8 %	8 %
Industrial processes	13.7	8.9	11.2	12.0	-35 %	-18 %	7 %
Agriculture	4.6	4.5	4.4	4.4	-2 %	-4 %	0 %
Waste	2.6	2.2	1.9	1.6	-14 %	-25 %	-16 %
Total	50.1	54.8	61.8	68.7	9 %	23 %	11 %

1 Including emissions from gas terminals and on and offshore oil loading.
2 Including emissions from gas-fired power plants.
3 Including mobile emissions from forestry, fisheries and agriculture.

particularly in the energy-intensive industries. There is considerable uncertainty as regards the realization of new power projects in the longer term. The profitability of new power projects depends on framework conditions, the development of the energy market and the prices of raw materials such as natural gas and crude oil. An increase in energy use can be met by generation of gas-fired power, hydropower, other renewable energy sources or by increased imports. Various combinations of power generation and import will lead to different effects on emissions in Norway and abroad. In the baseline scenario, electricity demand is assumed to be met by increased electricity supply from gas–fired power stations from 2010 to 2020. This should, however, be regarded as a technical assumption.

Table 3.2 Greenhouse gas emissions from 1990-2003. CO_2 equivalents

	CO_2	CH_4	N_2O	PFCs	SF_6	HFCs	Total
1990	34.4	5.2	5.1	3.3	2.2	0	50.1
1991	33.5	5.2	4.9	2.5	2.1	0	48.3
1992	33.8	5.3	4.3	2	0.7	0	46
1993	35.4	5.3	4.6	2	0.7	0	48
1994	37.3	5.4	4.7	1.7	0.9	0	50
1995	37.2	5.4	4.8	1.6	0.6	0	49.6
1996	40.4	5.4	4.9	1.4	0.6	0.1	52.8
1997	40.6	5.5	4.8	1.4	0.6	0.1	52.9
1998	40.8	5.3	5.1	1.3	0.7	0.1	53.3
1999	41.6	5.2	5.3	1.1	0.9	0.2	54.3
2000	41.1	5.3	5.2	0.9	0.9	0.2	53.8
2001	42.7	5.3	5.2	1	0.8	0.3	55.3
2002	41.2	5.1	5.4	1.1	0.3	0.4	53.5
2003	43.2	5.1	5.3	0.7	0.2	0.2	54.8
Change 90-03	26 %	-2 %	5 %	-79 %	-89 %		9 %

1 HFCs are given as actual emissions (Tier 2).
Sources: Norwegian Pollution Control Authority, Statistics Norway and Ministry of Finance

Table 3.3. Projections of greenhouse gas emissions in 2010 by sector and gas, based on the baseline scenario including measures already implemented and adopted. Mill. tonnes CO_2 equivalents

2010	CO_2	CH_4	N_2O	PFK	HFK	SF_6
Total Energy	42.3	1	1			
- Oil and gas production	13.4	0.7	0.0			
- Petroleum Refining	1.9	0.0	0.0			
- Public Electricity and Heat production [1]	1.2	0.0	0.0			
- Manufacturing Industry and Construction	4.9	0.0	0.1			
- Transport	16.6	0.1	0.9			
- Other sectors	4.2	0.2	0.0			
Industrial Processes	7.5	0.0	1.8	1.1	0.5	0.2
Agriculture	0	2	2.5			
Waste	0.1	1.7	0.1			
Total	49.9	4.7	5.4	1.1	0.5	0.2

1 Including one gas-fired power station approved for construction in 2000 (Kårstø)

3.2 Emissions of CO_2

In 2003, Norway's emissions of CO_2 were 43.2 million tonnes and the projection for 2010 is 49.9 million tonnes; this corresponds to a growth of 26 and 45 per cent respectively from the 1990 level of 34.4 million tonnes. Emissions from the industrial sector are dominated by sources related to oil and gas extraction and production of metals, minerals and chemicals. A relatively large share of the transport-related emissions originates from coastal shipping and the fishing fleet. Since electricity is generated almost exclusively from hydropower, emissions from stationary combustion have a relatively low share of total emissions and are dominated by industrial sources.

The single most important factor explaining the historical increase in emissions is activities related to oil and gas extraction. Emissions of CO_2 from the petroleum sector have increased as a result of increasing activity on the Norwegian Continental Shelf. The increase was 78 per cent from 1990 to 2003. Norway exports 90 per cent of its production. A large proportion of this is natural gas that is exported to other countries in Europe, where it replaces more carbon intensive fuels and helps to reduce national greenhouse gas emissions. Emissions from road traffic and coastal traffic and fishing have increased by 28 per cent since 1990. Transport may be the most significant growth factor over the next five years. Emissions from other mobile sources and industry (combustion and processes) are back to the 1990 level after peaking in the mid- to late 1990s, but are projected to grow over the next few years in the absence of further measures. The projections show that growth in the emissions from the petroleum sector is slowing. Emissions of CO_2 from the petroleum sector are projected to increase until 2009 and then decrease.

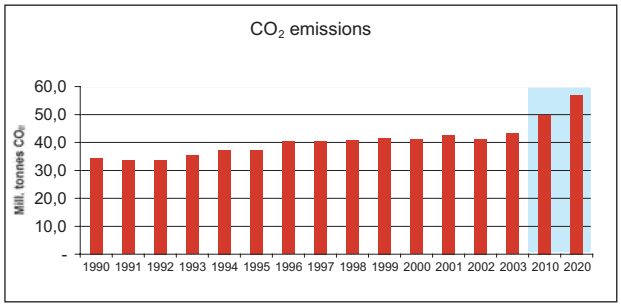

Fig. 3.2 Emissions of CO_2 including projections for 2010 and 2020
Sources: Norwegian Pollution Control Authority, Statistics Norway and Ministry of Finance

3.3 Emissions of CH_4

In 2003, Norway's total emissions of CH_4 were 241 000 tonnes (5.1 million tonnes CO_2 equivalents). About 40 per cent of this originated from waste treatment and 39 per cent from agriculture.

Emissions from agriculture are related to the number of animals and are relatively stable from year to year. Emissions from waste treatment were relatively stable throughout the 1990s, as higher waste volumes were offset by an increase in waste recovery and burning of methane from landfills. Over the last six years, emissions from landfills have been reduced by 14 per cent despite increased waste volumes. A further reduction is projected.

Emissions from the oil and gas industry accounted for 14 per cent of total CH_4 emissions in 2003. These are largely caused by landing and loading of crude oil offshore and emissions from this sector have risen by 74 per cent from the 1990 level. Minor sources include emissions from petrol cars, domestic heating and coal mining.

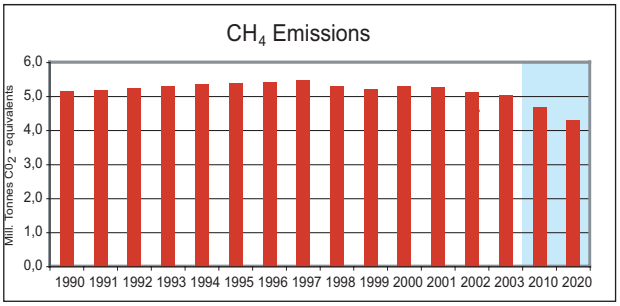

Figure 3.3 CH_4 emissions 1990-2003 and projections for 2010 and 2020.
Sources: Norwegian Pollution Control Authority, Statistics Norway

3.4 Emissions of N_2O

The main sources of N_2O emissions are agriculture and two plants producing nitric acid (fertilizers). Aggregate emissions have been fairly stable since 1990, but there have been variations from year to year as a result of fluctuations in emissions from nitric acid production. These have been caused by changing production volumes and technological changes. There has also been a considerable increase in emissions from road traffic, which currently account for 13 per cent of total N_2O emissions. Overall N_2O emissions are projected to grow slightly by 2010. However, further measures in the fertilizer industry may outweigh the projected growth.

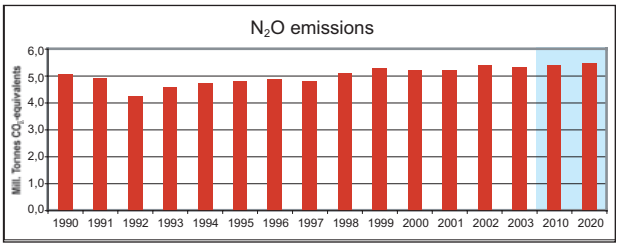

Figure 3.4 N_2O emissions 1990-2003 and projections for 2010 and 2020
Sources: Norwegian Pollution Control Authority, Statistics Norway

3.5 Emissions of fluorinated gases (PFC, HFC and SF_6)

From 1990 to 2003 emissions of fluorinated greenhouse gases have been reduced from 5.5 to 1.1 million tonnes CO_2 equivalents mainly by reducing emissions of PFCs from aluminium production and SF_6 from magnesium production. In recent years emissions of SF_6 from electrical switchgear have also been reduced through an agreement with the industry, while the upward trend for HFCs has been halted through taxation measures.

Emissions of PFCs (CF_4 and C_2F_6) from Norwegian aluminium plants in 2003 were calculated to be approximately 0.7 million tonnes CO_2 equivalents. These plants account for virtually all Norwegian PFC emissions. Emissions of PFCs were reduced by 79 per cent from 1990 to 2003. This is explained by improved technology, process control and conversion to prebake technology. PFC emissions per tonne aluminium produced were reduced by approximately 84 per cent from 1990 to 2003. In 2010 PFC emissions are projected to be slightly higher than today unless further measures are taken.

In 2003, SF_6 emissions totalled 9.7 tonnes (0.23 million tonnes CO_2 equivalents), which is about 90 per cent below the 1990-level (2.2 million tonnes). SF_6 is used in magnesium production to cover the surface of liquid magnesium and prevent it from oxidizing, and this is still the largest source of SF_6 emissions (74 per cent). Relative emissions were reduced in the early 1990s by improvements in technology and process management, as well as reductions in production levels. Primary production stopped in 2002, resulting in a further drop in emissions to about one quarter of the previous level, while other parts of the production line have been maintained. Similar use of SF_6 in the aluminium industry in the early 1990s has been discontinued. The remaining quarter of emissions originate mainly from gas-insulated electric switchgear. These emissions have been approximately halved since an agreement was signed in 2002. Emissions of SF_6 are projected to remain stable up to 2010, thus accounting for only 0.4 per cent of total greenhouse gas emissions.

HFC emissions were 0.24 million tonnes CO_2 equivalents in 2003, equivalent to about 0.4 per cent of total greenhouse gas emissions. These emissions gained significance in the mid-1990s, when HFCs were introduced as substitutes for ozone-depleting substances. An exponential growth trend was reversed after a tax on import and production of HFCs and PFCs was introduced in 2003. Phasing out of HCFC and other ozone-depleting substances is increasing the demand for HFCs, so that future growth in these emissions cannot be ruled out. However, it is presumed that better maintenance of equipment and more use of low-GWP HFCs and alternative substances will result in a lower growth rate than previously estimated. Nevertheless, emissions are projected to double by 2010, and would then account for about 1 per cent of total emissions.

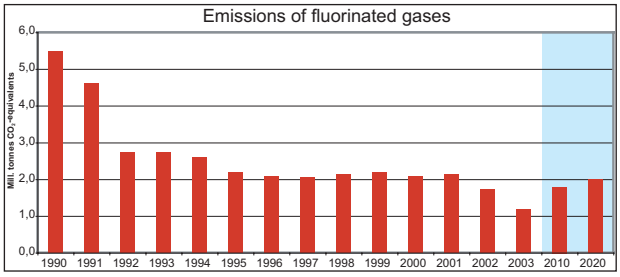

Figure 3.5 Emissions of fluorinated gases 1990-2003 and projections for 2010 and 2020
Sources: Norwegian Pollution Control Authority, Statistics Norway

3.6 Emissions and removals from land-use, land use change and forestry

The total net sequestration from the land-use, land-use change and forestry sector was about 21 million tonnes of CO_2 in 2003, which was enough to offset 38 per cent of total greenhouse gas emissions in Norway that year. Sequestration increased by 56 per cent from 1990 to 2003. Forest land covers around 29 per cent of the mainland area of Norway and is the most important land-use category. Forest land is also the most important contributor to carbon stock changes.

Despite the massive sequestration of carbon in Norwegian forest resulting from current and historical management practices, it is uncertain whether the net contribution from activities specified in Article 3.3 of the Kyoto Protocol (afforestation,

reforestation and deforestation) will be positive or negative in 2008-2012. The long rotation period in the Norwegian forest means that forest planted after 1990 (afforestation and reforestation) will only account for a limited storage of carbon in 2008-2012. Deforestation is limited in Norway as it has mainly been caused by development of roads and new or expanded dwelling areas in recent decades. The net positive or negative contribution from the activities under Article 3.3 is thus believed to be less than 0.5 million tonnes annually. This estimate corresponds to less than 1 percentage point of the gross emissions.

Norway has not selected any forest management activities that could be accounted for under Article 3.4. The cap given by the COP/MoP through the adoption of the Marrakech accords is 0.40 million tonnes carbon/year, which corresponds to about 2.7 per cent of Norway's 1990 emissions.

3.7 Use of the Kyoto mechanisms

According to projections, the gap to be covered through further national measures or acquisitions of AAUs, CERs and/or ERUs ("Kyoto units") under the Kyoto mechanisms (Articles 6, 12 and 17) is currently about 10 million tonnes annually, or about 50 million tonnes for the period 2008-2012. This takes into account the effects of recently introduced policy instruments and measures (the emissions trading scheme and the arrangement with the process industry). The uncertainties in this estimate are described in the Fourth National Communication. The introduction of further domestic measures would reduce the need to acquire Kyoto units. An important element of the government's policy in this area is to promote the development of gas fired power plants with carbon capture and storage, through economic measures and by supporting the development of new technologies, for example at the gas fired power plant at Kårstø.

Industrial enterprises will be able to acquire Kyoto units through the emissions trading scheme. There is a general provision for such acquisitions in the Emission Trading Act, and detailed operational provisions for using CERs from CDM in the system for 2005-2007 have been laid down in domestic regulation. CERs used for this period will be cancelled. Details for the period 2008-2012 have not yet been decided. These will depend partly on how Norway's emissions trading scheme is linked to other trading schemes, in particular the EU ETS.

If the emission trading scheme does not bring enough Kyoto units to cover the gap described earlier, the state will have to acquire the remaining Kyoto units needed to comply with Norway's quantitative commitment under Article 3.1. Some small quantities are expected to be acquired through the involvement in pilot schemes through the World Bank (PCF) and the Testing Ground Facility and through bilateral projects.

4. Evaluation of the contribution of domestic measures

It is estimated that without the policy instruments and measures introduced since 1990, emissions growth from 1990 to 2010 would be at least 17-22 percentage points higher. These figures are based on the assessments reflected in the Fourth National Communications (see table 4.1).

There are uncertainties around the future "distribution of work" between the CO_2 tax and the emissions trading scheme. Decisions on the scope of the trading scheme and the allocation of allowances will be taken in 2006, while the scope of the CO_2 tax and tax rates are decided annually. The expected and actual prices in the trading scheme will guide the installations in their choice between carrying out domestic measures and making net purchases of allowances. Together with the allocation of allowances this will determine how these installations will use the Kyoto mechanisms.

In any case, the industrial sector expects a regime that puts a price on carbon emissions for activities that are currently included in the trading scheme or subject to the CO_2 tax. This means that it is safe to assume that in 2010 too, day-to-day decisions on fuel use will depend on a price of carbon emissions, regardless of whether this is established through taxation or through emissions trading. It is here assumed that the effect of such a price in 2010 would be the same as for the CO_2 tax, and for practical reasons the effect is attributed to the tax in the table below. The effect of the trading scheme is set at the same level in 2010 and 2005.

Further uncertainty is linked to the role of a possibly continued arrangement with industry on emissions that fall outside both the trading scheme and the tax. When drawing up the allocation plan for the emissions trading scheme for 2008-2012, the government will have to consider whether to extend its scope to include installations whose emissions are currently only covered by the arrangement with the process industry. In table 4.1, a technical assumption is that the scope of the arrangement remains unchanged and that it yields the same emission reductions in 2010 as in 2007.

In the quantitative assessment of the effects of policies and measures, long lasting effects of technical solutions that have been attributed to the tax are carried forward to 2010. These effects will continue to be apparent even if the regulatory regime were to be changed.

The government intends to promote the development of a solution for carbon capture and storage for the gas-fired power plant under construction at Kårstø, with the aim of establishing the solution within 2009. Until then the plant will emit about 1 million tonnes CO_2 per year.

The table below indicates the estimated effects of policy instruments and measures on domestic emissions. It should be noted that both in 2005 and 2010, there is a possibility that part of the effect attributed to the emissions trading scheme (0.5 million tonnes), and to the arrangement with the process industry (0.6 million tonnes), could be achieved by the acquisitions of units from the clean development mechanism, through joint implementation (only relevant to 2010 estimate) and/or through the European emissions trading scheme rather than by domestic emission reductions. However, these amounts are estimated to be so small compared to the total that this possibility does not change the overall picture.

The net effects of policies and measures in relation to Article 3.3 on afforestation, reforestation and deforestation in 2010 are assumed to be zero, and no effects from activities under Article 3.4 have been estimated (see Section 3.6).

Table 4.1 Effects on domestic emissions of policy instruments and measures that have been implemented and adopted since 1990. Million tonnes CO_2 equivalents reduction per year.

	1995	2000	2003	2005	2010
Directly related to climate change:					
CO_2 tax offshore[1)]	0.6	3.0	3.0	3.0	3.7[3)]
CO_2 tax onshore [2)]		0.8	0.8	0.8	0.8[3)]
Requirement to collect landfill gas	0.25	0.4	0.45	0.5	0.6
Other measures in the waste sector		0.07	0.2	0.25	0.3
Tax and recycling schemes on HFC			0.2	0.3	0.5
Climate change agreement with aluminium industry [4)]	0 - 1.6	0.6 - 3	1.2 - 4.0	1.4 - 4.0	1.4 - 4.1
Agreement on SF_6 emissions			0.05	0.06	0.06
Other regulations:					
VOC regulation offshore			0.17	0.2	0.25
VOC regulation at the Sture terminal		0.01	0.17	0.02	0.005
Voluntary reductions:					
SF_6 reduction, magnesium production	1	1.4	0.5 [5)]	0.5	0.5
N_2O reduction , production of nitric acid	0.4	0.3	0.3	0.3	0.3
Use of bicarbon in cement production		0.02	0.03	0.1	0.1
SUM - effect implemented measures in baseline	2.25 - 3.85	6.6 - 9	7.07 - 9.87	7.43 - 10.03	8.515 - 11.115
New policies and measures post 2004					
Emission trading sceme 2005-2007				0-0.5	0-0.5[6)]
Consensus with the processing industry					0.6
Additional measures addressing the waste sector					0.15
Total emission reductions	2.25 - 3.85	6.6 - 9	7.07 - 9.87	7.93 - 10.03	8.965 - 11.065

1 Based on reports from companies operating on the Norwegian Continental Shelf and the Norwegian Petroleum Directorate.
2 Based on an equilibrium analysis for 1990-1999. Bruvoll.A and B.M.Larsen (2004) "Greenhouse gas emissions in Norway. Do carbon taxes work" Energy Policies 32 (4), 493-505, and assessment made for the Third National Communication.
3 The role of the CO_2 tax scheme may change from 2008 as a consequence of a revised national emission trading system for 2008-2012.
4 Lowest number reflects direct effect of the agreement, while highest estimate includes voluntary measures taken before adopting the agreement in 1997.
5 A part of a factory was shut down in 2001. The associated emission reductions are not included.
6 A revised national emission trading scheme for 2008-2012 may include other effects.

5. Description of the activities under articles 10 and 11

5.1 Inventory

Norway has been compiling an inventory of greenhouse gas emissions, as is required under Article 10(a), for more than twenty years. The inventory has gradually been improved and figures are reported annually to the UNFCCC Secretariat. Norway plays an active part in improving the inventory methodology so that it is suited to national and regional circumstances both in the IPCC process and in related processes in Europe. Furthermore, Norway has lent experts to the UNFCCC and Kyoto Protocol review process, which is also instrumental in improving inventories. Norway is currently taking the final steps to meet the requirements specified for national systems under the Protocol, which will be reported in 2006. The Norwegian inventory is discussed in Chapter 3 of the Fourth National Communication.

5.2 Mitigation and measures related to information, training and public awareness

Norway started a national programme to mitigate climate change, as is required under Article 10(b) of the Protocol, before the UNFCCC was even adopted in 1992. The status of the policies and measures to mitigate climate change is reported in Chapter 4 of the Fourth National Communication. Chapters 2 - 4 of this report on demonstrable progress are based on this information.

In the education sector, the curricula for primary and secondary schools include several examples of content relevant to the commitments under the Kyoto Protocol (Article 10 (e)). A number of the courses offered at university level are of relevance for climate change. This is further documented in Chapter 9 of the Fourth National Communication.

The Ministry of the Environment works through many different channels to enhance public awareness of issues related to climate change. This includes the development of legal provisions to ensure access to information relevant to the environment from both public authorities and private enterprises. The Ministry makes use of websites, printed publications and other media. The research institute Cicero has been given a special responsibility for information on climate change.

Internationally Norway's support to UNEP makes a significant contribution to enhancing public awareness of climate change-related issues and to capacity building.

5.3 Minimising effects of response measures on developing countries

As a major exporter of fossil fuels, Norway is well aware that widespread international taxation of these commodities, as well as other policies and measures that influence demand, may have implications for prices and thus affect the revenue earned by exporters. This is emphasized in relation to Articles 4.8 and 4.9 of the Convention and Articles 2.3, 3.14 and 11 of the Kyoto Protocol. One of the reasons why Norway emphasizes the need to devise cost-effective policies, is that this is a means of minimizing unintended effects of response measures. The final effects are, however, highly uncertain and will generally also depend on the producers' policies. Norway's share as a consumer is in any case so small that it is not believed to significantly affect these markets.

5.4 Domestic adaptation

Norway's climate is generally highly variable and the society has considerable adaptive capacities. The Arctic region is undergoing rapid change, as documented by the Arctic Climate Impact

Assessment (ACIA), and is considered vulnerable. In the temperate part of Norway, too, climate change is believed to be having considerable effects on the biosphere as well as human settlements.
At national level, the government started to address necessary adaptations to climate change through the Interministerial Group on Climate Change, which reported its work in 1991. However, there has so far not been a comprehensive plan for adaptation measures. In 2005, Norway started the process of developing a comprehensive action plan for adaptation to climate change, which would also serve as a response to Article 10 (b). This involves relevant ministries and agencies. Independently, agencies such as the Norwegian Water Resources and Energy Directorate and The Norwegian Public Roads Administration have focused more closely on challenges related to climate change and have carried out developed analyses and response measures. The work done so far is reported in Chapter 6 of the Fourth National Communication.

5.5 Cooperation in scientific and technical research and observation

It is particularly important for Norway, as a small country, to continue and strengthen its participation in international research cooperation. This gives access to technical and scientific advances taking place globally, and makes is possible to contribute to the process in areas where Norway has special expertise. At the regional level, cooperation within the EU/EEA, OECD and the International Energy Agency (IEA) is particularly important. This is also in line with the provisions of Article 10 (d) of the Protocol. There is a fuller description in Chapter 7 of the Fourth National Communication.

Norwegian scientists take part in the IPCC's efforts to synthesize the status of knowledge on climate change. At regional level, a considerable effort has been put into the ACIA in the past few years, culminating in its 2004 report. This was a project under the Arctic Council, where Norway is a member. The ACIA process documented that temperature has been rising twice as fast in the Arctic as in the rest of the world in the past few decades, with widespread melting of glaciers and sea ice and rising permafrost temperatures presenting strong evidence of global warming. These changes are dramatically altering the conditions for both humans and ecosystems in the Arctic region. The ACIA process has identified needs for further research and been a stimulus for increased activity.

Norway is also involved in a number of other international programmes, in particular under the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP).

Norway's geographical situation gives a special responsibility to carry out monitoring relevant to climate change. A number of Norwegian Global Climate Observing System (GCOS) stations report to the World Meterological Organisation's international data exchange. In 2000, the Research Council of Norway established a research programme on monitoring of marine and terrestrial systems. The programme covers both the development of monitoring technology and the practical application of novel technologies in resource monitoring. An expansion of the programme to include monitoring of environment and climate parameters is under consideration. A number of different Norwegian institutions are collecting long-time series of climate data. Continuation of these series requires sustained efforts.

Given Norway's long coastline and involvement in offshore and Arctic activities, a strong emphasis on oceanographic observations is quite natural. However, Norway also runs terrestrial monitoring programmes both on the mainland and in the Arctic. Further details are given in Chapter 7 of the Fourth National Communication.

5.6 Capacity building especially for developing countries in the field of climate change, including cooperation on adaptation activities

Norway makes substancial contributions to capacity building in the field of climate change through UN agencies and international financial institutions, as well as through regional and bilateral co-operation programmes. Such contributions include support for participation from developing countries to COPs and other relevant meetings, assistance in developing Designated National Authorities (DNAs), various initiatives to strengthen national, regional and local government institutions in developing countries and support for the improvement of statistics, monitoring systems, etc.

Moreover, Norway supports a number of initiatives that will enhance the adaptation capabilities of developing countries. These are listed in Chapter 8 of

the Fourth National Communication and are a response to Articles 11.1 as well as Articles 4.4 and 4.8 of the Convention.

Norway's support for adaptation activities by developing countries that are particularly vulnerable to the adverse effects of climate change is mainly channeled through the general contributions to multilateral development institutions, including the UNDP and international financial institutions. Norway is supporting the Global Environmental Facility (GEF) pilot programme on adaptation through its general contribution to GEF. Moreover, Norway has played an active part in establishing the climate change funds in GEF, including the Least Developed Countries Fund and the Special Climate Change Fund, both dealing with adaptation activities. Norway has contributed NOK 9 million, the equivalent of USD 1.4 million, to the LDC Fund and NOK 10 million to the Climate Change Fund. Support has also been provided to the UNFCCC Secretariat, OECD Annex 1 Expert Group, and others for activities related to adaptation.

At the resumed Sixth Conference of the Parties in Bonn, many donor countries made a political declaration reaffirming their common commitment to funding for climate change activities in developing countries at the level of USD 410 million per year in the period 2005–2008. Norway will meet its fair share of this commitment, and for 2005 NOK 20 million, approximately USD 3 million, has been provided in this respect, partly through contributions to the LDC and Climate Change Funds.

Through bilateral and regional development cooperation programmes, Norway is supporting various projects related to identification of land areas where natural disasters such as floods, landslides, etc. are likely to occur, including identifying preventive and protective measures. In addition, flood control measures often form an integral part of hydropower development projects.

5.7 Cooperation on technology access and transfer

The transfer of technology and know-how in order to promote development, availability and efficiency of energy constitutes an important element of Norwegian ODA and has significant environmental co-benefits that are consistent with the promotion of the Convention.

Norway contributes to the international transfer of energy-related technology by supporting investments 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 technology that are given political priority by the recipient country and that are economically viable and competitive.

Activities include improvements of the electricity grid, improved utilization 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 to solar energy and other renewable energy technologies. This helps to reduce emissions of greenhouse gases. Norway is also involved in gas flaring reduction initiatives bilaterally (e.g. in Iran and Nigeria) and in cooperation with the World Bank's Global Gas Flaring Reduction Public-Private Partnership.

In addition, Norway voluntarily supports a number of IEA projects to provide information and analysis on, and transfer of environmentally sound and climate friendly energy technologies.

A significant proportion of technology transfers take place through various forms of cooperation between private-sector enterprises in Norway and in countries in other parts of the world. The government does not have an overview of such private-sector activities.

5.8 Assistance to developing countries in implementing the Convention

Norway has sought to follow up its financial commitments under both the Convention and the Kyoto Protocol (Article 11.2) through the GEF. In addition, non-ODA multilateral funds have been provided through UNEP for conducting a study and presentation of knowledge and research on climate change in Africa and through UNDP for climate change activities in China.

Norway has supported China in the development of its first national climate change strategy including both mitigation and adaptation measures, and in the

establishment of the secretariat of REEEP Asia (renewable energy & efficiency partnership) in Beijing involving cooperation with Japan, South Korea and Mongolia. Funds have also been provided to the CCAP (Center for Clean Air Policy) for building capacity to support climate change mitigation and CDM project implementation.

Norway has also contributed considerable ODA funds (2001-2003: USD 179 million reflecting new directions from OECD/DAC) to activities where the principal or significant objectives were related to the implementation of the Climate Change Convention. Sustainable development concerns (environmental considerations) are an explicit priority in Norwegian development aid (see details in the Fourth National Communication).

Norway has also contributed substantial funds to enable delegates from developing countries to attend COPs and other meetings, thus facilitating the implementation of the UNFCCC in developing countries.

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