Document 3-series

Riksrevisjonen

Office of the Auditor General of Norway

The Office of the Auditor General's investigation into target achievement in climate policy

Document 3:5 (2009–2010)

This document is available at www.riksrevisjonen.no

Public offices can order this document from
Government Administration Services
Phone: + 47 22 24 20 00
E-mail: publikasjonsbestilling@dss.dep.no
www.publikasjoner.dep.no

Others can order this document from
Bestillinger offentlige publikasjoner
Phone: + 47 55 38 66 00
Fax: + 47 55 38 66 01
E-mail: offpub@fagbokforlaget.no

Fagbokforlaget AS
Postboks 6050 Postterminalen
NO-5892 Bergen

ISBN 978-82-8229-091-3

Illustration: 07 Oslo AS

The Office of the Auditor General's investigation into target achievement in climate policy

Document 3:5 (2009–2010)

To the Storting

The Office of the Auditor General hereby submits Document 3:5 (2009–2010) *The Office of the Auditor General's investigation into target achievement in climate policy.*

The Office of the Auditor General, 15 April 2010

For the Board of Auditors General

Jørgen Kosmo
Auditor General

Contents

The Ministry of the Environment

The Office of the Auditor General's investigation into target achievement in climate policy

1 Introduction

According to the UN Intergovernmental Panel on Climate Change's fourth assessment report, failure to implement or delayed implementation of measures to reduce greenhouse gas emissions will have broad economic, biological and social implications. The Kyoto Protocol under the United Nations Framework Convention on Climate Change was signed by Norway in 1998 and ratified in 2002, cf. Recommendation No 185 to the Storting (2001–2002). Norway has pledged to limit average greenhouse gas emissions in the commitment period 2008–2012 to one per cent above the 1990 level. The Kyoto commitment covers emissions of the greenhouse gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). These gases are converted into CO_2 equivalents using the GWP (Global Warming Potential), and the commitment refers to total greenhouse gas emissions in CO_2 equivalents.

Report No 34 to the Storting (2006–2007), cf. Recommendation No 145 to the Storting (2007–2008), assumes that Norway, within the framework of the Kyoto Protocol, will include removals by forests, corresponding to about 1.5 million tonnes of CO_2 per year, to allow it to meet its commitment. According to Proposition No 1 to the Storting (2008–2009), Norway will purchase carbon credits to avoid using its allowances deriving from net carbon removal in its existing forest areas.

The 'Agreement on Norway's Climate Policy' was signed in January 2008. This agreement is a result of an accord between the Norwegian Labour Party, Socialist Left Party, the Centre Party, the Conservative Party, the Christian Democratic Party and the Liberal Party on responses Report No 34 to the Storting (2006–2007) *Norway's Climate Policy*, cf. Recommendation No 145 to the Storting (2007–2008). The agreement is commonly referred to as the Storting's climate settlement. During the Storting's processing of report No 34 (2006–2007), the majority in the Standing Committee on Energy and the Environment agreed, among other things, to strengthen Norway's Kyoto commitment by ten percentage points and to make Norway carbon neutral by 2030. This presupposes that other industrial countries will also take on greater commitments through a global and ambitious climate agreement. Carbon neutrality means that Norway will undertake to reduce emissions by the equivalent of 100 per cent of its own emissions by 2030. Up to 2020, Norway will undertake to cut global emissions of greenhouse gases by an amount corresponding to 30 per cent of Norwegian emissions in 1990. In Recommendation No 145 to the Storting (2007–2008), the Committee's majority states that a reduction in Norway of 15–17 million tonnes of CO_2 equivalents in relation to the baseline scenario presented in the national budget for 2007 would be a realistic target.[1]

The objective of the investigation has been to assess target achievement in relation to Norway's international climate commitments, and the work carried out by the authorities to implement the climate policy decisions of the Storting. The investigation covers work to reduce greenhouse gas emissions in Norway and contributions by the Norwegian authorities to reducing emissions in other countries.

The following lines of inquiry were pursued:

1 Will Norway achieve its emissions targets?
2 How well is the Ministry of the Environment fulfilling its overriding responsibility for ensuring target achievement?
3 To what extent are the implemented policy instruments adequate for ensuring target achievement?

The investigation looks at the sectors mainly responsible for greenhouse gas emissions – petroleum, energy, industry, transport and agriculture – and the largest emission sources within each of these sectors. The investigation also covers work on research and development in climate-friendly technology, including gas-fired power stations and carbon capture and storage.

This investigation will form part of the 'Global coordinated audit on climate change' under the

1) Including uptake by forests within the existing framework of the Kyoto commitment.

auspices of the INTOSAI Working Group on Environmental Auditing (WGEA).[2]

A draft report was sent to the Ministry of the Environment, the Ministry of Finance, the Ministry of Foreign Affairs, the Ministry of Petroleum and Energy, the Ministry of Transport and Communications, the Ministry of Agriculture and Food and the Ministry of Trade and Industry in a letter of 3 November 2009. All the ministries responded by letter giving their comments on the report – the Ministry of Agriculture and Food on 30 November 2009, the Ministry of Trade and Industry and the Ministry of Transport and Communications on 2 December 2009, the Ministry of Foreign Affairs on 3 December 2009 and the Ministry of the Environment, the Ministry of Finance and the Ministry of Petroleum and Energy on 7 December 2009. Most of the ministries' comments on the factual section of the report have been taken into account and incorporated into the report. Most other comments have been incorporated into Chapter 2 below. The Office of the Auditor General's investigation report is enclosed as a printed appendix.

2 Implementation of the investigation

The issues in the investigation are elucidated by means of document analysis, statistical data and interviews. The investigation also refers to results from performance audits conducted by the supreme audit institutions of Brazil, Indonesia, the United Kingdom and the USA.

An analysis of relevant Storting documents has been carried out in order to identify relevant targets, management signals relating to the use of policy instruments and information reported to the Storting. Assessments of targets in the field, the use of policy instruments and performance monitoring in the individual sectors are also based on reviews of sectoral action plans, allocation letters to subordinate agencies and other available management information and reporting. Statutes, regulations, EU directives, evaluations, strategy documents, official reports and expert reports have also been reviewed. The investigation is also based on an analysis of available internal documents from the ministries, including minutes of meetings and governing documents that have been important in the follow-up of the Kyoto Protocol and in setting the long-term climate targets.

Statistical data have been collected from Statistics Norway (SSB) to shed light on emissions trends, energy use, other emission-generating activities and target achievement in Norway. Information about the purchase of allowances has also been included when assessing target achievement, and the relevant data have been obtained from the Ministry of Finance. Allowance prices have been obtained from the analysis company Point Carbon, and tax rates from the Ministry of Finance's budget propositions. Research allocations statistics have been obtained from the Research Council of Norway. Some data have also been obtained directly from the sector ministries. International data have been used in the investigation to compare Norway with other countries, obtained where possible from international organisations, including the United Nations Framework Convention on Climate Change and the European Environment Agency (EEA).

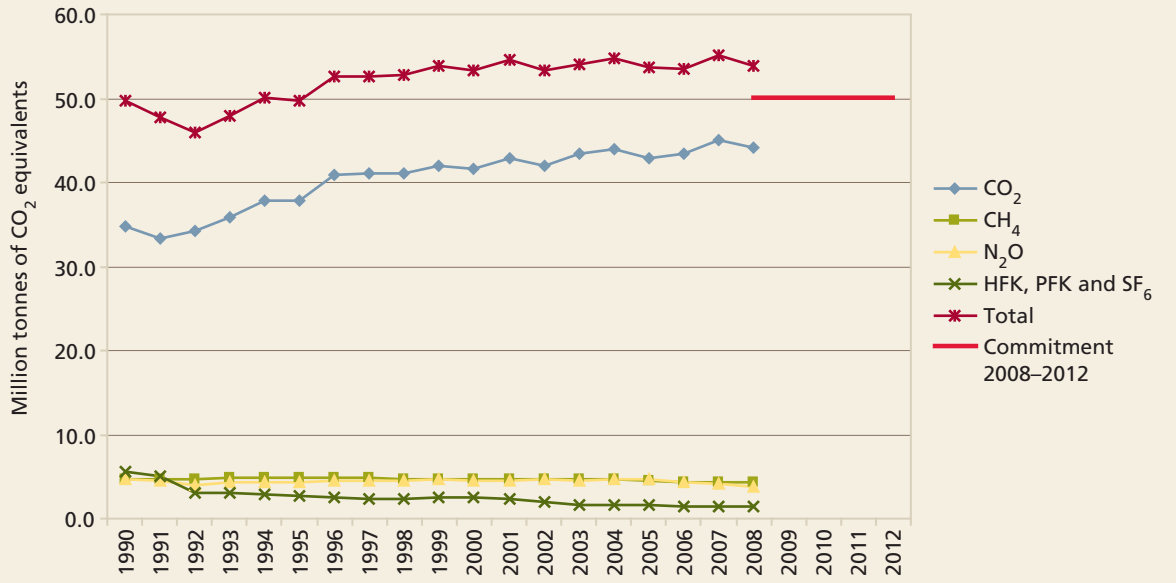
Interviews have been carried out with all ministries and subordinate agencies relevant to the investigation and with selected research communities and representatives of business and industry. Verified summaries of these interviews are part of the factual basis of the report.

The Office of the Auditor General has also commissioned special reports. Econ Pöyry AS prepared a report on the main findings in recent international literature evaluating various aspects of the Clean Development Mechanism (see fact box 1). The law firm Thommessen AS has assessed the Emissions Trading Directive's relevance to the European Economic Area (EEA) and the relationship between the first allocation plan and the Emissions Trading Directive.

All documents relevant to the lines of enquiry have been requested for this investigation. Documents from the interministerial work have only been made available to a very limited extent. According to the Ministry of the Environment, this may be due in many cases to the absence of documentation. In other cases, the Ministry of the Environment and the Ministry of Finance have pointed out that in their opinion, some of the relevant documents are not covered by the Office of the Auditor General's right of access. This applies, for example, to correspondence in connection with reporting and the minutes of

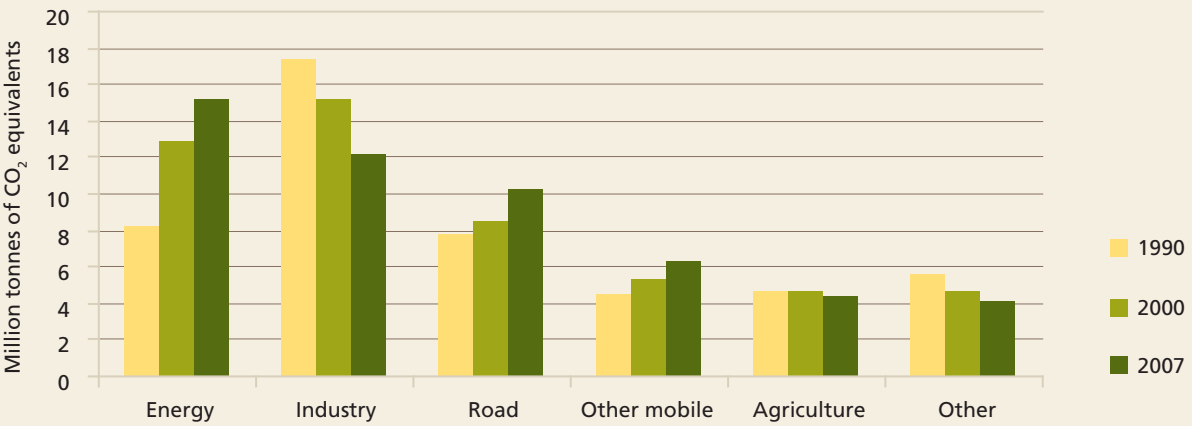
2) INTOSAI is an acronym for the International Organization of Supreme Audit Institutions. The 14 participant countries are Australia, Finland, Brazil, Canada, Estonia, Greece, Indonesia, Norway, Poland, Slovenia, the United Kingdom, South Africa, the USA and Austria.

Figure 1 Norwegian emissions of greenhouse gases 1990–2008



Source: Statistics Norway and the Norwegian Pollution Control Authority

Figure 2 Greenhouse gas emissions by source in 1990, 2000 and 2007



Source: Statistics Norway and the Norwegian Pollution Control Authority

meetings from the State Secretary Committee on Sustainable Development and Climate.

3 Summary of the findings

3.1 Norwegian emissions of greenhouse gases are increasing and are expected to continue to do so

In 2008, Norwegian greenhouse gas emissions totalled 53.8 million tonnes of CO_2 equivalents, which is 8.4 per cent higher than in 1990, see figure 1. Emissions increased by 5.9 per cent from 1990 to 1997 and by 2.0 per cent from 1998 (when the Kyoto Protocol was signed) to 2008.

The biggest source of greenhouse gas emissions in Norway is energy production, which accounts for 27 per cent (including petroleum recovery), followed by industry and road traffic, which account for 26 and 19 per cent respectively, see figure 2. Greenhouse gas emissions from the agricultural sector account for approximately 9 per cent. From 1990 to 2007 there was a strong increase in emissions from energy production and road traffic, but a substantial reduction in emissions from the industrial sector. Waste management sector emissions have also decreased (other sources).

According to Report No 9 to the Storting (2008–2009), unless further measures are implemented greenhouse gas emissions are projected to reach 57.3 million tonnes of CO_2 equivalents in 2010 and 56.5 million in 2020. This means an increase of 6.5 per cent and 5 per cent respectively on 2008 emissions. The projections show a continued increase in emissions from the transport sector until 2020. The most recent forecasts from the Petroleum Directorate indicate that emissions from the petroleum sector will not peak until 2019. Projections for the other sectors show that only minor changes in emission levels are expected. Several factors contribute to uncertainty about emission levels up to 2020, including economic growth, the activity level in petroleum recovery, realisation of carbon capture and storage (CCS) by gas-fired power stations and the price of emission allowances.

3.2 Purchases of emission allowances by private enterprises will probably ensure that the Kyoto target is met

The Kyoto Protocol commits Norway to limiting its total greenhouse gas emissions. However, the regulations under the Kyoto Protocol permit the purchase of emission allowances through the flexible mechanisms in order to compensate for increases in emissions, see fact box 1. Given the projections for 2010, this means that in order to meet its Kyoto commitments Norway will need to purchase allowances for slightly less than 6 million tonnes annually unless it takes further steps to reduce its own emissions of greenhouse gases. For the purpose of comparison, greenhouse gas emissions would have been at least 8 million tonnes of CO_2 equivalents higher in 2010 had policy instruments not been implemented after 1990.

Both the State and private enterprises may participate in emissions trading. The (Norwegian) Greenhouse Gas Emission Trading Act imposes obligations on Norwegian companies, which they can meet by reducing their own emissions or by buying allowances. The investigation shows that the number of allowances that the environmental authorities have allocated to enterprises in the emissions trading scheme is smaller than the expected demand. No free allowances, for example, were allocated to the petroleum sector. Unless further measures are implemented, Norwegian enterprises will have to buy approximately 7 million allowances annually through the European emissions trading scheme or the project-based mechanisms. The State can use these allowances to meet Norway's Kyoto commitment. Purchases of allowances by private enterprises when their actual emissions exceed their allocated allowances will thus help Norway to achieve its climate targets.

Given Norway's national allowance requirement of just under 6 million tonnes, these private purchases mean that the Norwegian State will not need to buy allowances to meet its Kyoto commitment. State purchases of allowances through the purchasing programme will provide extra security should private enterprises' purchases prove insufficient. It is therefore probable that Norway will meet its commitment under the Kyoto Protocol.

Fact box 1 The flexible mechanisms

An emission allowance is a right to emit one tonne of CO_2 equivalents. The allowances are tradable, thereby providing a country or enterprise with a financial incentive to reduce its own emissions.

The Kyoto mechanisms defined in the Kyoto Protocol comprise

- International trading in allocated emission allowances between countries required to surrender allowances under the protocol
- The Clean Development Mechanism (CDM), which includes project collaboration between countries required to surrender allowances and developing countries.
- Joint Implementation between countries required to surrender allowances (JI)

The CDM and the JI are often referred to by the collective term 'the project-based mechanisms'.

3.3 Uncertain cost of strengthening of the Protocol commitment

Norway will use emission-reducing measures in other countries to strengthen its Kyoto Protocol commitment, and State purchases of credits from the 'project-based mechanisms' will be central to achieving this target. The first pilot projects for joint implementation were set up on a Norwegian initiative in 1993. It was pointed out in Report No 29 to the Storting (1997–98) that Norway had accumulated considerable experience in using the project-based mechanisms, and the exploitation and continued development of this Norwegian advantage was cited as an objective in the transition to an operational system. The intention

was to continue active Norwegian efforts to gain experience of the JI and the CDM. The investigation shows that, in line with the intentions of the Storting, cf. Recommendation No 204 to the Storting (2001–2002), the amount of work carried out by Norwegian authorities on developing projects further after the end of the pilot phase was limited in the period 2001–2007. This limited the transfer of the competence and experience gained in the pilot phase, and resulted in the Norwegian authorities not having built up networks of potential credit sellers when the public purchasing programme was set up in 2007.

The investigation reveals uncertainty as to whether agreements to purchase emission allowances from projects in an early phase will allow Norway to reach its target of strengthening its Kyoto commitment by ten percentage points by 2012. The budget proposition for 2008 anticipated the signing of contracts to purchase allowances corresponding to a considerable portion of the total requirement in the period 2008–2012. The investigation shows that no allowance purchase contracts were signed in 2007, and only two in 2008 (one of which was subsequently cancelled). It seems that obtaining enough allowances proved a greater challenge than was expected when the purchase programme was established. The Ministry of Finance has stated that in some cases, the Ministry lost out to other buyers in the bidding rounds. The fact that other countries have larger networks because they became involved as investors at an earlier stage has also proved challenging. The consequences of starting to buy allowances at a later stage include higher prices, but also a reduced risk because the market is more mature.

In order to strengthen its Kyoto commitment, the Norwegian State will need to purchase approximately 26 million allowances. As of December 2009, contracts have been signed for delivery of just over 9 million allowances for the period 2008–2012, mainly for early-phase projects. The investigation also reveals that actual deliveries of allowances are expected to be lower than contractual volumes as a result of delays, non-implementation or lower-than-expected efficiency of the projects. The signed allowance purchase contracts far from cover the number of allowances required to strengthen the Kyoto commitment, and it is uncertain when the allowances will be delivered. In its budget proposition for 2010, the Ministry of Finance mentions the possibility of buying guaranteed allowances in the secondary market, i.e. trading in already issued allowances. In mid-December 2009, the price of allowances traded on the secondary market was about 25 per cent higher than for allowances from early-phase projects. The Ministry of Finance points out that being able to deliver a sufficient number of allowances to strengthen the Kyoto commitment by ten percentage points is therefore very much a question of funding.

3.4 Limited contribution from cross-sectoral policy instruments outside the petroleum sector

Effectiveness and cost effectiveness have been two central criteria in designing climate policy instruments since the Kyoto Protocol was signed. The investigation shows that cross-sectoral policy instruments have been very much based on cost effectiveness principles, i.e. they are designed to promote measures that will give the greatest possible emissions mitigation in relation to the resources employed.

3.4.1 Differentiated carbon tax provides differing incentives to implement emission-reducing measures

The carbon tax is intended to contribute to cost-effective reductions in CO_2 emissions. The investigation shows that the tax has been a long-term instrument and has triggered a number of emission-reducing measures, primarily in the petroleum sector, where the tax level has remained high.

The carbon tax level has risen very little since 1998, which is in line with the Storting's annual tax decision. The current tax system differentiates by sector and does not provide the same financial incentives for the implementation of measures in all sectors. A number of activities, such as ships engaged in international traffic, fishing vessels and aircraft in international traffic, are exempt from the tax. If the cost effectiveness principle is followed, emission cuts will be made in the sector where they are cheapest, and the cheapest measures will be triggered first. In its current form, the carbon tax will not necessarily result in cost-effective solutions across sector boundaries.

In its current form, the tax provides consumers and enterprises with a financial incentive to take the climate into consideration, but the investigation shows that the total effect on greenhouse gas emissions from sources in mainland Norway has been relatively small. Only in the petroleum sector have the taxes remained high enough over time to have any great impact. In the transport

sector, the carbon tax on fuel has also remained high over time. However, this tax constitutes only a small part of the total fuel cost, and major changes in fuel prices would be required to produce any change in driving patterns. The Ministry of Finance points out that there are other taxes on fuel that provide a stronger incentive to reduce consumption than the carbon tax.

3.4.2 Little emission-reducing effect from the first phase of the emission trading scheme

The intention of the Greenhouse Gas Emission Trading Act is to limit greenhouse gas emissions in a cost-effective manner. In many sectors, regulation through the emissions trading scheme has gradually replaced taxation. The emissions trading scheme for the period 2005–2007 included CO_2 emissions from sources not subject to the carbon tax, and which would have had an obligation to surrender allowances under the EU's Emissions Trading Directive. This corresponded to approximately eleven per cent of Norwegian emissions of greenhouse gases. The investigation shows that prior to 2008 the emissions trading scheme had little impact on greenhouse gas emissions. This is due partly to the limited scope of the emissions trading scheme, and partly to over-allocation of allowances resulting over time in extremely low prices. Both the authorities and representatives of business and industry think that the emissions trading scheme before 2008 had an important learning effect with respect to both technical design and the consequences of allocation principles.

In compliance with the EU's Emissions Trading Directive, the scope of the emissions trading scheme for 2008–2012 was extended in relation to the first period, and in 2008 it included approximately 36 per cent of Norwegian greenhouse gas emissions. Statistics show that the allowance price was relatively high in 2008, but fell at the beginning of 2009 and has fluctuated since then. It became clear during the investigation that Norwegian authorities have not calculated the expected impact of the emissions trading scheme on domestic emission reductions. During most of 2009, the price of allowances in the EU emissions trading scheme was 40 per cent lower than the carbon tax on mineral oil. An allowance price that is lower than the earlier carbon tax is a weak incentive to reduce domestic emissions. Since 2008, the petroleum sector has been regulated through allowances and a half tax rate, and this combination of policy instruments provides an incentive to implement measures whose costs are slightly below the earlier carbon tax level in the sector.

In its reply, the Ministry of Finance points out that there are relatively few onshore sectors where carbon tax has been replaced by an obligation to surrender allowances. In the case of some of these sectors, such as wood processing, however, the tax was lower than the current allowance price.

The Ministry of the Environment notes in its reply that no concrete targets have been set for reductions in domestic emissions for the period 2008–2012. The point of an emissions trading scheme will then be to control the total allowance quantity; the reduction of emissions in any facility will depend on the cost of the measures and the price of allowances.

3.4.3 Work on the emissions trading scheme has taken time

The right of Norwegian enterprises to trade with enterprises in other countries through linkage to the EU emissions trading scheme is intended to facilitate a more cost-effective implementation of climate policy. Proposition No 66 to the Odelsting (2006–2007), cf. Recommendation No 100 to the Odelsting (2006–2007), proposed the Norwegian emissions trading scheme to that of the EU from 1 January 2008.

Linkage to the EU emissions trading scheme was not finally adopted until February 2009. This delay can be ascribed to the continuing uncertainty as to whether the EU Emissions Trading Directive would have to be incorporated into the EEA Agreement. The investigation shows that Norway wanted to be linked to the EU emissions trading scheme through a bilateral agreement rather than through incorporation of the Directive into the EEA Agreement. The differing views of Norway and the EU led to negotiations, and it was not until 2007 that a final decision was made to incorporate the Directive into the EEA Agreement. In its letter of reply, the Ministry of the Environment stated that, in its opinion, the European Commission's position on this matter evolved over time. When informally approached in summer 2004, the Commission (Environment Directorate-General) was positive to reciprocal recognition of the Norwegian and EU emissions trading systems pursuant to article 25 of the directive. However, when the formal investigatory discussions started in 2005, it was the Commission's clear opinion that the Directive had to be incorporated into the EEA Agreement.

The investigation also shows that the authorities took a long time to clarify the allocation plan for 2008–2012. ESA (the EFTA Surveillance Authority) was the approval instance for the Norwegian allocation plan under the EEA Agreement, and approval of the plan was a precondition for linking the Norwegian and the EU emissions trading systems. The Norwegian plan for allocation of allowances was initially rejected by ESA, in part because the definition of 'new entrants' in the Norwegian Greenhouse Gas Emission Trading Act conflicted with the definition enshrined in the EU Emissions Trading Directive. The investigation points out that it is difficult to see how Norwegian authorities could reasonably expect the ESA to approve a divergent definition of new entrants, as the term is based on a definition set out in the Directive. This meant that the Storting had to process the Greenhouse Gas Emission Trading Act anew. As a result, the provisional plan for how Norway would meet its obligations under the Kyoto Protocol was not in place until late in 2007. This delay meant that there was no final clarification until 2009. As a consequence of this, Norwegian enterprises had to live longer than most of their European competitors with uncertainty about allocation.

In its reply, the Ministry of Finance points out that Norway was in a process of negotiation on adjustments to the Directive, and that therefore adaptation to all definitions of the Directive was in principle negotiable.

3.4.4 The Pollution Control Act has had only to a limited extent been applied to greenhouse gas emissions

Pursuant to the Act relating to Protection against Pollution and relating to Waste (the Pollution Control Act), the authorities have three ways of setting conditions when processing emission permits: capping the level of emissions; compliance with best available techniques to ensure low emission levels and efficient energy utilisation; and making requirements relating to technology. The investigation shows that the Pollution Control Act is regarded as an effective policy instrument, i.e. an instrument that will ensure target achievement with the greatest possible degree of certainty.

The Storting's premise that double regulation should be avoided has prevented the environmental authorities from applying the Pollution Control Act in areas where other policy instruments were used. It is also clear from the investigation that application of the Act may be in breach of the principle of cost-effectiveness. In its reply, the Ministry of the Environment points out that application of the Pollution Control Act is primarily relevant for emissions not regulated by other policy instruments, but that Report No 34 to the Storting (2006–2007) opens for the use of several policy instruments for the same source of emissions.

The Pollution Control Act has been applied to methane from waste by regulation of emission limits. In this sector, the use of policy instruments has had documented effect. The Pollution Control Act has not been applied very much to other greenhouse gases and sectors, and very few real conditions have been stipulated in emission permits in any of the areas where this is a possibility. When processing individual applications for emission permits, the Norwegian Pollution Control Authority considers what is deemed to be the best available technique (BAT), and assesses whether the applicant's choice of technology meets the requirements. According to the Norwegian Pollution Control Authority, greenhouse gases have been given little weight in assessing BAT, but there has been a focus on efficient energy use in operations. As far as technology requirements are concerned, the Ministry of the Environment has stipulated carbon capture and storage (CCS) requirements for gas-fired power plants.

In the case of the offshore petroleum sector, few requirements have been made of developers pursuant to the Pollution Control Act. The environmental authorities become involved in the process after the investment decisions have been made, which limits their opportunity to influence choices in favour of emission-reducing development solutions. Overall, the application of the Pollution Control Act on reducing greenhouse gas emissions has not had a major impact.

3.5 Inadequate fulfilment of sectoral responsibility

The investigation assumes that the sector authorities shall have an overview of the environmental impact of activities in their own sectors, and shall take responsibility for initiating and implementing measures in their own areas. Environmental work in the sectors must be carried out in a manner consistent with the national targets adopted by the Storting.

In connection with processing of Report No 34 to the Storting (2006–2007), cf. Recommendation No 145 to the Storting (2007–2008), sectoral climate action plans and emission reduction targets for 2020 were established for four sectors. The targets were set in relation to the baseline scenario in the Norwegian Pollution Control Authority's mitigation analysis, as shown in table 1.[3]

Table 1 Sectoral emission reduction targets in 2020 (in million tonnes CO_2 equivalents)

Petroleum and energy	Transport	Industry	Primary industries and waste management
3–5	2.5–4	2–4	1–1.5

The investigation shows that since the Kyoto Protocol was signed in 1998 the sector ministries have done little or nothing to operationalise the climate targets by setting working targets and concretising policy instrument use in their own sectors. In the same period, the sector ministries have given few specific management signals concerning climate targets to their subordinate agencies. There has, however, been a positive development as regards management signals since 2008.

The investigation also reveals that the sectors' application of climate measure-promoting policy instruments is very variable, and indicates that several targets intended to reduce greenhouse gas emissions will probably not be achieved. In Recommendation No 145 to the Storting (2006–2007), the majority in the Standing Committee on Energy and the Environment states that special consideration should be given to measures that will be cost-effective given a projected rise in carbon prices over the lifetime of the investment, and which would not necessarily be triggered by the current use of policy instruments. The sector ministries, however, primarily emphasise the importance of the current taxation level and allowance price in determining which measures are deemed to be cost-effective. The investigation shows that such assessments apparently fail to take account of the projected rise in the carbon price. The question is whether uncertainty about costs and what can be deemed cost-effective might have obstructed the implementation of policy instruments in the sectors. The investigation also points out that little attention would seem to have been paid to effectiveness in long-term climate goals.

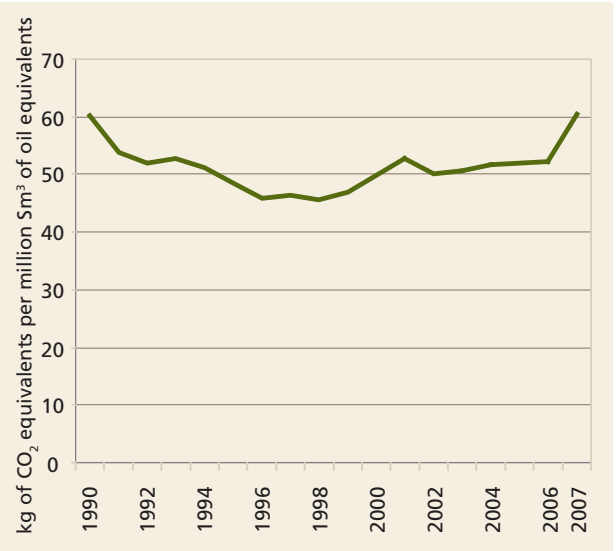
3) The sector targets are based on estimates and will have to be reconsidered where indicated by changes in forecasts, costs or technological development, or other materially changed premises.

The Ministry of Finance refers to the great uncertainty concerning the future carbon price, pointing out that the price will be determined, among other things, by the outcome of an international climate agreement. The Ministry of Finance and the Ministry of Petroleum and Energy point out in their replies that the investigation assumes that the sector authorities are responsible for following up the sector targets in their own areas. Both ministries point to the necessity of implementing cross-sectoral measures in order to reduce emissions sufficiently to meet Norway's national climate target. These cross-sectoral policy instruments will first and foremost be the emissions trading scheme and climate-related taxes, where both the Ministry of the Environment and the Ministry of Finance have their respective administrative responsibilities. There are also some sector-specific policy instruments. The degree of target achievement in the different sectors will therefore also depend on policy instruments outside the responsibility areas of the respective sectors.

3.5.1 Emission-reducing solutions given too little consideration in the petroleum sector

Emissions from petroleum activities increased by 92 per cent from 1990 to 2007 and by 39 per cent from 1998. This increase is explained by increased recovery on the continental shelf, new discoveries and an extended economic life for existing fields. CO_2 from gas turbines used in offshore power production accounts for the largest percentage of the emissions.

Figure 3 Greenhouse gas emissions from oil and gas recovery per produced unit in 1990–2007



Source: Statistics Norway and the Norwegian Pollution Control Authority

Figure 3 shows that emissions per produced unit decreased up to 1998, but increased again after 1999. The current emissions level corresponds to the 1990 level. The investigation shows that the reduction was a result of greater energy efficiency and less use of flaring offshore. The increased emissions per produced unit in recent years are the result of an increase in energy consumption for offshore operations. An increase in the number of older fields and a change in production profile, with an increasing amount of gas recovery, both entail more energy-intensive operations. Since 1989, major new developments have been approved and targets have been set for increasing recovery from older fields. The investigation indicates that the projections for the sector before 2007 have underestimated the actual emissions level for 2010.

The investigation shows that use of policy instruments in the sector has been based on the principle of cost-effectiveness, and that the offshore carbon tax has been the most important instrument since its introduction in 1990. The offshore carbon tax has helped to reduce emissions from the sector compared with what would otherwise have been the case – by the equivalent of two to three million tonnes per year over a 20-year period. Even though companies will include the carbon tax, together with the projected allowance price, in their profitability calculations when they consider development options, reporting from the companies shows that the tax level is increasingly ineffective in triggering new emission-reducing measures for existing activities on the continental shelf. This indicates that the sector now has few remaining measures where the costs are equal to or lower than the total of allowances and taxes.

The Ministry of Finance points out in its reply that taxes will often have a greater effect in the long-term perspective. The Ministry of the Environment refers to the fact that if tax is to stimulate more expensive measures over time, it must be raised.

Petroleum activities in Norway shall be conducted in a prudent manner and take due account of the environment, among other things, cf. the Act relating to Petroleum Activities section 10-1. The Ministry of Petroleum and Energy is entitled to stipulate environmental requirements in what is referred to as the plan for development and operation (PDO). In accordance with Recommendation No 114 to the Storting(1995–96), when preparing the PDO, the oil companies are required, among other things, to submit evaluations of the electrification of new fields and major development projects rather than using gas turbines to provide energy. Requirements relating to use of technology may also be stipulated during approval of the PDO. It is clear from the investigation that the PDO is important because the choice of development solution determines the choice of technology and emission-reducing solutions on an installation, and thus has a major impact on the amount of emissions from the field for many years to come.

A review of 45 approved PDO documents processed since 1998 reveals that the petroleum authorities have rarely required operators to apply emission-reducing technology solutions, and that alternative development solutions have not been sufficiently highlighted in the documents submitted during the process. It is pointed out in the investigation that in a number of documents it is, for example, difficult to determine whether or not the developer has chosen solutions based on BAT. Electricity generated onshore was chosen as a solution in three developments, but the document review shows that in the last three years electrification has increasingly been assessed as a relevant option. Few developers have sufficiently established the costs involved in using power generated onshore rather than gas turbines. The review shows that the petroleum authorities attach a great deal of weight to profitability and security of supply on the basis of the companies' own evaluations. The investigation questions whether the reduction potential of alternative solutions has been given adequate focus in the PDO documents, and this makes it difficult to evaluate whether emission-reduction considerations have been given sufficient attention.

In its reply, the Ministry of Petroleum and Energy defines its main task as facilitating an overall petroleum policy based on efficient use of resources. Among other things, this involves ensuring adequate socio-economic and environmental administration. The petroleum sector is affected by cross-sectoral policy instruments such as the carbon tax and the emissions trading scheme. Given the presence of these instruments, the cost effectiveness principle must be applied when choosing development solutions. The PDOs and their processing are an important process for verifying that correct and environmentally friendly development solutions are chosen. These are important and overriding cost-effectiveness principles that the Ministry considers to be poorly reflected in the report. The Ministry also

disagrees with the evaluation of the PDO process and considers that the report creates a false impression that the petroleum authorities do not make independent assessments and fail to stipulate requirements and conditions for emission-reducing measures. A PDO is the result of a long process. The authorities are in dialogue with the operators before the PDO is submitted so as to ensure, for example, that account is taken of BAT requirements for environmental solutions and that the use of power generated onshore is considered. The authorities also make their own independent assessments of what constitutes an expedient development solution based on environmental, cost-related and resource-related considerations.

The Ministry of Petroleum and Energy comments further that climate policy is an important framework for energy policy, but that there are also other very important considerations to be taken into account. The Ministry of Petroleum and Energy's main task is to facilitate an overall petroleum and energy policy based on efficient use of resources. Environmental considerations and sustainable development have always been an integral part of Norwegian petroleum and energy activities.

3.5.2 Several energy sector targets will not be achieved

During the processing of report No 29 to the Storting (1998–99), cf. Recommendation No. 122 to the Storting (1999–2000), targets were set to limit energy consumption. Statistics show that the total stationary final consumption of energy has increased little in recent years, while there has been a great increase in the use of energy in energy production and transport. According to Statistics Norway, electricity accounts for about 50 per cent of the stationary final consumption of energy in Norway. Hydropower accounts for 98–99 per cent of electricity production and wind power for slightly less than one per cent. The Ministry of Petroleum and Energy does not have its own performance indicators for measuring the effect of policy instruments on reducing energy use. The target is operationalised via Enova, which has a total target of 18 TWh of saved or produced renewable energy by 2011, with energy-efficiency measures as part of the target.

In Recommendation No 122 to the Storting (1999–2000), the Standing Committee on Energy and the Environment proposed an annual increase in wind power production of three TWh by 2010. This was to be achieved through financial support schemes, for example from Enova and the green certificates scheme. The investigation shows that uncertainty surrounding the support schemes combined with the lack of profitability in the projects has caused planned projects to be dropped. It was pointed out in the investigation that the framework conditions for producers of renewable energy have been unpredictable. By the end of 2008, wind power corresponding to an annual production of one TWh had been developed. Reports to the Norwegian Water Resources and Energy Directorate show that produced wind power increased somewhat in 2009, but that the wind power target will still not be met.

According to the Ministry of Petroleum and Energy, renewable heating solutions such as district heating are important because they can replace heating with fossil fuels. Through the processing of Report No 29 to the Storting (1998–99), a target was set to increase use of water-borne heating solutions by at least 4 TWh per year by 2010. The Ministry of Petroleum and Energy wished to achieve the target of increased use of renewable heating solutions based on renewable energy sources through economic policy instruments, in particular Enova. The investigation shows that production of district heating increased by approximately 1.5 TWh from 1998 to 2008. In 2008 it had reached about three TWh, but there is a considerable risk that the target for increased use of renewable energy heating will not be achieved. The investigation also shows that greenhouse gas emissions in district heating production have increased. Major fluctuations in the demand for power during the year necessitate the use of peak load fuels. The use of fossil fuels for peak loads in district heating somewhat diminishes the climatic benefit of this type of heating solution.

Investments in wind power and district heating require changes to the infrastructure. The investigation reveals that the Norwegian Water Resources and Energy Directorate find the licensing process demanding, among other things because many projects are complex and meet great opposition. In recent years, there has been insufficient licence-processing capacity despite an increase in the number of executive officers.

The Ministry of Petroleum and Energy is responsible for the consumer aspect of the bioenergy investment. According to Report No 145 to the Storting (2007–2008), a targeted and coordinated use of policy instruments to increase

the development of bioenergy by up to 14 TWh by 2020 must be ensured. The investigation reveals that the parties exercising authority perceive the target of 14 TWh of bioenergy as unclear, as it is not evident whether it applies to consumption or outtake of fuels for bioenergy. The investigation also shows that the total consumption of bioenergy has not increased in recent years. The percentage of bioenergy in district heating also remained stable in the period.

In order to reduce the use of fossil fuel for heating, a target was set in 2002 to reduce the use of mineral oil for heating by 25 per cent in the period 2008–2012 compared with the period 1996–2000, cf. Recommendation No 240 to the Storting (2001–2002). It was assumed that phasing in new renewable energy sources ought to reduce the use of fuel oil. The investigation shows that consumption was almost halved in the period 1990–2007, and the Ministry of Petroleum and Energy deems the target to have been met.

Target achievement in one area of the energy sector is often a prerequisite for target achievement in another. For example, this reduction in the use of fossil fuels presupposes the availability of renewable energy and heating solutions to which the consumer can convert. It was pointed out in the investigation that failure to meet targets in the energy sector constitutes a considerable risk to long-term climate targets.

The Ministry of Petroleum and Energy is unwilling to accept that the energy sector is lagging behind with respect to achieving the long-term climate targets, and it points out that electricity production is based almost exclusively on renewable power. The Ministry also underlines that energy policy is not governed by climate targets alone.

3.5.3 The forestry sector's use of policy instruments does little to underpin the climate targets

The forestry sector primarily contributes to climate policy objectives being achieved in two ways. Firstly, the forests are the main source of raw materials for the production of bioenergy, which can replace fossil fuels. Secondly, the forests capture and store carbon, thereby helping to keep the level of atmospheric CO_2 lower than it would otherwise have been. Norwegian forests capture approximately 25 million tonnes of CO_2 equivalents annually.

Sufficient availability of bioenergy is a prerequisite if the investment in district heating is to contribute to reducing greenhouse gas emissions. Increased production of bioenergy means more felling of trees. The processing of Report No 17 to the Storting (1998–99) prepared for a policy of increased felling. Low timber prices have resulted in a low activity level in the sector and felling has remained relatively stable. Silviculture activity, tree-planting in particular, has declined in parallel with the policy instrument transition from direct to indirect grants.

If we are to achieve the target of increasing bioenergy development by 14 TWh, the present level of production, which has remained stable at about 13 TWh for a long time, must be more than doubled. The economic policy instruments intended to promote bioenergy production have not contributed much to target achievement. Grants from the Forest Trust Fund, for example, are not aimed at bioenergy production in particular. The Ministry of Agriculture and Food subsidises bioenergy production through its bioenergy programme, but the production plants put into use so far have had little effect. There is a considerable risk that the long-term bioenergy targets will not be met.

The Kyoto Protocol provides limited credits for forestry measures. It became clear in the investigation that focus has been on the measures that could reduce emissions under the Kyoto Protocol. The more long-term possibilities relating to climate measures in the forestry sector in light of the general commitments under the United Nations Framework Convention on Climate Change have been given less priority.

3.5.4 Insufficient knowledge base hinders emission reduction in the agricultural sector

Greenhouse gas emissions from agriculture remained stable at slightly less than 4.5 million tonnes of CO_2 equivalents in the period 1998–2007. In general, this sector's greenhouse gas emissions are unregulated.

During the processing of Report No 69 to the Storting (2007–2008), cf. Recommendation No 320 to the Storting (2007–2008), the Standing Committee on Business and Industry pointed out that agriculture, like other sectors, faces a great number of environmental challenges and that there is scope for further improvement – not least in the matter of greenhouse gas emissions. The investigation shows that policy instruments

through the National Agricultural Agreement make an indirect contribution to reducing emissions of greenhouse gases. This includes grants from the national environmental programme and the regional environmental programmes. However, these programmes are primarily aimed at other environmental values than climate.

The agricultural authorities point to an inadequate knowledge base as a challenge to implementing measures in the agricultural sector. In the investigation, it was questioned whether the Ministry of Agriculture and Food has done enough towards providing a knowledge-based decision-making platform to contribute to reducing greenhouse gas emission in agriculture. This entails a risk that agriculture will not make sufficient contribution to achieving the 2020 target.

The Ministry of Agriculture states in its reply that it has no comments on the main lines of the draft report's description and evaluations, but points out that measures have been initiated in recent years, among other things through the five-year national development programme for climate measures in agriculture adopted in the 2007 Agricultural Agreement.

3.5.5 Voluntary agreements have contributed to reducing emissions in industry

Emissions from the industrial sector fell by approximately 25 per cent in the period 1990–2007. The reduction is as result of modernisation, new technology, restructuring of processes and the closure of a number of emission-intensive enterprises. Voluntary agreements between industry and the authorities have been the most important policy instrument since 1998. The investigation shows that the greatest reductions in greenhouse gas emissions were in sectors covered by the agreements.

When the agreement between the Ministry of the Environment and the process industry expired in 2007, approximately half of the industrial greenhouse gas emissions were unregulated. In 2009, a new agreement was signed with industry for the period 2008–2012, entailing a reduction of 200,000 tonnes compared with the 2007 level. The investigation shows that, due to the closure of an industrial plant and the market situation in 2009, a greater reduction than this had already been achieved when the agreement was signed.

The investigation reveals a lack of clarity as to which ministry or ministries are responsible for ensuring achievement of the sector target for industry. The Ministry of Trade and Industry does not consider itself to be a sector ministry on a par with some of the other ministries. The Ministry refers to the fact that the Ministry of the Environment and the Ministry of Finance have regulating policy instruments at their disposal that can be used in relation to industry. Neither the Ministry of Trade and Industry nor the Ministry of the Environment set concrete working targets for reducing the industrial emissions in their budget propositions. It was pointed out in the investigation that unclear sector responsibility may be a risk factor in relation to the sector's target achievement up to 2020.

3.5.6 Growth in road traffic – freight a special challenge

The investigation shows that greenhouse gas emissions from the transport sector increased by 35 per cent from 1990 to 2007. In road haulage, which is the dominant form of freight transport, transport work in tonne-kilometres increased by 98 per cent from 1990 to 2007, while passenger transport work in passenger-kilometres increased by 26 per cent. Growth is expected to continue up to 2020. In the processing of Report No 34 to the Storting (2006–2007), the Standing Committee on Energy and the Environment agreed that in order to reduce greenhouse gas emissions it will be necessary to restrict the growth in traffic as well as achieve transfer to more environmentally friendly forms of transport and cut emissions from individual vehicles, cf. Recommendation No 145 to the Storting (2007–2008).

In the processing of Report No 29 to the Storting (1997–98), cf. Recommendation No 233 to the Storting (1997–98), the majority of the Standing Committee on Energy and the Environment stated that transport and communications investments must be redirected from road to rail, and that as much as possible of long-distance freight should be transferred from road to rail. The investigation shows that the difference between road and rail appropriations in the period widened by more than two billion NOK in favour of roads. Road freight increased by 98 per cent from 1990 to 2007, while rail freight increased by 51.2 per cent. It would therefore appear that work to move more freight transport from road to rail has not been very successful in producing the desired results. The Ministry of Transport and Communications points out that although developing the railways is not primarily a climate measure, when combined with measures

restricting the use of cars and an intelligent land-use policy, a strengthened rail system may well have an effect on greenhouse gas emissions.

Average emissions from new passenger cars shall be less than 120 g CO_2/km by 2012, cf. Recommendation No 145 to the Storting (2007–2008). The registration tax on vehicles was restructured as from 2007, providing consumers with a greater incentive to choose low-emission vehicles. Average CO_2 emission from newly registered passenger cars fell from 177 g CO_2/km in 2006 to 159 g CO_2/km after the restructuring of the tax. In 2009, average CO_2 emissions from newly registered passenger cars fell further to 151 g CO_2/km. There is nevertheless a risk that the target of average emissions of maximum 120 g CO_2/km from new cars will not be achieved by 2012. This is partly because there is not a sufficient supply of larger (e.g. family-size) low-emission cars in the passenger car market.

The Ministry of Transport and Communications states that there are many policy instruments with potential for reducing greenhouse gas emissions in the transport sector which the Ministry does not have the authority to apply. These include taxes/tolls, parking policies, land-use policy and road pricing, which require local political support and interministerial collaboration. It was pointed out in the investigation that, along with the expected continued growth in the transport sector, coordination across sectors and administrative levels poses a particular challenge to the achievement of the long-term climate targets. The investigation does not cover the municipal policy instruments.

3.6 Technological advances can contribute to achieving long-term climate targets, but are associated with high risk

The investigation shows that the costs involved in major national emissions reduction may be high, but can be reduced by developing and implementing new technology. There was a considerable stepping up of appropriations for research that could help to reduce greenhouse gas emissions in the period from 1998 to 2009; half of the increase was allocated from 2008 to 2009. The increased research investments came late in relation to the climate target for 2008–2012, but may provide an important basis for achieving the long-term targets. There have been several changes in the organisation of research programmes in recent years, towards broader and more long-term programmes. Research has concentrated primarily on renewable energy and carbon capture and storage (CCS) from gas-fired power plants rather than on areas where Norway has high emissions of greenhouse gases. Technological research relating to greenhouse gas emissions in the process industry has not been prioritised.

The investigation shows that there are several challenges associated with introducing new technology into the market, and one of the reasons for this is that the energy sector has many small players. The Kyoto mechanisms currently make little contribution to technological advances and innovation, partly because the carbon price is too low. Most of the innovation-promoting policy instruments are general and not specially aimed at climate technology.

With the Storting's backing, plans were adopted to clean CO_2 from two gas-fired power plants at Kårstø and Mongstad. The investigation shows that time frames for the already established facilities are tight and the technological targets challenging. In the processing of the national budget for 2006, it was decided that Kårstø should have carbon capture and storage (CCS), and that the cleaning facility would be operational by 2009, cf. Budget recommendation No 9 to the Storting (2005–2006). The construction of the cleaning facility was subsequently postponed in accordance with the Storting's approval of the proposal made in the revised national budget for 2009 to consider an integrated solution. The delayed start-up of CO_2 cleaning will result in large emissions from the gas-fired power plant which came into regular production from 2009.

In 2006, the Ministry of Petroleum and Energy and Statoil signed an implementation agreement to establish CCS at Mongstad in two phases: first a test centre for carbon capture, to be followed by full-scale CCS from 2014. The aim is to develop solutions capable of reducing the costs and the technical and economic risks associated with full-scale carbon capture, which can be widely applied nationally and internationally, cf. Proposition No 49 to the Storting (2006–2007). The start-up of the test centre is scheduled for 2011, one year later than originally planned. The decision on the development solution for the full-scale facility at Mongstad is planned for 2012 at the latest, and the investigation shows that this means that the choice of technology will actually have to be made earlier. Tight time frames may mean that there is a risk that the CCS project will make but a small contribution to the development of new technology. The consequences of postponed

implementation of cleaning will be increased emissions of greenhouse gases at Kårstø and Mongstad.

Statoil's master plan for the full-scale facility at Mongstad presents an investment estimate of NOK 25 billion. In Proposition No 67 to the Storting (2008–2009), the Ministry of Petroleum and Energy states that a rough estimate from Gassnova indicates that the planning costs of a full-scale facility will amount to NOK 2 billion. The investigation shows that it is difficult to set fixed cost limits for the implementation of measures based on untested technology. The planning work alone is cost-intensive, and the management confirms that the time schedules determine some of the premises for the cost framework, the State's negotiating position and the choice of technology. A cost-sharing system in which the State pays most of the development, investment and operating costs entails a major risk of overruns, as the one party with a direct interest in limiting costs will be the State.

The investigation shows that, in the case of the two major investments at Kårstø and Mongstad, little weight was given to carbon transport and storage in relation to capture technology. As a result of this, there will be no storage solution established for the test centre, and this will mean CO_2 emissions. Moreover, there is a risk that optimal storage solutions will not be chosen when the capture facilities are established at Kårstø and Mongstad. It was pointed out in the investigation that insufficient focus on storage is a risk factor that may entail extra costs and further delays. The Ministry of the Environment points out that the reason why no storage solution was established for the test centre was an evaluation of the cost. In the Ministry's opinion, Norway is generally far ahead in the field of carbon storage.

3.7 Emission-reduction measures in other countries

The investigation shows that Norway's acceptance of the emission commitments under the Kyoto Protocol was conditional on being able to use the Kyoto mechanisms, including the Clean Development Mechanism. Calculations show that use of the flexible mechanisms will help to reduce the cost of meeting Norway's Kyoto commitment and will lessen the risk of carbon leakages (i.e. increases in emissions in other countries as a result of reduced emissions in Norway). The target for 2020 to undertake to cut global emissions of greenhouse gases by an amount corresponding to 30 per cent of Norwegian emissions in 1990 can also be achieved by reducing emissions in other countries. There is great uncertainty about the cost of domestic reductions and also the price of allowances up to 2020. However, the investigation shows that contributing to emission mitigation in other countries is associated with major challenges.

3.7.1 Uncertain how far the CDM contributes to global emission reductions

As stated above, the purchase of credits from the project-based mechanisms is a key policy instrument in Norway's achievement of its various national climate targets. The Kyoto Protocol states as an objective that CDM projects shall have real, measurable and long-term benefits. Another objective is that reductions in emissions shall be additional to any that would occur in the absence of the certified project activity. The investigation shows that use of the CDM helps emission mitigation in developing countries, but it is very uncertain how big the reductions actually are in relation to what has been claimed in the projects. An important reason for this uncertainty is the difficulty of verifying the additionality of a project, i.e. ensuring that it would not have been implemented without the income from CDM credits. Additionality shall be verified through the UN's certification system. It was pointed out in the investigation that the certification scheme is in continuous development, and that this will probably help to reduce the number of non-additional projects over time. There is also a risk of emissions increasing elsewhere as a result of projects being implemented. This is to a great degree a consequence of methodological challenges in connection with measuring such effects and of the absence of a global climate agreement. The investigation also shows that the projects contribute to some extent to technology transfer.

Another and equal objective under the Kyoto Protocol is that the CDM shall contribute to sustainable development in the host country. It is up to the host country to attend to the sustainability aspect. The investigation shows that the projects contribute to varying degrees to sustainable development. International studies of CDM projects show that the projects seem either to be additional or to contribute to sustainable development, but that these two considerations are more or less mutually exclusive.

The Ministry of Finance refers in its reply to Recommendation No 145 to the Storting (2007–2008), in which the majority of the Standing

Committee on Energy and the Environment emphasised that measures in developing countries can generate a threefold gain compared with expensive measures in other countries. The Clean Development Mechanism under the Kyoto Protocol allows industrial countries to fund emission mitigation projects in developing countries, thereby contributing to sustainable development in the host country as well as providing the investors with emission credits. The Ministry of Finance also refers to Report No 2 to the Storting (2006–2007), which states that 'through its purchase of credits and allowances, the State shall promote more stringent environmental requirements, and shall therefore only purchase credits and allowances certified by the UN'. The Ministry has assumed that there is no need to re-examine UN certification of the projects Norway purchases abroad.

The Ministry of the Environment points out in its reply that it is the job of the UN to ensure that the credits produce actual emission reduction, and emphasises that credit and allowance purchases are made on the basis of a clear remit from the Storting, and that the Storting has stipulated no special requirements for projects that are purchased.

3.7.2 Challenges in forest management in countries that are partners in the Climate and Forest Initiative

The Government's Climate and Forest Initiative commenced in 2007, one of its objectives being to contribute to reducing emissions of greenhouse gases from deforestation and forest degradation in developing countries. Reduced deforestation is not part of the Clean Development Mechanism. Norway's effort in this area is based on a view that cutting emissions from deforestation is cost-effective, and that the results can be achieved fairly quickly. The investigation has limited itself to evaluating the premises for target achievement in Brazil and Indonesia, and the work of the Norwegian authorities in following up conditions stipulated by the Standing Committee on Energy and the Environments for allocation resolutions.

The majority in the Standing Committee on Energy and the Environment considered that the investment should be conditional on the establishment of satisfactory mechanisms for certifying emission reductions and prudent management of large allocations to forestry measures. A reliable capacity must be established for monitoring, analysing and verifying forest areas and the carbon content of forest, and changes to these elements. A common denominator for the countries targeted by the Norwegian efforts must be an explicit and, over time, demonstrable political will to work systematically to combat deforestation and forest degradation, including developing and following up national strategies.

For 2009, NOK 1.5 billion was appropriated to the Climate and Forestry Initiative, and it has been proposed to increase the amount to NOK 2.1 billion for 2010. The Climate and Forestry Initiative has set up a project portfolio which, in addition to bilateral cooperation with Brazil, also has a special focus on multilateral organisations such as the UN and the World Bank. The fact that Norway has for a long time been the sole donor to the UN-REDD programme constitutes a risk that the economic incentives may be too weak and the programme may be perceived as a Norwegian initiative. There is also a risk associated with the coordination of the multilateral work at country level, in particular the work of the UN organisations that are involved.

Audit reports on forest management from both the Brazilian and the Indonesian supreme audit institutions identify challenges with regard to national ownership of the REDD work in both countries. The Brazilian supreme audit institution describes major challenges relating to interaction between ministries with responsibility for the causes of deforestation in the Amazon. The Indonesian supreme audit institution points out that forest management faces major challenges in implementing and enforcing the legislation. In both Brazil and Indonesia there are stated to be conflicts of goals between the REDD work and forest-based commercial activities, which may impede the reduction of emissions from deforestation.

There are also challenges regarding the monitoring of forest areas. Indonesia lacks both mapping of the forest areas and an overview of CO_2 emissions resulting from deforestation and forest degradation. In Brazil, the actual monitoring of forest areas is deemed satisfactory, but the Brazilian supreme audit institution points out that the authorities fail to differentiate between legal and illegal felling in their reporting. This may lead to an incomplete overview of the deforestation to be stopped, making it difficult to determine whether or not targets have been met.

The investigation shows that the Climate and Forestry Initiative demands an investment that is

associated with considerable risk, linked among other things to governance, economic incentives and geographical conditions. Through Proposition No 1 to the Storting (2008–2009), the Ministry of the Environment and the Ministry of Foreign Affairs, on behalf of both ministries, gave an account of many of the risk factors in the project and proposed risk management strategies.

The Ministry of Foreign Affairs and the Ministry of the Environment point out in their replies that the measures under the Climate and Forest Initiative shall contribute to sustainable development and combating poverty, preservation of biological diversity and safeguarding of the interests and rights of the local population. Climate and Forestry Initiative efforts cannot be judged solely on whether the individual countries actually succeed in reducing deforestation. The audit reports from Brazil and Indonesia point to 'a lack of national ownership of the work to reduce deforestation'. Support for the preparation of national strategies and capacity building may improve form and development.

3.8 Challenges in interministerial work

The Ministry of the Environment has special responsibility for the Government's environmental policy, including coordination of the Government's environmental policy targets and ensuring performance monitoring of the environmental policy. The Ministry shall be a driving force at the national level in relation to the various sector authorities.

Climate is a cross-sectoral area, and many ministries are responsible for sectors producing greenhouse gas emissions. The investigation shows that the policy instrument apparatus extends across the responsibility areas of many ministries, and the ministry responsible for the targets is not always the one responsible for the related policy instruments. Moreover, the responsibility of the different ministries to ensure that targets are achieved and that policy instruments are employed to reduce emissions of greenhouse gases is unclear. Since the sector targets were set, opinions have differed as to whether responsibility for the achievement of sector targets lies with the individual sector ministries or the Government as a whole. The investigation highlights the fact that unclear roles and unclear division of responsibility pose a risk that targets will not be followed up, and that sufficiently relevant and effective instruments will not be employed in the efforts to achieve climate targets.

The investigation shows that the Ministry of the Environment's fulfils its role as a driving force and performs coordination work through reports and bilateral contact with the sector ministries. Interministerial groups have been set up, for example in connection with reports. KLISUR (the Interministerial Group on Climate Change and Acid Rain), the only interministerial group at senior civil servant level to exist for any length of time, did little work on national climate policy in the period from 1998 to 2007, when it was disbanded. According to the Ministry of the Environment, much of the follow-up takes place in the specialist departments, but the investigation reveals that this work is poorly documented. It is therefore difficult to assess how well the Ministry of the Environment has managed to perform its role as a driving force in the area of climate systematically over time. The investigation raised the question of whether this might not obstruct systematic performance of the role. The lack of documentation of the work might also affect the possibility of access and verification of the decision-making processes. It was questioned whether this might not hinder good management and performance monitoring.

The investigation shows that, as a driving force, the Ministry of the Environment faces considerable challenges in the form of strong sectoral interests. The ministries have differing views as to whether a cross-sectoral approach is sufficient, or whether there is a need to focus on sector-specific aspects as well. The differences are manifested, among other places, in divergent opinions concerning the need for mitigation analyses and projections at sector level and the extent to which sector-specific policy instruments should be implemented. Disagreement between the ministries has made the Ministry of the Environment's work more difficult. Moreover, the area is marked by conflicts of goals, which may pose a risk to the achievement of long-term climate targets.

The Ministry of the Environment points out in its reply that prioritisation in the case of target conflicts is a political matter. The Ministry points out that the Storting sets targets through its processing of cases.

The investigation uncovered some weaknesses in management information. Sector projections are not shown in reports to the Storting, not even in Report No 34 to the Storting (2006–2007), in which the sector targets were set. This poses challenges to performance monitoring and

verifiability. Moreover, the 2020 targets were set in relation to a baseline scenario, i.e. projected emission levels assuming that the adopted policy instruments are implemented. Follow-up of the national targets will require retrospective evidencing of the impact of implemented measures at both the national and the sectoral levels. The investigation shows that retrospective differentiation between changes in emissions due to the impact of measures and changes that are due, for example, to general economic fluctuations is methodologically very demanding. This makes any collation of measures and their impact uncertain and difficult to verify. There has been no systematic reporting on the effect of implemented policy instruments since the targets were adopted. Particular reference was made in the investigation to the fact that the authorities have not evaluated the expected contribution of the emissions trading scheme to domestic emission reductions for the period 2008–2012, and that the basis for assessing the impact of the carbon tax on domestic emission sources seems uncertain. The investigation questioned whether the Ministry of the Environment has sufficient management information to allow for continuous assessment of target achievement, thereby ensuring good performance monitoring through its role as a driving force vis-à-vis the other ministries.

The Ministry of the Environment comments that the 2020 targets were not adopted until the Storting's climate settlement in January 2008 and its processing of Report No 34 to the Storting (2006–2007) in March 2008. The Ministry refers to the follow-up regime adopted by the Storting for the national climate target for 2020 and the sector targets, cf. Report No 34 to the Storting (2006–2007) and Recommendation No 145 to the Storting (2007–2008). It was stated here that at '[t]he Government intends to make five-yearly reviews of progress and how the use of policy instruments should be further developed' and '[t]he Government also proposes that an evaluation of climate policy and how policy instruments should be modified should be submitted to the Storting midway through the first Kyoto period (in 2010). The Ministry of the Environment points out that the Norwegian Pollution Control Authority has been requested to chair the agency group Climate Cure 2020, whose terms of reference are to assess measures and policy instruments in light of national climate targets. On the basis of the report from Climate Cure 2020, the need to modify policy instruments will be reported to the Storting.

3.9 Achievement of long-term policy targets is challenging

According to the Ministry of Finance's most recent projections, cf. Report No 1 to the Storting (2009–2010), the greenhouse gas emissions are expected to increase by approximately five per cent from 2008, i.e. to 56.5 million tonnes of CO_2 equivalents in 2020, unless further emission-reducing measures are implemented. The 2020 target for reducing emissions in Norway will mean substantially larger annual reductions in domestic emissions than those achieved up to 2008, and further measures will be required. The investigation shows that in their present form, cross-sectoral policy instruments will not be sufficient for achieving the Norway's national emissions target for 2020. All in all, the investigation gives reason to claim that there is a considerable risk that the domestic emission reduction target for 2020 will not be achieved.

The climate problem is a cross-sectoral matter, and responsibility for achieving the climate target extends across many ministries. This underscores how important it is that the Ministry of the Environment fills its role as a coordinator and driving force, and that the sector ministries assume their sectoral responsibilities. However, conflicting targets pose a major challenge in all sectors, and several ministries have identified the high costs of national measures as a significant challenge. The Ministry of Petroleum and Energy comments that many of the figures and evaluations presented in the Norwegian Pollution Control Authority's mitigation analyses are unknown to it.

The Ministry of Finance comments in its reply that the assessment of future target achievement in relation to Norway's 2020 climate targets is associated with major methodological challenges. There is uncertainty about future emissions, including about the development of cost-effective emission-reducing technology. The Ministry points out that it was assumed in the Storting's processing of the climate report that the stipulated sector targets would have to be reassessed in if new information came to light. The Ministry of Petroleum and Energy points out that the performance audit does not necessarily give a correct picture of policy implementation and the results that may be expected. The Ministry points out that it is questionable whether there is sufficient information available to assess the 2020 targets within the framework of the audit.

4 The Office of the Auditor General's comments

The objective of the Office of the Auditor General's investigation is to assess target achievement in relation to Norway's international climate commitments and the Norwegian authorities' contribution to reducing emissions in other countries. The investigation shows that national policy instruments have helped to curb the increase in Norway's domestic emissions of greenhouse gases, but not to reverse the trend of increasing emissions. Given the adopted policy instruments and the anticipated economic development, greenhouse gas emissions will continue to increase up to 2020. In the opinion of the Office of the Auditor General, it will therefore be necessary to intensify efforts to achieve the target of reducing emissions in Norway by 2020 by 15–17 million tonnes of CO_2 equivalents in relation to the baseline scenario as presented in the 2007 national budget, when uptake of CO_2 by forests is included. Given current design and allowance price, the cross-sector policy instruments will not be sufficient to achieve this target. Moreover, major weaknesses have been revealed in the way the different sectors discharge their sector responsibility. It is the Office of the Auditor General's assessment that there is a considerable risk that the target of reducing domestic greenhouse gas emissions by 2020 will not be achieved.

4.1 The Ministry of the Environment's coordination function and role as a driving force

The investigation shows that, when exercising its role as a driving force vis-à-vis the other ministries in climate matters, the Ministry of the Environment faces substantial challenges in the form of strong sector interests and professional and technical disagreements between the ministries. Because the Ministry of the Environment's performance of its role as a driving force since 1998 is poorly documented, the Office of the Auditor General finds it difficult to assess the Ministry's performance of this role in the area of climate. The Office of the Auditor General would like to underline the importance of written documentation of decisions and material evaluations in follow-up work on the climate targets, both in the Ministry of the Environment's bilateral contact with other ministries and in the interministerial work. This will help to ensure traceability and verifiability. The Office of the Auditor General would also like to stress that a lack of documentation may prevent the Ministry of the Environment from discharging its role as a driving force systematically, and impede good management and performance monitoring.

The investigation reveals that responsibility for targets and responsibility for policy instruments does not necessarily lie with the same party. There is particular reason to draw attention to the fact that it is unclear which ministries have sector responsibility for industry. The Ministry of Trade and Industry does not consider itself a sector ministry on a par with some of the other ministries and points out that the Ministry of the Environment and the Ministry of Finance possess regulating policy instruments that can be applied in relation to industry. The Office of the Auditor General would like to point out that unclear sector responsibility may pose a risk to target achievement in the sector up to 2020.

Conflict of goals, unclear roles and unclear division of responsibility entail a risk that targets may not be followed up and adequate policy instruments may not be employed. The complexity of the players involved and of the use of policy instruments underlines the importance of prioritising the coordination and driving force function. The Office of the Auditor General finds reason to question whether the Ministry of the Environment has been a sufficiently clear driving force vis-à-vis the ministries.

4.2 Fulfilling sector responsibility

The investigation shows that the sector ministries have done little or nothing to operationalise the climate targets through working targets and concretisation of policy instruments in their own sectors. The sector ministries have also given few specific management signals to their subordinate agencies. However, the Office of the Auditor General is pleased to note that there has been an increase in climate-related management signals since 2008, but finds reason to draw attention to the necessity of further operationalisation of climate targets in all sectors.

The investigation shows that many targets that may contribute to reducing greenhouse gas emissions, and for which the sector ministries are responsible, are not met. In the opinion of the Office of the Auditor General, this makes it harder to achieve the national climate targets. All things considered, the Office of the Auditor General finds reason to question whether sufficient priority has been given in the sectors to the consideration of reducing greenhouse gas emissions.

The investigation shows that emissions from the petroleum sector have almost doubled since 1990, and that in recent years emissions have increased more than production. The process whereby the licensees submit their PDOs for processing by the authorities is important in verifying that an appropriate development solution has been chosen. The PDO document shall provide evidence that electrification has been considered, and it shall also give an account of emission-reducing solutions and remedial measures that have been considered and chosen. The investigation shows that great importance is attached to the operators' own assessments of what is technically and financially feasible. Furthermore, requirements and conditions are rarely formulated explicitly in the documents relating to PDO approval decisions. All things considered, the Office of the Auditor General therefore finds reason to question whether the companies' assessments and needs are not assigned too much weight in relation to overriding environmental considerations. The Office of the Auditor General is of the opinion that a more formal formulation of explicit requirements and conditions in connection with the approval of PDOs would exert a more effective pressure to implement emission-reducing technology.

The Office of the Auditor General agrees with the Ministry of Petroleum and Energy that the cross-sectoral policy instruments are important, and points out that the investigation emphasises the offshore carbon tax as a policy instrument that has had a considerable emission-mitigating effect in the sector. However, the investigation also reveals that many fields have had a longer life than assumed, and that measures such as electrification implemented on existing fields cost more than implementing emission-reducing solutions in new developments. The Office of the Auditor General would like to emphasise that the development solutions approved in the PDO very much determine the amount of emissions during the life of the field.

The Office of the Auditor General notes that target achievement in the area of energy may be a decisive factor in climate target achievement. The key climate policy reports to the Storting emphasise that limiting energy consumption and making use of renewable energy sources will both strengthen the energy supply and reduce greenhouse gas emissions. The investigation has shown that the authorities will not reach the targets for increased wind power production and use of water-borne heating. Even though access to hydropower means that emissions from stationary energy use account for only a small percentage of greenhouse gas emissions, the Office of the Auditor General would like to point out that the total energy consumption is increasing. This applies to the transport and petroleum sectors in particular, as they currently primarily use fossil energy sources, thereby adding to greenhouse gas emissions. The electrification of the vehicle population and the fields on the continental shelf may help to reduce these emissions, but the Office of the Auditor General considers it pertinent to point out that such a transition to environmentally friendly energy use in these sectors requires an increased availability of to renewable energy sources. The Office of the Auditor General therefore questions whether energy and climate concerns are sufficiently seen in conjunction with each other.

The investigation shows that greenhouse gas emissions from the transport sector increased by 35 per cent from 1990 to 2007, and are expected to continue to increase up to 2020. The Office of the Auditor General points out that, along with the expected continued growth in the transport sector, coordination across sectors and administrative levels poses a particular challenge to the achievement of the long-term climate targets.

Freight transport is expected to increase more than passenger transport up to 2020. The Ministry of Transport and Communications' work to move more freight transport from road to rail appears to have had little success. The Office of the Auditor General questions whether the Ministry of Transport and Communications has done enough over time to consider and implement measures to reduce emissions from freight transport, including ensuring that the railways have the necessary framework conditions to actually transfer more freight from road to rail.

The Office of the Auditor General is pleased to note that there has been a substantial decrease in greenhouse gas emissions in industry since 1990, and that emissions have also fallen in relation to production level. Three voluntary agreements between industry and the authorities have been a contributory factor, although some of the decrease took place independently of these agreements. In the Office of the Auditor General's opinion, the most recent agreement entered into with industry in 2009 is not ambitious enough to

make much of a contribution to further reducing greenhouse gas emissions from industry.

4.3 Long-term climate targets

The Office of the Auditor General's investigation shows that the sector ministries emphasise the importance of the current taxation level and allowance price in determining which measures are deemed to be cost-effective, and that these assessments apparently fail to take into account the projected rise in the carbon price. The investigation also shows that the costs involved in major domestic emissions reduction may be high, but that they can be reduced by developing and implementing new technology. It takes time to develop technology, and there are several challenges associated with introducing new technology into the market. The Office of the Auditor General questions whether effectiveness has been sufficiently considered in relation to long-term climate targets, and asks whether more use should not have been made of policy instruments capable of exercising effective pressure in favour of using new technology (such as the Pollution Control Act).

The Office of the Auditor General would like to emphasise that the climate challenges demand a long-term approach in efforts to reduce greenhouse gas emissions. Norway's target of reducing its domestic emissions of greenhouse gases by 15–17 million tonnes of CO_2 equivalents by 2020 will involve far greater annual reductions than those achieved up to 2008. In the opinion of the Office of the Auditor General, early measures will have a greater impact than late ones, and it will be relatively cheaper to achieve large reductions in emissions if an early start is made.

The Office of the Auditor General acknowledges that we cannot expect all the prerequisites for achieving the 2020 targets to be in place already, nor would this be expedient. The climate challenges will require many difficult political deliberations both on the use of policy instruments and on investment decisions. The Office of the Auditor General would nonetheless like to stress the importance of ensuring that some key prerequisites for achieving the ambitious 2020 climate targets are already in place. In the opinion of the Office of the Auditor General, these include a clear division of responsibility, good coordination and good target and performance monitoring systems. On the basis of the investigation, the Office of the Auditor General finds reason to question whether enough has been done to facilitate the effective use of policy instruments and the integration of climate considerations into sectoral policy, which might contribute to a reduction in Norwegian greenhouse gas emissions.

5 Reply from the Ministry of the Environment

The case was submitted to the Ministry of the Environment, and the Minister replied as follows in a letter of 1 March 2010:

"I refer to the letter of 5 February 2010 in which Document No. 3:5 (2009-2010) 'The Office of the Auditor General's investigation into target achievement in climate policy' was submitted to the Ministry of the Environment for a statement. This document to the Storting was also submitted to the Ministry of Finance, The Ministry of Foreign Affairs, the Ministry of Petroleum and Energy, the Ministry of Transport and Communications, the Ministry of Trade and Industry and the Ministry of Agriculture and Food. The Ministry of the Environment was asked to coordinate the ministries' statements.

The objective of the Office of the Auditor General's investigation was to assess target achievement in relation to Norwegian international climate commitments and the authorities' work to implement the climate policy decisions of the Storting. It covers work to reduce greenhouse gas emissions in Norway and the Norwegian authorities' contributions to reducing emissions in other countries.

The Office of the Auditor General has evaluated, among other things, whether or not Norway will achieve the emission targets for the 2008-2012 Kyoto period and the national emission targets set for 2020. With regard to the target for the 2008-2012 Kyoto period, the Office of the Auditor General states that the design of the Norwegian emissions trading scheme will allow this target to be reached. As regards the resolution in the climate settlement to strengthen the Kyoto target by ten per cent, reference is made to the comments from the Ministry of Finance outlined below. In its investigation, the Office of the Auditor General focuses in particular on the national emission targets for 2020. I consider a review of target achievement in climate policy to be relevant and important, but the timing of this performance audit seems somewhat premature. The Office of the Auditor General's assessments will therefore be made on an uncertain basis. The

Office of the Auditor General also acknowledges that we cannot expect all the elements for achieving the 2020 targets to be in place already, nor would this be expedient.

Climate policy targets, measures and policy instruments were proposed in Report No 34 to the Storting (2006-2007) Norwegian Climate Policy and the Storting's processing of this report (Recommendation No 145 to the Storting (2007-2008)). Agreement was reached in the Storting's climate settlement that a reduction in Norway of 15-17 million tonnes of CO_2 equivalents compared with the baseline scenario presented in the national budget for 2007 is be a realistic target, provided forests are included. The sector targets presented in the climate settlement are based on estimates and will have to be reconsidered where so indicated by changes in forecasts, costs or technological development, or other materially changed assumptions.

In its investigation, the Office of the Auditor General has attached great importance to evaluating work by the sectors on measures and policy instruments to achieve the climate policy targets. The Office of the Auditor General states that the investigation reveals that the sectors' application of policy instruments that trigger climate-related measures is variable, and indicates that several targets that could help to reduce greenhouse gas emissions will probably not be achieved. In this context, I believe it is also important to point out that it was made quite clear in the Storting's processing of the climate settlement that cross-sectoral policy instruments are essential if we are to reduce domestic emissions in line with Norway's targets. Moreover, cross-sectoral policy instruments based on the 'polluter pays' principle offer an enduring and concrete incentive to change behavioural patterns and preserve fairness. The degree to which the various sectors achieve their sub-targets will therefore depend in part on policy instruments outside their areas of responsibility. However, it is clearly immensely important that sector-specific policy instruments are employed in order to trigger the measures and reorganisation required to achieve the concrete climate policy targets. In a number of contexts, it is important to keep sector-specific policy instruments in the sector ministries, as this will maximise overall consistency in sectoral policy. The Government's Report No 39 to the Storting (2008-2009) 'Climate Challenges – Agriculture part of the Solution' is referred to as a good example in this connection.

In order to ensure good follow-up of the climate settlement, the Storting declared its intention in 2008 of establishing five-yearly reviews of progress and how the use of policy instruments should be further developed, and that an evaluation of climate policy and how policy instruments should be modified should be submitted to the Storting midway through the first Kyoto period. An expert group chaired by the Climate and Pollution Agency was therefore appointed in 2008 to prepare the technical underlying material required for assessing the need for new policy instruments up to 2020. The other participants in the group were the Norwegian Public Roads Administration, the Norwegian Petroleum Directorate, the Norwegian Water Resources and Energy Directorate and Statistics Norway. The report from this group, Climate Cure 2020, was submitted to the Ministry of the Environment on 17 February 2010 and has now been distributed for a broad consultation round. This work will provide an important basis for work on the dedicated report on climate policy that the Government plans to submit to the Storting in 2011.

The Office of the Auditor General discusses the Government's Climate and Forest Initiative that commenced in 2007. One of its objectives was to contribute to reducing emissions of greenhouse gases from deforestation and forest degradation in developing countries. The Office of the Auditor General points out that the Climate and Forest Initiative requires investments associated with considerable risk and stresses the importance of establishing satisfactory mechanisms for certifying emission reductions, and for ensuring the prudent management of large allocations to forest measures. I would like to emphasise that the Government attaches great importance to good management of the risk factors in this extremely important project. I refer to the extensive work that has been initiated in close collaboration with several other countries to establish reliable monitoring, analysis and verification of forest areas and the carbon content of forests, and changes in these factors. I would furthermore like to point out that Norway, along with other donor countries, is engaging in extensive cooperation with expert environments on anti-corruption work, with the aim of ensuring the satisfactory transfer and use of funds for forest measures.

The Ministry of the Environment and the other ministries also report to the Storting on developments in target achievement and climate policy

instruments in their annual budget propositions. A great deal of attention is paid to the further development of systems for target and performance monitoring and ensuring good coordination of climate policy measures and instruments.

Document 3:5 (2009-2010) has been submitted to the other two ministries involved. The following is a presentation of their views.

The Ministry of Petroleum and Energy has the following opinion about the report:
'Environmental and sustainable development considerations are an integral part of activities in the petroleum and energy sector. The sector has implemented comprehensive measures to mitigate environmental impact over a number of years, but will nonetheless continue to have an environmental impact in the future.

In its report, the Office of the Auditor General discusses the Ministry's processing and approval of development plans on the Norwegian continental shelf. It points out that one of the main tasks of the Ministry of Petroleum and Energy is to facilitate an overall petroleum policy based on efficient use of resources. Among other things, this means ensuring adequate socio-economic management, including safeguarding environmental considerations.

The petroleum sector is subject to cross-sectoral policy instruments such as the carbon tax and the emissions trading scheme, which means that the companies have a vested interest in implementing emission-reducing measures. The application of environmental solutions is thus wedded to value creation for society. The PDOs and their processing are an important process for verifying that the right development solutions are chosen. The important and overriding principle of cost-effectiveness is poorly reflected in the Office of the Auditor General's assessments.

A PDO is the result of a long process and is prepared in accordance with requirements laid down in the Petroleum Activities Act, the Petroleum Activities Regulations and other regulations. The authorities are in dialogue with the operators before the PDO is submitted so as to ensure, for example, that account is taken of BAT requirements for environmental solutions and that the use of power generated onshore is evaluated. The authorities also make their own independent assessments of what constitutes an expedient development solution based on environmental, cost-related and resource-related considerations. In other words, the petroleum authorities consider it very important that the technical solutions used in petroleum activities also take account of environmental considerations.

The Office of the Auditor General's report can be read as meaning that the Ministry does not make independent assessments and fails to stipulate requirements and conditions for e.g. emission-reducing measures. This seems to be primarily based on an observation that the degree to which requirements and conditions are explicitly formulated in the field development documents relating to the PDO approval decision varies greatly. This approach gives a false impression of how the authorities work on these questions – and the results produced. In future, the Ministry will provide clearer descriptions in its decision-making documents about field developments of important processes and evaluations involved in processing PDOs. Updated PDO/ PIO guidelines were issued on 15 February this year. They describe the interaction between licensees and authorities in connections with the preparation of a development plan (PDO/PIO) as it has been practised in recent years.

The processing of licenses for hydropower and wind power projects involves a great number of considerations that need to be heeded and safeguarded. As the report points out, the process is demanding. To ensure good resource utilisation and as few conflicts as possible, while also stepping up investments in renewable sources, the Government has strengthened the decision-making basis for licence processing and increased the number of man-hours worked in the Norwegian Water Resources and Energy Directorate. The Directorate's licence processing capacity was doubled from 2005 to 2009. This is starting to produce clear results in the form of an increase in the number of licensed projects per year.

It is pleasing to note that the number of new renewable GWhs coming into production each year is increasing. As the Office of the Auditor General points out, this may contribute to achieving long-term climate targets. Among other things, increased production of renewable power in Norway can make a positive contribution in the international context. It should, however, be emphasised that even though increased production of environmentally friendly energy is a central element in the Government's renewable energy effort, it is not the only factor that must be taken

into consideration in energy policy. The success of the renewable energy effort must therefore not only be measured by the number of environmentally friendly GWhs, but also by improved security of supply, the safe and coordinated development of the energy system, local developments in business and industry and ensuring that other environmental and social considerations apart from climate are attended to.

Renewable energy accounts for most of Norway's stationary energy supply. Efforts have been made to facilitate further increasing renewable energy and limiting the use of fossil energy. Among other things, an extremely restrictive policy is planned for the construction of gas-fired power plants, and mineral oil is heavily taxed. It should also be noted that energy use in stationary energy supply has not increased significantly in recent years, and we have an active energy-efficiency policy.

Greenhouse gas emissions from the stationary energy supply stem primarily from the use of mineral oil. As the Office of the Auditor General has also noted, there has been a strong decrease in consumption. District heating systems also produces some emissions, but total emissions have fallen in recent years despite increased production of district heating. It should also be noted that the increased combustion of waste in district heating systems can lead to less waste in landfills. When compared with landfills, which produce methane emissions, combustion that allows the heat to be utilised in district heating systems seems a very good option.

The Office of the Auditor General has assessed target achievement for wind power, district heating and energy efficiency measures in its audit report. As the Office of the Auditor General points out, this section of energy policy is governed by different considerations. We need to establish a more diversified energy supply that will make us less vulnerable to fluctuations in hydropower production, cf. in particular Report No 18 to the Storting (2003-2004) Om forsyningssikkerheten for strøm mv. ('On security of supply for electricity etc.'). It takes time to make an impact on the energy system and associated infrastructure, so restructuring energy is a long-term undertaking.

The restructuring of the energy system will involve limiting energy use in stationary supply and also employing a wide range of energy resources. Extensive efforts are being put into water-borne energy based on renewable sources and waste heat, wind power, energy efficiency and the development of a domestic gas infrastructure.

The Office of the Auditor General points out that the authorities will not achieve the target of increasing the use of water-borne heat based on renewable energy sources, heat pumps and waste heat by a minimum of 4 TWh per year by 2010. The Office of the Auditor General would seem to have based its assessment of target achievement on the statistics for delivered district heating. The Ministry points out that that district heating is far from being the only solution that can be used to achieve this target. It also points out that Enova has been commissioned to meet the target through an agreement with the Ministry of Petroleum and Energy. The objectives formulated do not relate to statistically recorded district heating production, but to the total district-heating portfolio managed by Enova. This comprises plants that have received grants (contractual production), plants under construction and plants for which final reports have been made. It would thus appear that the Office of the Auditor General in this instance has failed to base its assessment on the correct formulated objectives and premises for performance reporting. Furthermore, the Office of the Auditor General recently conducted a performance audit of Enova in which it took a third approach to assessing the district heating target. It would have been natural for the Office of the Auditor General to have coordinated the two audits. It is, moreover, the Ministry's opinion that we will achieve the target of 4 TWh/year of water-borne heat based on renewable energy sources, waste heat and heat pumps by the end of 2010.

As regards achievement of the wind power target, the Storting was informed in Proposition No 1 to the Storting (2009-2010) that the Ministry does not expect the wind power target of 3 TWh/year to be achieved by the end of 2010 due to unanticipated high costs.

The Ministry questions the Office of the Auditor General's assessment that target achievement in the energy sector is not on track. Apart from the wind power target, the Ministry cannot see that the Office of the Auditor General has substantiated its opinion that the energy targets will not be achieved.

The Office of the Auditor General questions whether effectiveness has been sufficiently considered in relation to long-term climate targets, and asks whether more use should not have been made of policy instruments (such as the Pollution Control Act) capable of exercising effective pressure to use new technology'. The demonstration phase is a bottleneck when introducing new technology as an option in the market. If new technology is to be used, we need policy instruments for testing and verifying the technology. For the project developer, this is a costly phase associated with major risks. Public grant schemes are often necessary to push the projects from the development stage to the demonstration and testing stage by reducing the projects developer's risk. The Ministry of Petroleum and Energy provides large grants for new technology through Enova SF, Gassnova SF and the Research Council of Norway. Policy instruments funded by other ministries' budgets come in addition to this. Demonstration plants are also given priority in licence processing pursuant to the Energy Act and the new Act on offshore renewable energy production'.

The Ministry of Transport and Communications has the following views:
'Figure 2 in the report shows emissions from road traffic. New figures from Statistics Norway show a 1.4 per cent decrease in emissions from 2007 to 2008. Statistics Norway explains this by the financial crisis towards the end of 2008, energy efficiency and increased use of biofuels. The Norwegian Public Roads Administration's road traffic index shows an increase of 1.3 per cent for light vehicles and 1.5 per cent for heavy vehicles. This means that greenhouse gas emissions have decreased by 2.5 – 3 per cent compared with the 2008 traffic level.

The Office of the Auditor General refers to the processing of Report. No 29 to the Storting (1997-98), cf. Recommendation No 233 to the Storting (1997-98), in which the majority in the Standing Committee on Energy and the Environment stated that traffic investments must be redirected from road to rail, and that as much as possible of long-distance freight should be transferred from road to rail.

The National Transport Plan 2010-2019 aims to almost double rail freight capacity by the end of the planning period. The scope of capacity-increasing measures will be considered on the basis of the growth in freight volume and the impact of measures implemented. Rail freight is a socio-economically advantageous alternative as land use, emissions, noise and accidents are normally less than with other transport options by road. The Government therefore wishes to facilitate the transfer of more freight from road to rail in contexts where the advantages of rail transport can be exploited. The main goal of the freight transport policy is to ensure adequate capacity for the efficient, safe and reliable transport of goods throughout the country.

The Office of the Auditor General points out that there is a risk of not achieving the target for emissions under 120 gram CO_2/km on average for new vehicles by 2012. The Ministry of Transport and Communications agrees that this is a very ambitious target, and refers to the description in report No 16 to the Storting (2008-2009) – the National Transport Plan 2010-2019. The lowering of the EU's ambition level in this area makes achieving the target even more of a challenge. There has, however, been a positive development, with a reduction from 177 grams in 2006 to 137 grams in January 2010. This is a decrease of 40 grams in four years, and these vehicles will remain on the roads until after 2020 and will have a great impact on emissions from road traffic emissions. The availability of cars with emissions under120 grams has increased greatly in recent years and medium-size cars with emissions as low as this have also become available. Greenhouse gas emissions from the transport sector have increased by 29 per cent and are expected to continue to increase. The most important driving forces are population growth and greater prosperity, which result in more transport of passengers and goods.

Rail freight developed poorly from 1990 to 2003, but from 2003 to 2008 rail freight work increased by 70 per cent. Several measures have been implemented involving tax cuts, goods terminals and the construction of more passing tracks. In the same period, road transport increased by 17 per cent.'

The Ministry of Agriculture and Food has the following views:
'Report No 39 to the Storting (2008-2009)' Climate Challenges – Agriculture part of the Solution' has attracted a great deal of attention within a short time, both nationally and internationally, and is becoming a central governing document for the Norwegian Agricultural Authority. The Office of the Auditor General's main report makes a

number of references to Report No 39 to the Storting, but fails to mention it in Doc 3:5. The Ministry of Agriculture and Food considers it important to include a reference to Report 39 in Doc 3:5, as this report contributes to the operationalisation of climate targets, which the Office of the Auditor General deems to be generally weak in all sectors. The Office of the Auditor General points, for example, to a lack of sector projections made through reports to the Storting. A sector projection has, however, been made for forests in Report No 39, setting a good example to follow.

The Ministry of Agriculture and Food is of the opinion that the conclusion in Doc 3:5 that the use of policy instruments in the forestry sector does little to help achieve the climate targets could be nuanced. The forest policy instruments mentioned in Doc 3:5 – the forest trust fund scheme and the bioenergy programme – are, respectively, a fiscal instrument to maintain forest production and an industrial development programme for bioenergy, rather than policy instruments directly targeting climate efforts out in the forests. Several of the other forest policy instruments will also contribute indirectly to positive climate effects that are not mentioned, in that forests and their raw materials both replace fossil fuels and store carbon.

The Ministry of Agriculture and Food also feels that the picture can be elaborated with regard to descriptions of knowledge and research. A lot has happened, especially since 2008, with respect to improving the agricultural and climatic knowledge base. Report No 39 to the Storting prioritises important areas of research and knowledge dissemination, and a number of research projects have been initiated with the aim of helping the sector's climate accounts. Nor is there any mention in Doc 3:5. of the budgetary boost to agricultural research efforts to follow up the Storting's climate settlement.

On the agricultural front, Norwegian research environments are international frontrunners with respect to understanding the nitrogen cycle, including nitrous oxide formation and gaseous losses. Norway may not be quite so advanced when it comes to methane or carbon in soil/CO_2 losses from soil, but there is a limit to how much responsibility a country with as little agricultural production as Norway should assume in the international research community.'

The Ministry of Finance has the following views: 'In Chapter 3.7, the Office of the Auditor General discusses emission-reducing measures in other countries. The Government is confident that it will be able to achieve the target adopted in the climate settlement to strengthen the Kyoto commitment by 10 per cent. The State only purchases UN-certified allowances and credits. The purchasing scheme is in line with the Storting's intentions on which it has based its processing of the annual national budgets. The Storting has given its approval to the UN scheme, among other things by ratifying the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The UN is intended to ensure that CDM projects satisfy the requirements for real and verifiable climate effects and sustainable development.

The requirement that CDM projects shall contribute to sustainable development is assigned equal status with the requirement that emission reductions shall be real and verifiable. The term sustainable development refers to the three pillars of economic, social and environmental development. In its account, the Office of the Auditor General seems to disregard the fact that the projects transfer resources to developing countries, thereby contributing to development. It is hard to see how the Office of the Auditor General's could justify its assertion that additionality and sustainable development are more or less mutually exclusive considerations. However, the ministries have not had access to the Office of the Auditor General's underlying materials, and have thus been unable to evaluate the claims of conflict between additionality and sustainability.

Along with the projected allowance price, the carbon tax puts a price on CO_2 emissions on the Norwegian continental shelf. This provides the oil companies with a strong and enduring incentive to reduce their CO_2 emissions. The Office of the Auditor General points out that the combination of carbon tax and allowance prices is less effective in triggering new emission-reducing measures for existing activity on the continental shelf, which indicates that the amount of measures that can be implemented with costs below this level is exhausted. This is also an example that the enduring price signal given first by the carbon tax and subsequently also by the allowance price actually changes the production companies' behaviour. This is a sign that the carbon tax actually works, and not a sign of weakness in this policy instrument. If the aim is to promote the

implementation of more costly emission-reducing measures, it is important to increase the total price of emissions, for example by raising the tax. The Ministry of the Environment and the Ministry of Finance's statements regarding the long-term effects of the carbon tax are therefore not at odds with each other.'

The Ministry of Foreign Affairs has the following views:
'The Ministry of Foreign Affairs is responsible for fulfilling the Kyoto Protocol obligations which concern financial aid to developing countries, and for managing the aid money in the Government's Climate and Forest Initiative. With regard to this initiative, we agree with the Ministry of the Environment's comments. There are considerable risks in this internationally pioneering investment, and major challenges relating to the form of performance-based aid that is envisaged here. It is also a perpetual challenge to ensure that the effort does not only meet climate policy objectives, but also helps to promote sustainable development and the fight against poverty. The Ministry of the Environment and the Ministry of Foreign Affairs are cooperating well on the continuous operationalisation of the Climate and Forest Initiative."

6 The Office of the Auditor General's statement

The Office of the Auditor General has carried out a performance audit of the Norwegian authorities' work to reduce greenhouse gas emissions in Norway and in other countries. The investigation covered all the most important emission sectors and policy instruments. The basis for the investigation was Norway's international and central climate policy resolutions.

The investigation shows that national policy instruments have helped to curb the increase in Norway's domestic emissions of greenhouse gases, but not to reverse the trend towards increasing emissions. Given the adopted policy instruments and projected economic development, greenhouse gas emissions will continue to increase up to 2020. In the opinion of the Office of the Auditor General, there is therefore a need to intensify efforts in order to achieve the target of reducing emissions in Norway by 2020 by 15–17 million tonnes of CO_2 equivalents in relation to the baseline scenario presented in the 2007 national budget, when uptake of CO_2 by forests is included.

The investigation shows that the cross-sectoral policy instruments provide incentives to take account of climate considerations but, apart from in the petroleum sector, these policy instruments have as a whole had a limited effect in terms of reducing greenhouse gas emissions. The Ministry of the Environment points out that it was made quite clear in the Storting's processing of the climate report that cross-sectoral policy instruments are essential if we are to reduce domestic greenhouse gas emissions in line with Norway's targets, but that it is clearly immensely important that sector-specific policy instruments are employed that are capable of triggering the measures and modifications required to achieve the concrete climate policy targets. The Office of the Auditor General's assessment is that, in their present form and given the current allowance price, cross-sectoral policy instruments will not be sufficient for achieving Norway's domestic emissions target for 2020. In this connection, the Office of the Auditor General would like to stress the importance of highlighting the expected and actual effects of the cross-sectoral policy instruments on the various sectors.

The Office of the Auditor General emphasises that a cross-sectoral policy does not relieve the sector ministries of their responsibility to help to achieve the climate targets, and reminds the involved parties that environmental work in the sectors must be consistent with the strategic and national targets in the area. The Office of the Auditor General stresses that consideration of greenhouse gas reductions in the sectors must be given higher priority, and considers it important that the Ministry of the Environment has an active and clear function as a driving force in this context. The Office of the Auditor General takes a positive view of the Ministry of the Environment's initiative in appointing the inter-agency group Climate Cure 2020 and notes that the report was submitted in February 2010.

The investigation pointed out that cost-effectiveness has very much been the governing principle in the processing of plans for development and operation (PDOs) in the petroleum sector. The Office of the Auditor acknowledges that extensive measures have been implemented to reduce the environmental impact of the petroleum sector, but emphasises that greenhouse gas emissions from the sector have nevertheless almost doubled since 1990, and that emissions have increased more than production in recent years. The development solutions approved in the PDO very much

determine the amount of emissions during the life of the field. In the Office of the Auditor General's opinion, further measures can be made cost-effective if based a projected increased allowance price. Moreover, the Office of the Auditor General notes that the Ministry of Petroleum and Energy will provide clearer descriptions of important processes and evaluations involved in processing PDOs in its decision-making documents about field developments in future.

With regard to target achievement in relation to the heating target, reference is made to Document No. 3:6 (2009–2010) *'Riksrevisjonens undersøkelse av Enova SFs drift og forvaltning (The Office of the Auditor Generals investigation into the operation and management of Enova SF).* It emerges from this investigation that the Office of the Auditor General's does not believe that Enova's heating targets will be met by 2010. The Office of the Auditor General would also point out that measures supported by Enova do not give a complete picture of the total heat production, and that actual consumption data according to official statistics provide relevant additional information on performance in light of the long-term energy policy targets. In the Office of the Auditor General's opinion, it is the actual consumption that is important in relation to greenhouse gas emissions, and the statistics presented in the report show that the consumption of district heating in 2008 was only 1.5 TWh higher than in 1998.

The investigation includes targets for wind power, heating, energy efficiency, bioenergy and fuel oil in the energy sector. The Ministry of Petroleum and Energy agrees that the wind power target will not be met, but questions the Office of the Auditor General's assessment that target achievement in the energy sector is not on track. In the case of energy efficiency and bioenergy, the investigation reveals a lack of clarity about how the targets are to be interpreted, and that the performance indicators are inadequate. Bioenergy consumption in Norway has been relatively constant in recent years. However, the target of increased development of bioenergy requires a doubling by 2020. The increase in consumption of district heating in 2008 was less than half of the target for 2010. In view of this, the Office of the Auditor General maintains that target achievement in the energy sector is not on track, and emphasises the importance of developing good performance indicators for the national energy targets.

The investigation shows that domestic rail freight increased by approximately 700 million tonne-kilometres in the period from 2000 to 2007, while domestic road freight increased by more than 3 billion tonne-kilometres. The Office of the Auditor General acknowledges that the railway's share of domestic freight transport has increased since 2003, but would point out that the actual increase is nonetheless greater for road freight then for rail freight. The Office of the Auditor General is pleased to note that the Ministry of Transport and Communications has planned to almost double rail freight capacity by 2019. However, the Office of the Auditor General also stresses that the expected continued increase in greenhouse gas emissions from the transport sector indicates a need for further measures in this area too.

The investigation shows that the Clean Development Mechanism helps to reduce emissions in developing countries, but that there is great uncertainty about how big the reductions actually are in relation to what has been claimed in the projects. It is up to the host country to attend to the sustainability aspect, and the investigation shows that the projects contribute to variable degrees to sustainable development. The Office of the Auditor General has noted that the project-based mechanisms are one of the most important instruments in Norwegian climate policy, and the Ministry of Finance has been authorised to sign contracts for more than NOK 6 billion. In the opinion of the Office of the Auditor General, it is important to evaluate the effect of the policy instrument as regards both emission reductions and sustainable development.

The Ministry of the Environment states that a review of target achievement in climate policy is relevant and important, but that the timing of this performance audit seems somewhat premature. The Office of the Auditor General acknowledges that we cannot expect all the elements for achieving the 2020 targets to be in place already, nor would this be expedient. In the Office of the Auditor General's opinion, the climate challenges will require many difficult political deliberations both on the use of policy instruments and on investment decisions. The Office of the Auditor General would nonetheless emphasise that the work on reducing emissions of greenhouse gases requires a long-term perspective, and that the 2020 target requires intensified efforts. It must also be emphasised that early measures will have a greater impact than late ones, and it will be

relatively cheaper to achieve large reductions in emissions if an early start is made. The Office of the Auditor General therefore stresses the importance of ensuring that some key prerequisites for achieving the ambitious 2020 climate targets are already in place. In the opinion of the Office of the Auditor General, these include a clear division of responsibility, good coordination and good target and performance monitoring systems.

The case will be submitted to the Storting.

Adopted at a meeting of the Office of the Auditor General on 16 March 2010

Jørgen Kosmo **Arve Lønnum**

Annelise Høegh **Per Jordal** **Synnøve Brenden**

Bjørg Selås

Report: The Office of the Auditor General's investigation into target achievement in climate policy

Appendix to Document 3:5 (2009–2010)

Contents

Tables

Figures

List of key terms and abbreviations

Additionality	Requirement stipulated for CDM projects that emission reductions must come in addition to what would have taken place without the project activity.
Allowances and credits	Allowances are part of an emissions trading scheme, and they are transferable rights to emit greenhouse gases during a given period. The European emissions trading scheme is an example of an emissions trading scheme. Allowances from the project-based mechanisms are often called credits.
Baseline scenario	Projected emissions of greenhouse gases with the current policy (adopted policy instruments)
BAT	The principle of using the best available technique
BNDES	The Brazilian Development Bank
Carbon fund	Several buyers can invest in a carbon fund that buys or develops projects. The fund is often managed by an external party. For example, the World Bank has a number of carbon funds.
CDM	See Clean Development Mechanism
Clean Development Mechanism	Project collaboration between countries with emissions commitments and developing countries. Approved credits from the Clean Development Mechanism are tradable and are designated CERs (Certified Emission Reductions).
CO_2 equivalents	Emissions of various greenhouse gases weighted together in relation to the effect of one tonne of CO_2 on global warming over a certain period of time (in this case, 100 years)
Cost-effectiveness	That the policy instruments trigger measures that result in the greatest possible reduction of emissions in relation to the resources invested.
EEA	European Economic Area
Effectiveness	That a policy instrument should lead to the goals being achieved with the highest degree of certainty possible
Electrification	The replacement of power production from fossil energy sources on offshore installations by power generated onshore
Emission leakages	Increased emissions elsewhere resulting from measures. Emissions leakage is relevant in connection with the CDM mechanism (project activities), REDD and national regulation in countries with emission commitments under the Kyoto Protocol.
Final energy consumption	Total energy consumption excluding consumption in the energy sectors, energy converted into other energy and energy used as a raw material in industry.
First commitment period	The period from 2008 up to and including 2012.
Flaring	Controlled burning of gas in flare booms on installations and in processing plants
Innovation	An article, service, new production process or form of organisation introduced on the market or implemented in production to create economic values.

IPCC	The UN Intergovernmental Panel on Climate Change
JI	See Joint Implementation
Joint Implementation	Project collaboration between countries with a duty to surrender allowances pursuant to the Kyoto Protocol (Joint Implementation, JI). Approved credits from a Joint Implementation project can be traded and are designated ERUs (Emission Reduction Units).
Mature phase	Recovery of resources from deeper down in the reservoir because much of the resources have already been recovered from a field.
Norwegian Board of Technology	The Norwegian Board of Technology is an independent public body whose task it is to identify important technological challenges and promote broad public debate about the potential and consequences of new technology – to individuals as well as to society at large. The Board is to provide input in technological matters to the Storting and other authorities.
PDO	Plan for development and operation
Project-based mechanism	Collective term for the Clean Development Mechanism and Joint Implementation
Projections	Stipulates future emissions development based on assumptions about the financial and technological development.
REDD	Reduced Emissions from Deforestation and Forest Degredation
Secondary market	Trading in credits issued by the project-based mechanisms
The Climate Report	Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*
The Climate Settlement	*Agreement on Norway's climate policy.* Agreement between Norwegian political parties Labour, the Socialist Left Party, the Centre Party, the Conservative Party, the Norwegian Christian Democratic Party and the Liberal Party on comments to Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*, cf. Recommendation No 145 to the Storting (2007–2008) *Om norsk klimapolitikk ('On Norwegian climate policy')*.
The Emissions Trading Report	Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy*
The Energy Report	Report No 29 to the Storting (1998–99) *On Norwegian Energy Policy*
The flexible mechanisms	Collective term for emissions trading, the Clean Development Mechanism and Joint Implementation
The Kyoto mechanisms	See the flexible mechanisms
The Kyoto Report	Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*
UNFCCC	United Nations Framework Convention on Climate Change
United Nations REDD programme	The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. The programme consists of The Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

1 Introduction

1.1 Background

The four main reports from the UN Intergovernmental Panel on Climate Change have helped to improve knowledge of the connection between greenhouse gas emissions and global warming. The Fourth Assessment Report from 2007 concluded that it is highly probable that most of the increase in the global average temperature since the middle of the 20th century is a result of the observed increase in anthropogenic greenhouse gas emissions.[1] According to this report, lacking or delayed implementation of emissions-reducing measures will have major economic, biological and social consequences. Great global emission cuts are necessary to avoid significant climate change. Accordingly, Norway has signed the United Nations Framework Convention on Climate Change.[2]

Norway signed the Kyoto Protocol under the Convention in 1998 and ratified it in 2002.[3] The Norwegian commitment is to limit the average emissions during the commitment period (2008–2012) to one per cent above the 1990 level – corresponding to an average of 50.1 million tonnes of CO_2 equivalents per year. The Kyoto commitment covers emissions of the greenhouse gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6). These gases are translated into CO_2 equivalents using GWP (Global Warming Potential), and the commitments cover total greenhouse gas emissions in CO_2 equivalents.

The Kyoto commitment can be met by using the flexible mechanisms (emissions trading, Joint Implementation and the Clean Development Mechanism (CDM)) in addition to national emissions cuts. The use of these mechanisms means that increased emissions in Norway are compensated by emissions reductions either in other countries with quantified commitments under the Kyoto Protocol or in developing countries.

An 'Agreement on Norway's climate policy', hereinafter called the Climate Settlement, was reached in January 2008. During the Storting's consideration of the Climate Report[4], the majority of the members of the Standing Committee on Energy and the Environment agreed on, among other things, strengthening the Kyoto Protocol by 10 percentage points and making Norway carbon neutral by 2030, provided that other industrialised countries also take on extensive obligations through an ambitious global climate agreement. This means that Norway is to ensure a reduction of emissions corresponding to Norwegian emissions in 2030. Based on a rough estimate, the parties in the Climate Settlement believe that the new measures make it realistic to expect further emission reductions in Norway. The parties therefore consider that when forest is taken into account, the interval from the government's climate report can be increased to 15–17 million tonnes of CO_2 equivalents in 2020 compared with the baseline scenario as presented in the national budget for 2007. The Climate Report proposed sectoral climate action plans, and sector targets for 2020 were stipulated for four groups of emissions sectors. It is also a goal that Norway should be a leading country in environmental policy and have ambitious climate goals.

The Ministry of the Environment has overriding responsibility for Norway's international climate commitments and coordination responsibility for Norwegian climate policy. The Ministry of Finance has overriding responsibility for taxes in environmental policy, and coordination of the sustainable development work, which includes climate,[5] and is responsible for the Norwegian state's trading in emission allowances. The Ministry of Foreign Affairs is responsible for follow-up of the United Nations Framework Convention on Climate Change commitments relating to financial support for developing countries, including the government's climate and rain forest efforts. The sector ministries are

1) *UN Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report. Working group I. Summary for Policymakers.* (Norwegian Pollution Control Authority (SFT) report 2329/2008).
2) United Nations Framework Convention on Climate Change 9 May 1992 No 1 Multilateral.
3) Report No 185 to the Storting (2001–2002) adopted by the Storting on 21 May 2002, cf. Proposition No 49 to the Storting (2001–2002).
4) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
5) Report No 1 to the Storting (2008–2009) *The National Budget 2009*.

Table 1.1 Norwegian greenhouse gas emissions in million tonnes of CO_2 equivalents

1990	1998	2000	2008	Change in per cent, 1990–2008
49.7	52.8	53.4	53.8	8.4

Source: Statistics Norway and the Norwegian Pollution Control Authority

responsible for the initiation and implementation of measures within their own fields and for ensuring that environmental work in the sectors are carried out in accordance with strategic and national goals in this area.[6] The sector ministries are also responsible for following up the sector targets for 2020 in their respective areas of expertise.

1.1.1 Status for Norwegian emissions of greenhouse gases

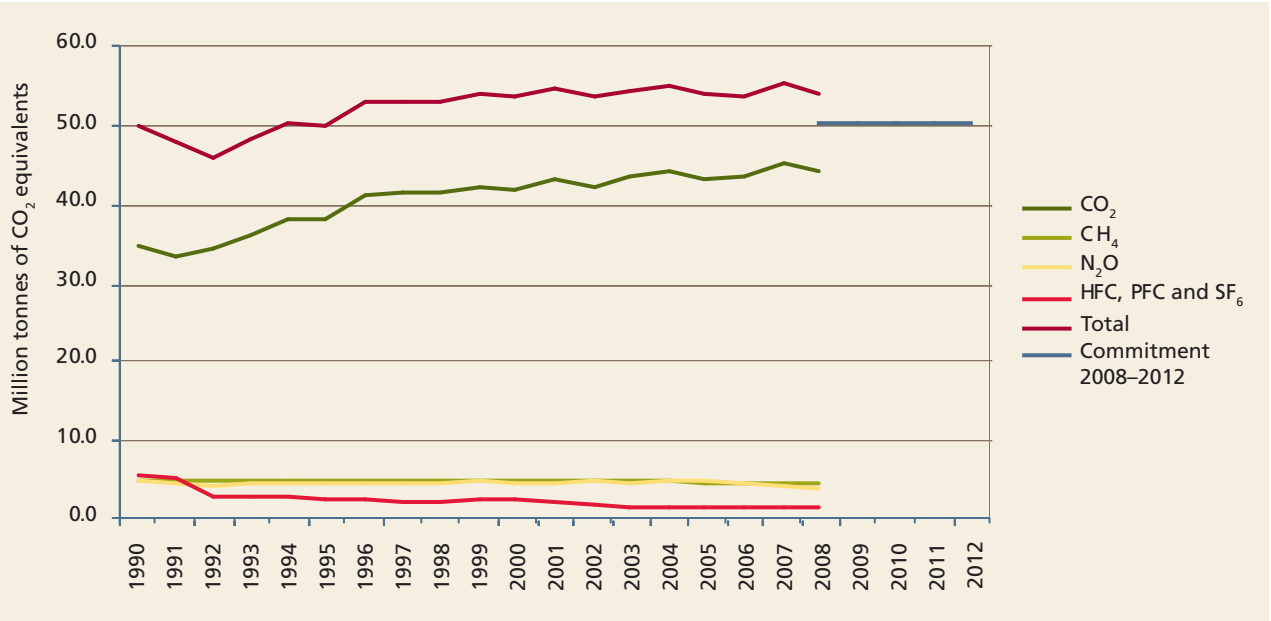
The 2008 greenhouse gas emissions totalled 53.8 million tonnes of CO_2 equivalents, that is 8.4 per cent more than in 1990 (cf. table 1.1).

Figure 1.1 shows the development in the emissions of various greenhouse gases and in total greenhouse gas emissions since 1990. The total emissions were reduced between 1990 and 1992, but subsequently increased again. Emissions in 2007 were the highest since 1990, but were reduced from 2007 to 2008. Emissions have increased by 5.9 per cent from 1990 to 1997 and by 2.0 per cent from 1998 (when the Kyoto Protocol was signed) to 2008. Carbon dioxide emissions have increased by 27 per cent in the period 1990–2008. Emissions of other gases than CO_2 and HFC have been reduced, and the greatest reduction has taken place in PFC and SF_6 emissions.

The Ministry of Finance states in an interview that the Norwegian economy has grown considerably since 1998. The population has grown rapidly, at the same time as the income per person has increased considerably. The increase in activity in the Norwegian economy has been steeper than expected, and this has probably contributed to the increase in emissions, particularly from transport. According to Statistics Norway, the reduction in greenhouse gas emissions from 2007 to 2008 can be partially explained by the financial crisis in 2008, but measures implemented in the process industry has also played a part.

Figure 1.2 shows that the greatest Norwegian source of greenhouse gas emissions in 2007 was energy production (oil and gas recovery), followed by industry and road traffic. The figure shows that the emissions have increased in all sectors with the exception of the industry and "other sources" (including the waste sector). Greenhouse gas

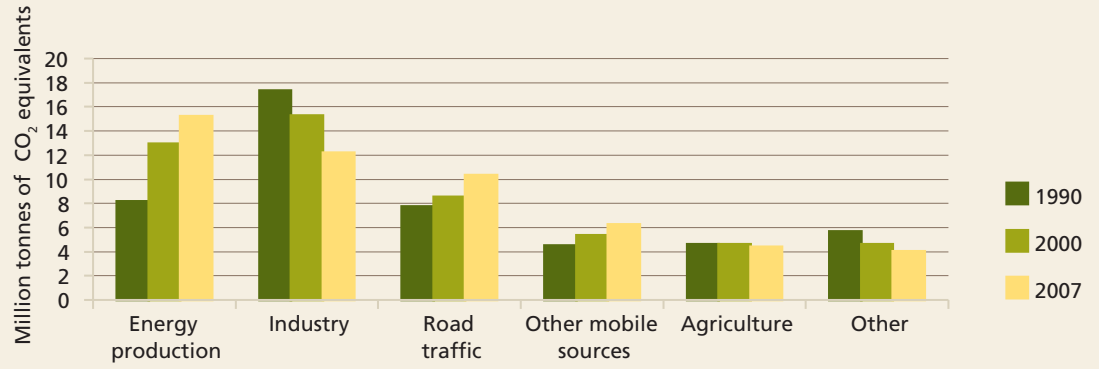
Figure 1.1 Norwegian greenhouse gas emissions 1990–2008



Source: Statistics Norway and the Norwegian Pollution Control Authority

6) Recommendation No 256 to the Storting (1999–2000), cf. Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the Environment in Norway*.

Figure 1.2 Greenhouse gas emissions by source for 1990, 2000 and 2007



Source: Statistics Norway and the Norwegian Pollution Control Authority

emissions from agriculture have been relatively stable. Emissions from oil and gas recovery have seen the highest increased during this period, both in per cents and in tonnes, and these emissions increased by more than 90 per cent from 1990 to 2007. Road traffic emissions increased by 33 per cent during the same period.

1.1.2 The emissions development in other countries

Greenhouse gas emissions have also increased in many other countries, see table 1.2. The increase in emissions has been particularly great in Australia, Canada, New Zealand, Ireland, Iceland, Spain and Portugal. Table 1.2 shows that many

Table 1.2 Greenhouse gas emissions in selected countries with commitments under the Kyoto Protocol in relation to emissions in 1990

	1990	1995	2000	2005	2007	Change 1990–2007 (in per cent)	Commitment 2008–2012 (as per cent of 1990 emissions)[7]
Australia	416	441	495	525	541	30.0	+8
Canada	592	641	717	731	747	26.2	-6
Denmark	70	77	69	65	68	-3.3	-21
EU-15	4 233	4 128	4 171	4 141	4 052	-4.3	-8
Finland	71	71	69	69	78	10.6	0
France	565	560	560	558	536	-5.3	0
Ireland	55	59	69	70	69	25.0	+13
Iceland	3	3	4	4	4	31.8	+10
The Netherlands	212	224	214	212	207	-2.1	-6
New Zealand	62	64	70	77	75	22.1	0
Norway	50	50	53	54	55	10.8	+1
Portugal	59	70	82	89	82	38.1	+27
Spain	288	320	386	441	442	53.5	+15
Switzerland	53	51	52	54	51	-2.7	-8
Sweden	72	73	68	67	65	-9.1	+4
UK	774	715	677	656	640	-17.3	-12.5
Germany	1 215	1 085	1 008	987	956	-21.3	-21
Austria	79	80	81	93	88	11.3	-13

Source: United Nations Framework Convention on Climate Change

7) For EU member countries, the commitment is based on the EU's internal agreements on distribution of the burden.

Photo: Fredrik Naumann / Samfoto

countries have also implemented considerable cuts in emission, including Sweden, Denmark, Germany and the UK. There is, however, great variation in the level of costs of measures faced by different countries. For example, many countries have reduced their emissions as a result of inefficient coal-fired power plants.[8] Costs are higher for Norway than for many other countries, among other things because the production of electricity is primarily based on hydroelectric power.[9]

1.2 Objectives and lines of inquiry

The goal of the investigation is to assess goal achievement in relation to Norwegian international climate commitments and the authorities' work on implementing the climate policy decisions of the Storting. The investigation covers the work on reducing Norwegian greenhouse gas emissions[10] and the Norwegian authorities' contributions to reduction of emissions in other countries.

The following lines of inquiry were pursued:

1 Will Norway achieve its emissions targets?
   - 1.1 Will Norway's short-term targets be achieved (2012)?
   - 1.2 Is the development of national emissions in line with long-term climate targets (2020)?

2 To what extent does the Ministry of the Environment fulfil its overriding responsibility for ensuring target achievement in the field of climate policy?
   - 2.1 Has the Ministry of the Environment ensured that the targets are sufficiently clearly defined and operationalised?
   - 2.2 Are roles and responsibilities sufficiently defined and clarified between the Ministry of the Environment and other ministries?
   - 2.3 Is there sufficient management information for the targets to be attained?
   - 2.4 Has the Ministry of the Environment managed the national work to further develop and implement policy instruments to limit emissions of greenhouse gases in Norway in a satisfactory manner?

3 To what extent are sufficient policy measures implemented to ensure goal achievement?
   - 3.1 To what extent do the cross-sector policy instruments contribute to goal achievement?
   - 3.2 To what extent have the sector ministries implemented sufficient policy instruments to ensure target achievement within their area of responsibility?
   - 3.3 To what extent do Norwegian purchases of credits from the project-based mechanism contribute to target achievement?
   - 3.4 To what extent does the Norwegian work to reduce deforestation and forest degradation in developing countries contribute to the reduction of emissions?

The investigation covers the most important main sectors for greenhouse gas emissions – petroleum, energy, industry, transport and agriculture – and the largest sources of emissions within each of these sectors. It does not cover municipal policy instruments. The investigation also covers work on research and development of climate-friendly technology, including gas-fired power stations and carbon capture and storage.

The investigation of the Norwegian work to help reduce emissions from deforestation and forest degradation in developing countries is limited to an assessment of the preconditions for target achievement in Brazil and Indonesia, and Norwegian authorities' work to follow up the intentions of the Storting in this decision.

8) Cf. Annex I National Communications and Reports Demonstrating Progress under the Kyoto Protocol. www.unfccc.int.
9) Cf. Environmental Performance Reviews Norway. OECD 2001.
10) This also includes increased CO_2 absorption and carbon storage in forests.

2 Methodological approach and implementation

2.1 Statistical data

Statistical data for the development of emissions in Norway, the use of energy and other activities that generate emissions have been important in the evaluation of target achievement. Most of the statistics have been prepared by Statistics Norway (SSB) in collaboration with the Norwegian Pollution Control Authority.[11] The national targets are in the future, and the investigation has therefore also analysed official projections as reproduced in reports to the Storting and in the Norwegian Pollution Control Authority's mitigation analyses. Information about purchase of allowances has also been included in the assessment of goal achievement, and data have been obtained from the Ministry of Finance and UNEP Risø. Allowance prices have been obtained from the analysis company Point Carbon and tax rates from the Ministry of Finance's budget propositions. These data have been analysed. Research allocations statistics have been obtained from the Research Council of Norway. Some data have also been obtained directly from the specialist ministries and agencies. International data have been used in the investigation to compare Norway to other countries, and they have when possible been obtained from international organisations, including the United Nations Framework Convention on Climate Change and the European Environment Agency (EEA).

2.2 Document analysis

The document analysis included a review of relevant documents from the Storting to identify relevant goals in the field, management signals relating to the use of policy instruments and information reported to the Storting. The review covered, among other things, reports and recommendations to the Storting and committee recommendations, which can elucidate and elaborate on the intentions of the Storting in approving the government's proposals. In connection with work on the emissions trading scheme, letters from the Ministry of the Environment to the Storting and minutes from the Storting's European Consultative Committee have also been reviewed. Evaluations of targets, the use of policy instruments and performance monitoring in the individual sectors are also based on reviews of sectoral action plans, allocation letters to subordinate agencies and other available management information and reporting. Among other things, the investigation of the petroleum sector has reviewed 45 plans for development and operation processed after 1998, in addition to reporting about the offshore carbon tax to enable an analysis of the use of policy instruments and effects in the petroleum sector. Norway's allowance accounts for the period 2008–2012 have been drawn up on the basis of data from the Ministry of Finance's newest budget recommendations.

The investigation has also included relevant evaluations, including Statskonsult's evaluation of work on the sectoral environmental action plans. Strategy documents and programme plans have been analysed in order to assess goals and goal achievement in the research and development sector. Relevant statutes, regulations and EU directives have also been reviewed. In addition, NOUs (official Norwegian reports), specialist reports from the various subordinate agencies and specialist and research reports from environments outside of the civil service have also been used to strengthen the factual basis.

The investigation is also based on an analysis of available internal documents from the Ministries, including terms of references, minutes of meetings, governing documents, evaluations and statements from consultation bodies that have been important to the follow-up of the Kyoto Protocol and the stipulation of the long-term climate goals. The purpose of this has been to shed light on key decision-making processes, and on the development and use of policy instruments.

All relevant documents relating to the lines of enquiry have been requested. Documents have only been received to a limited extent. Generally speaking, documentation from interministerial work has not been made available to any significant extent. According to the Ministry of the Environment, this could be because in many cases there is no documentation. In other cases,

11) The Norwegian Pollution Control Authority changed its name to the Climate and Pollution Agency on 18 January 2010.

Photo:Svein Grønvold / NN / Samfoto

the Ministry of the Environment and the Ministry of Finance has expressed the view that in their opinion, relevant documents are not covered by the Office of the Auditor General's right of access (cf. the Act relating to the Office of the Auditor General). This applies to, among other things, correspondence in connection with report work and minutes of meetings from the work of the State Secretary Committee for Sustainable Development and Climate.

2.3 Interviews and meetings

Interviews have been carried out with all relevant ministries and subordinate agencies covered by the investigation. The ministries interviewed were the Ministry of the Environment, the Ministry of Finance, the Ministry of Agriculture and Food, the Ministry of Trade and Industry, the Ministry of Petroleum and Energy, the Ministry of Transport and Communications and the Ministry of Foreign Affairs. In addition, interviews were carried out with key subordinate agencies including the Norwegian Pollution Control Authority. (A complete list of interviews is enclosed with this report.) Interviews have also been carried out with a selection of research communities and representatives of business and industry. The interview topics have been adjusted in accordance with the role of the interviewees, but generally, questions have been asked about roles, responsibilities, work processes and the result of policy instruments used. Verified minutes of meetings make up an important part of the data basis for the report.

2.4 Reports drawn up on assignment from the Office of the Auditor General

Econ Pöyry AS has drawn up a report about the CDM mechanism.[12] This report describes and summarises the main findings from recent international literature evaluating various aspects of the CDM mechanism. During its performance of this assignment, Econ Pöyry was asked to give particular attention to studies that deal with additionality and emission reduction, as well as the mechanism's contribution to sustainable development, technology transfer and technology development in host countries.

The law firm Thommessen AS has drawn up a report that formed a basis for the work of the Office of the Auditor General. The report comprised i) an assessment of the Emissions Trading Directive's relevance to the European Economic Area (EEA) and ii) an assessment of the relationship between the first allocation plan and the Emissions Trading Directive.[13]

12) Econ Pöyry: CDM – *Styrker og svakheter ('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
13) Thommessen AS: *Juridisk betenkning utarbeidet for Riksrevisjonen om kvotedirektivets EØS-relevans og direktivets implementering i norsk rett. ('Legal report prepared for the Office of the Auditor General about the Emissions Trading Directive's EEA relevance and the implementation of the Directive in Norwegian law').*

2.5 The global climate audit

This investigation will be included in the global climate audit 'Global coordinated audit on climate change' under the auspices of the INTOSAI Working Group on Environmental Auditing (WGEA).[14] The 14 countries participating are Australia, Brazil, Canada, Estonia, Finland, Greece, Indonesia, Norway, Poland, Slovenia, the UK, South Africa, the USA and Austria.

Findings from other countries' performance audits have been used to strengthen the data basis of the report. This includes performance audits carried out by the supreme audit institutions of Brazil and Indonesia focusing on the respective authorities' work to reduce deforestation. These two reports help to shed light on the prerequisites for reaching the Norwegian effort's goal of helping to reduce deforestation and forest degradation in developing countries. In addition, investigations carried out by the supreme audit institutions of the UK and USA have been used to elucidate the flexible mechanisms under the Kyoto Protocol.

14) International Organization of Supreme Audit Institutions.

3 Audit criteria

3.1 Norway's international commitments and the Clean Development Mechanism

The countries listed in Annex I to the United Nations Framework Convention on Climate Change (including Norway) have committed themselves to adopting national strategies and implement corresponding measures on the mitigation of climate change by limiting its anthropogenic emissions of greenhouse gases and by enhancing its greenhouse gas sinks and reservoirs. These strategies and measures are intended to demonstrate that the industrialised countries lead the way in modifying long-term trends in anthropogenic emissions in a manner consistent with the convention's objectives.[15]

Through the Kyoto Protocol, Norway has committed itself to limiting the average greenhouse gas emission for the period 2008–2012 to one per cent above the 1990 level.[16] The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, shall be used to meet each of the Annex I Parties' commitments under this article Norway has also decided to include the effect of forest management under article 3.4 in the fulfilment of its obligations in accordance with the existing regulations.[17] The relevant removals volume of 1.5 million tonnes of CO_2 equivalents will come in addition to the commitment and help the country strengthen its commitment.[18]

The Kyoto Protocol binds Norway to implement and examine policy instruments and measures in a number of sectors to achieve the quantified emissions commitments, cf. article 2. The countries are to have demonstrated clear progress in achieving its commitments by 2005, cf. article 3.2. The parties shall formulate, implement, publish and update national programmes of measures to mitigate climate change, cf. article 10. Such programmes shall include cover the energy, transport, industry, agriculture, forestry and waste management sectors.

The commitments can be fulfilled using the flexible mechanisms (cf. articles 6, 12 and 17). The purpose of the Clean Development Mechanism (CDM) is to assist countries without quantified commitments in achieving sustainable development and and in contributing to the ultimate objective of the United Nations Framework Convention on Climate Change, as well as to assist the Annex I Parties[19] in meeting their quantified emission commitments, cf. article 12. It is also a goal of the Kyoto Protocol that CDM projects should result in real, measurable long-term benefits and reductions in emissions that are additional to any that would have occured in the absence of the certified project activities.

The parties to the Kyoto Protocol has decided that use of the flexible mechanisms under the Protocol shall come in addition to domestic measures, and that domestic measures shall constitute a significant element in the effort to meet quantified commitments.[20] The preconditions for ratification of the Kyoto Protocol was that a significant part of the quantified emissions commitments are to be met by means of domestic measures, and that purchase of allowances should only be a supplement to such measures.[21] In the Standing Committee on Energy and the Environment's Recommendation No 233 (1997–98) *om Norges oppfølging av Kyotoprotokollen ('On*

15) Cf. article 4.2 (a) of the United Nations Framework Convention on Climate Change 9 May 1992 No 1 Multilateral. The overall objective of the climate convention is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, cf. article 2 of the United Nations Framework Convention on Climate Change.

16) The Kyoto Protocol to the UN Framework Convention on Climate Change of 11 December 1997 no. 3 Multilateral.

17) In the regulations to the protocol, there is an upper limit on credits for Norway from article 3.4 of 1.5 million tonnes per year for the period 2008–2012.

18) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

19) The industrialised countries, i.e. the industrialised countries that were OECD members in 1992, plus the countries that were in a transitional phase towards becoming market economies. The relevant countries are listed in Annex 1 to the climate convention.

20) Decision by the parties under the Kyoto Protocol (2/CMP.1 article 1, Principles, nature and scope of the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol).

21) Recommendation No 233 to the Storting (1997–98), cf. Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')* and Recommendation No 185 to the Storting (2001–2002) *Innstilling fra utenrikskomiteen om samtykke til ratifikasjon av Kyotoprotokollen av 11. desember 1997 til FNs rammekonvensjon om klimaendring av 9. mai 1992 ('Recommendation from the Standing Committee of Foreign Affairs about consent to ratification of the Kyoto Protocol of 11 December 1997 to the United Nations Framework Convention on Climate Change of 9 May 1992')*.

Norwegian follow-up of the Kyoto Protocol'), the committee states that it is pleased that no quantitative cap is stipulated for the use of project-based mechanisms, but it also emphasised that regulations are required to ensure that the flexible implementation mechanisms contribute to actual reductions in greenhouse gas emission, and that it is in the best interest of Norway and Norwegian business and industry that domestic measures to stimulate the development of new environmentally friendly technology be implemented. The committee's majority also emphasised the importance of Norway implementing a considerable part of its commitments through national measures, among other things in order to avoid far greater restructuring costs at a later time when we will probably be facing even stricter emissions commitments.

In the basis for the decision to ratify the Kyoto-Protocol, it was pointed out that Norway has accumulated considerable experience in the use of project-based mechanisms, and utilising and developing the Norwegian experience advantage was stated to be a goal in the transition to an operative system.[22] Therefore, one will aim to continue the active Norwegian work to gain experience with JI and CDM. A goal was expressed for this to happen in such a manner that Norway is as well prepared as possible to participate in a reliable and effective manner when these mechanisms become fully operative. Certified reductions in emission achieved between 2000 and 2008 can, according to the Kyoto Protocol, be used to fulfil the commitments in the first commitment period (cf. article 12). In addition to cost-effective emissions reductions, CDM projects can, among other things, contribute to sustainable development by means of transfers of knowledge, technology and financial resources. CDM projects are therefore deemed to be good development tools.[23]

In order for Norway to be able to fulfil the Kyoto Protocol in an efficient manner with a high degree of certainty, it was important to start purchasing allowances as early as in 2007.[24] One aimed to sign contracts in 2008 for purchase of a number of allowances corresponding to a significant share of the total estimated requirement for the period 2008–2012.[25] The Standing Committee on Finance and Economic Affairs has given its consent to the Ministry of Finance emphasising finding projects in minor developing countries where there are few or no projects to start with.

3.2 Norway's national targets

The following targets were stipulated in the Climate Settlement[26]:

- Norway will strengthen its emissions commitment pursuant to the Kyoto Protocol by 10 percentage points, which means a reduction of 9 percent compared with the 1990 level. This will be done by means of funding that will in its entirety go to emissions-reducing measures in other countries, primarily developing countries.
- In the period until 2020, Norway will bind itself to cut global emissions of greenhouse gases by an amount corresponding to 30 per cent of Norwegian emissions in 1990. It is a realistic goal to reduce emissions in Norway by 15–17 million tonnes of CO_2 equivalents compared with the baseline scenario as presented in the national budget for 2007 when forests are included based on the existing framework of our Kyoto participation. In such case, this means that about two thirds of Norway's total emission cuts will be made nationally.[27]

The parties in the Climate Settlement agree that early action to prevent global warming is much more effective than action at a later stage. The parties therefore consider it important to gain support for rapid implementation of measures to tackle climate change (cf. Recommendation No 145 to the Storting (2007–2008) and IPCC's Fourth Assessment Report).

Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the environment in Norway* states that work will be done to put in place the solutions required for Norway to fulfil its Kyoto commitments, including that the cheapest national measures will be implemented within 2–5 years. The policy

22) Recommendation No 233 to the Storting (1997–98), cf. Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*.
23) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
24) Budget Recommendation No 1 to the Storting (2006–2007), cf. Proposition No 1 to the Storting (2006–2007) *The Ministry of Finance*
25) Budget Recommendation No 6 to the Storting (2007–2008), cf. Proposition No 1 to the Storting (2007–2008) *The Ministry of Finance*.
26) *Agreement on Norway's climate policy.* Agreement between Norwegian political parties Labour, the Socialist Left Party, the Centre Party, the Conservative Party, the Norwegian Christian Democratic Party and the Liberal Party on comments to Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*, cf. Recommendation No 145 to the Storting (2007–2008).
27) In connection with the Climate Settlement, it was assumed that the contribution from articles 3.3 and 3.4 under the existing framework of the Kyoto commitment will make up about 3 million tonnes of CO_2 equivalents in 2020.

design will take into consideration the long-term adjustments required for the expected stricter commitments after 2012.

3.3 Goals for the effort to reduce deforestation and forest degradation in developing countries

One of the goals of this effort to help to reduce deforestation and forest degradation in developing countries is to ensure quick and cost-effective reductions in greenhouse gas emission. The effort is also to contribute to building capacity and expertise internationally as well as in the recipient countries in forest monitoring and analysis, and to contribute to sustainable development.[28]

Norway's effort in this field is based on the fact that reduction of emissions from deforestation and forest degradation in developing countries is considered cost-effective, and that results can be achieved relatively quickly.[29] A reliable ability to monitor, analyse and verify forest areas and the carbon content of forest, and changes to these elements must be established. A common denominator for the countries that Norwegian efforts are aimed at must be an explicit and with time demonstrated political willingness to work systematically against deforestation and forest degradation, including the development and follow-up of national strategies. Key elements in the recipient countries' national strategies to combat greenhouse gas emissions from deforestation and forest degradation are a coordinating national entity, an international programme per country to support the national entity, and an international support structure.[30]

The Standing Committee on Energy and the Environment's condition for this effort is that satisfactory mechanisms be established, for example under the auspices of the UN or the World Bank, to certify emissions reductions and handle large transfers of funds to forest measures in an adequate manner. In a start-up phase, it will therefore be necessary to use resources on the development of regulations, monitoring and control measures, including demonstration and pilot projects.[31]

28) Proposition No 1 to the Storting (2008–2009) *The Ministry of the Environment*, Budget Recommendation No 3 to the Storting (2008–2009), cf. Report No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.
29) Budget Recommendation No 3 to the Storting (2008–2009), cf. Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*
30) Budget Recommendation No 9 to the Storting (2008–2009), cf. Proposition No 1 to the Storting Appendices 2 and 4 (2008–2009).
31) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

3.4 The Ministry of the Environment's overriding responsibility

The Ministry of the Environment is to initiate, develop and implement measures using its own policy instruments, but is also to be a driving force in relation to various sector authorities on the national level.[32] The Ministry is responsible for the coordination of the Government's environmental policy goals and for ensuring result follow-up of the environmental policy.

The Ministry of the Environment is to take a coordinating position in Norwegian climate work.[33] The Ministry is responsible for managing the national work to further development and implementation of the use of policy instruments to limit greenhouse gas emissions in Norway (Working goal 1.1). The Ministry of the Environment is also to contribute to reducing the consequences of emissions in connection with the use and production of energy in cooperation with the energy authorities (working goal 1.2). From 2008, the Ministry of the Environment has also been given responsibility for establishing a follow-up scheme for the sector and national reductions targets, among other things by stipulating reviews of progress in the period until 2020 (working goal 3.2).

As a basis for ratification of the Kyoto Protocol, the Storting was informed that the cross-sectoral environmental protection policy will be strengthened by the introduction of sectoral environmental action plans and further development of a national performance monitoring system, cf. Recommendation No 233 to the Storting (1997–98) and Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyoto-protokollen ('Norwegian follow-up of the Kyoto Protocol')*.

According to the Regulations on Financial Management in Central Government section 4, the ministries shall stipulate overall goals and management parameters for subordinate agencies. All agencies shall ensure that stipulated objectives and performance requirements are achieved, that the use of resources is efficient, and that the entity is run in accordance with applicable laws and regulations, including the requirements relating to good administrative practice, imparti-

32) Cf. the government's website regjeringen.no "Ansvarsområder" (*'Areas of responsibility'*). Read 12 January 2010.
33) Budget Recommendation No 9 to the Storting (2007–2008), cf. Proposition No 1 to the Storting (2007–2008) *The Ministry of the Environment*.

ality and ethical behaviour. All agencies shall also ensure sufficient management information and an adequate basis for decisions.

Pursuant to the Regulations on Financial Management in Central Government section 16, all agencies shall ensure that evaluations are carried out to provide information about efficiency, goal achievement and results within the whole or parts of the agency's area of responsibility and activities. The evaluations shall, among other things, look into the expediency of for example ownership, organisation and policy instruments, including grant schemes. The frequency and scope of the evaluations shall be decided on the basis of the agency's distinctive characteristics, risk profile and significance. The need for evaluation must be considered in relation to the quality and scope of other reporting, cf. Provisions on Financial Management in Central Government, section 1.5.3.

3.5 Cross-sectoral policy instruments

Effectiveness and cost-effectiveness are two key criteria in the design of policy instruments in environmental policy like in other areas.[34] By effectiveness is meant that a policy instrument should lead to the goals being reached with the highest possible degree of certainty. The effectiveness of a tax depends on whether it is sufficiently high and accurate to trigger the required adaptations in businesses and households. Cost-effectiveness means that the policy instruments trigger measures that result in the greatest possible reduction of emissions resulting from the resources invested.[35] The policy instruments chosen should also ensure cost-effectiveness over time to the greatest possible extent (dynamic efficiency).[36]

The parties in the Climate Settlement agree that measures that are cost-effective in light of an expected rise in carbon prices over the investments' life cycle and which are not necessarily triggered by the present use of policy instruments should be given particular consideration. In this context, measures that contribute to technology development will be given particular consideration.[37]

The emissions trading scheme is one of the most important policy instruments for Norway to fulfil its emissions commitments under the Kyoto Protocol, and the carbon tax is the main policy instrument for reduction of greenhouse gas emissions for enterprises that are not covered by the emissions trading scheme.[38]

3.5.1 The emissions trading scheme

The purpose of the Greenhouse Gas Emission Trading Act is to limit the emissions of greenhouse gases in a cost-effective way.[39] Each year, the Norwegian Pollution Control Authority allocates the number of allowances that each entity with a duty to surrender allowances is entitled to. The intention behind the Norwegian emissions trading scheme at the time when the Greenhouse Gas Emission Trading Act was adopted, was that it would be connected with the EU's emissions trading scheme as soon as possible.[40] Proposition No 66 to the Odelsting (2006–2007) prepared for the emissions trading scheme to be connected to the EU's emissions trading scheme from 1 January 2008.[41] Article 9 of the Emissions Trading Directive states that an allocation plan must be published and the Commission notified of this at least 18 months prior to the beginning of the emissions trading period.[42] According to article 11, the decision on the amount of allowances must be made at least 12 months before the missions trading period starts.

Technical regulations are given in the Regulations relating to greenhouse gas emissions trading.[43]

34) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
35) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
36) Recommendation No 233 to the Storting (1997–98), cf. Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*.
37) *Avtale om klimameldingen (Agreement relating to the Climate Report)*. Agreement between Norwegian political parties Labour, the Socialist Left Party, the Centre Party, the Conservative Party, the Norwegian Christian Democratic Party and the Liberal Party on comments to Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*, cf. Recommendation No 145 to the Storting (2007–2008).
38) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
39) Act No 99 of 17 December 2004: Act *Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances* and amendments proposed in Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* ('*On the act relating to changes in the Greenhouse Gas Emission Trading Act etc.* ') and Report No 19 to the Odelsting (2008–2009).
40) Recommendation No 100 to the Odelsting (2006–2007), cf. Proposition No 66 to the Odelsting (2006–2007) *Lov om endringer i klimakvoteloven m.m* ('*On the act relating to changes in the Greenhouse Gas Emission Trading Act etc.* ')
41) Recommendation No 100 to the Odelsting (2006–2007).
42) Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 *establishing a scheme for greenhouse gas emission allowance trading within the Community* and amending Council Directive 96/61/EC.
43) Regulations relating to greenhouse gas emission allowance trading and the duty to surrender emission allowances (Greenhouse Gas Emission Trading Regulations), Regulations No 1851 of 23 December 2004.

These Regulations give the Norwegian Pollution Control Authority a number of tasks relating to the operation of the scheme, including the establishment and running of the Norwegian register of emissions allowances.

3.5.2 The carbon tax

The carbon tax on mineral products is levied in accordance with the Act relating to Special Taxes. Emissions on the continental shelf are regulated through a special act, which following an amendment also covers CO_2 emissions from petroleum recovery.[44] The purpose of the tax is to contribute to cost-effective reductions in emissions of the greenhouse gas CO_2.[45]

3.5.3 The Pollution Control Act

The Pollution Control Act is a broad framework that only to a small extent allocates duties and rights, but which contains principles that the authorities are authorised to stipulate in more detail through regulations and individual decisions.[46] Since the law came into force, a number of rights, duties and limitations have been stipulated through regulations. Much of this elaboration of the framework has consisted of adjustments in connection with Norway's implementation of a number of EU Directives. At present, there are three pertaining regulations to this act: the Waste Regulations, the Product Control Regulations and the Pollution Regulations.[47]

The general rule in section 7 of the act reads as follows 'No person may possess, do or initiate anything that may entail a risk of pollution unless this is lawful pursuant to section 8 or 9 or permitted by a decision made pursuant to section 1'. Section 11 authorises individual decisions to grant special permits for any activity that may cause pollution. The Act covers emission of greenhouse gases. Any person wishing to engage in activities that may result in emission of greenhouse gases that is illegal pursuant to the Pollution Control Act section 8 or regulations issued pursuant to the Pollution Control Act section 9, must apply for a permit from the pollution control authorities.[48] Regular emissions to air from activities on the continental shelf also requires a permit from the Norwegian Pollution Control Authority, cf. the Pollution Control Act section 4.

The pollution control authorities have a relatively far-reaching right to stipulate conditions pursuant to the Pollution Control Act section 16. Parties with a duty to surrender allowances pursuant to the Greenhouse Gas Emission Trading Act section 4 shall, however, be granted a permit for emissions to which the duty to surrender allowances applies if they substantiate that they are capable of monitoring and reporting the emissions in a satisfactory manner. The Pollution Control Act section 11 second paragraph states that no emission limit value shall be stipulated in the permit for greenhouse gas emissions to which the duty to surrender allowances applies. The right to make other requirements (typically technology requirements) in order limit greenhouse gas emission has, however, been maintained. The authority to make such requirements lies with the Ministry of the Environment.

Under and in pursuance of the Pollution Control Act section 9, the pollution control authorities can issue regulations relating to limit values, technical requirements and other quality requirements in connection with permits for activities that contribute to the emission of pollution.

The Pollution Control Act section 11 first paragraph can be used to regulate greenhouse gas emissions from activities that are not covered by the Greenhouse Gas Emission Trading Act. Conditions for these activities can also be stipulated based on an overall assessment, cf. section 11 fifth paragraph. This is in agreement with the guidelines formulated in the Pollution Control Act section 2.3, which reads as follows: 'Efforts to avoid and limit pollution and waste problems shall be based on the technology that will give the best results in the light of an overall evaluation of current and future use of the environment and economic considerations.' The Pollution Regulations that implements the IPPC Directive contains more detailed provisions relating to the 'best available technique' requirement.[49]

44) Cf. Act No 72 of 21 December 1990 *relating to carbon tax in the petroleum activity on the continental shelf*. Most recently amended through Act No 100 of 20 December 1996.

45) Proposition No 1 to the Storting (2008–2009) *Skatte-, avgifts- og tollvedtak Skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties').*

46) Act No 6 of 13 March 1981: *Act relating to Protection against Pollution and relating to Waste* (the Pollution Control Act).

47) Cf. Regulations No 930 of 1 June 2004 *relating to the recycling of waste* (the Waste Regulations), Regulations No 922 of 1 June 2004 *relating to restrictions on the manufacture, import, export, sale and use of chemicals and other products hazardous to health and the environment* (the Product Regulations) under and in pursuance of Act No 79 of 11 June 1976 *relating to the Control of Products and Consumer Services* (the Product Control Act) and Regulations 931 of 1 June 2004 *relating to pollution control (the Pollution Regulations).*

48) The pollution control authority is either the Norwegian Pollution Control Authority or the County Governor, depending on the subject area.

49) Regulations No 931 of 1 June 2004 *relating to pollution control* chapter 6 implements Directive EC/96/EØF Integration of Pollution Prevention and Control.

Photo:Mikkel Østergaard / Samfoto

3.6 The sector authorities' responsibilities, targets and use of policy instruments

3.6.1 The sector authorities' general responsibilities

The sector authorities are to have an overview of the environmental impact of activities in their sector and are responsible for initiating and implementing measures in their own fields. The sector authorities are also to be responsible for reporting on environmental developments in the sector and the costs relating to implemented measures.[50] It is a continuous task to ensure that the overall public policy instrument organisation aims to reach environmental policy goals and create positive effects on the environment. Environmental work in the individual sectors must be carried out in accordance with the strategic and national goals in this field.[51] Cross-sectoral policy instruments help to ensure a cost-effective implementation of the environmental policy.[52]

General policy instruments are key elements in the national climate policy. Cross-sectoral financial policy instruments form the basis for decentralised, cost-effective and informed measures, for which the polluter pays. There are certain emission sources that can neither have a duty to surrender allowances nor a carbon tax imposed on them. Here, the authorities must use other policy instruments to reduce greenhouse gas emissions.[53]

The parties in the Climate Settlement agreed that in areas subject to general policy instruments, further regulations should as a rule be avoided. At the same time, the parties also agree that the opportunity to use other policy instruments in addition to allowances and taxes should be continued also for these sectors. It is important to use resources on technology development that will enable major reductions in future.

It has been an objective to focus on environmental technology and strengthen the environmental aspect of the research and development programme.[54] Increased use of environmental technology is crucial in order to solve key environmental and resource problems in Norway as well as internationally, and to achieve the goal of disconnecting financial growth from environmental impact.[55]

Strategic efforts in research and technology development will help Norwegian research milieus and Norwegian business and industry to contribute to solving global climate and environmental

50) Recommendation No 256 to the Storting (1999–2000), cf. Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the environment in Norway.*
51) Recommendation No 228 to the Storting (2004–2005), cf. Report No 21 to the Storting (2004–2005) *The Government's Environmental Policy and the State of the environment in Norway.*
52) Recommendation No 256 to the Storting (1999–2000), cf. Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the environment in Norway.*
53) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
54) Report No 58 to the Storting (1996–97).
55) Recommendation No 13 to the Storting (2007–2008), cf. Report No 26 to the Storting (2006–2007) *The Government's Environmental Policy and the State of the environment in Norway*.

challenges. The innovation policy is intended to support the goals of the sustainability strategy as described in the national budget for 2008.[56]

3.6.2 The petroleum and energy sector

The target is for existing and new policy instruments in the petroleum and energy sector to trigger a reduction in greenhouse gas emissions of 3–5 million tonnes of CO_2 equivalents by 2020 compared with the baseline scenario on which the Norwegian Pollution Control Authority based its mitigation analysis.[57] The targets relating to this sector are based on estimates, and it will be necessary to reconsider them if changes in future forecasts, costs, technology development or other significantly changed conditions so indicate. If the development trend indicates that the targets will not be realised, the government will consider additional measures.[58]

Petroleum activities in Norway shall be conducted in a prudent manner and take due account of, among other things, the environment, cf. the Act relating to Petroleum Activities section 10-1. Requirements to the use of technology can be stipulated by the petroleum authorities, in connection with the approval of plans for development and operation (PDO)[59], and by the environmental authorities under the Pollution Control Act. The oil companies are required to submit evaluations of electrification of new fields and major development projects rather than using gas turbines in the preparation of the PDO, cf. Recommendation No 114 to the Storting (1995–96).

The parties in the Climate Settlement are of the opinion that there is a pressing need for technological developments and demonstration projects in order to achieve the goals for carbon capture and storage in Norway. The parties agree that efforts to develop emission-free energy systems must be intensivied, and that on the basis of technical, financial and supply considerations, electricity generated onshore or emissions-free electricity is to be considered for new developments and major development projects.

During the consideration of the budget in the 2001–2002 session there was agreement on developing plans for a research basis for carbon dioxide reduction technology with a view to establishing a pilot/demonstration facility in 2004/2005.[60]

In 2006, the Ministry of Petroleum and Energy signed an implementation agreement with Statoil for the establishment of carbon capture and storage at Mongstad in two stages: first a test centre for carbon capture, then full-scale carbon capture and storage from 2014. Start-up of the test centre will take place after start-up of the combined heat and power plant, which is scheduled to take place in 2011. According to the agreement, the Government is responsible for establishing a transport and storage solution for 100,000 tonnes of CO_2 per year from the Mongstad test centre. Moreover, a technology company will be created to own and operate the carbon capture pilot plant. The purpose is to develop solutions that can reduce the costs and the technical and financial risks associated with full-scale carbon capture, and that can be widely applicable in Norway as well as internationally, cf. Proposition No 49 to the Storting (2007–2008). A majority also supported carbon capture and storage for the Kårstø gas power station, and that this cleaning plant was to be operational by 2009.[61] According to the Standing Committee on Energy and the Environment, cleaning of emissions from the Kårstø gas power plant by 2009 will be important to Norway's fulfilment of its international environmental commitments.

In 2002 a target was set for the use of mineral oil for heating to be reduced by 25 per cent in the period 2008–2012 in relation to the average for the period 1996–2000.[62] It was assumed that a reduction in the use of fuel oil should be carried out by means of a transition to the use of new renewable energy sources.

During the consideration of Report No 29 to the Storting (1998–99) *Norwegian Energy Policy*, cf.

56) Recommendation No 170 to the Storting (2008–2009), cf. Report No 7 to the Storting (2008–2009) *An Innovative and Sustainable Norway*.
57) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* and the Norwegian Pollution Control Authority. *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: An mitigation analysis for 2020'*) Report TA-2254/2007.
58) In the rest of the report, reproduction of the sector targets as proposed in Report No 34 to the Storting (2006–2007) will only refer to the reduction target. The possibility of reconsideration of the targets will generally not be repeated.
59) In Report No 26 to the Storting (1993–94), Proposition No 1 to the Storting (2001–2002), Proposition No 1 to the Storting (2002–2003), Proposition No 1 to the Storting (2003–2004), Proposition No 1 to the Storting (2004–2005), Proposition No 1 to the Storting (2005–2006), Proposition No 1 to the Storting (2006–2007) and Proposition No 1 to the Storting (2007–2008).
60) Budget Recommendation No 9 to the Storting (2001–2002).
61) Budget Recommendation No 9 to the Storting (2005–2006) and Budget Recommendation No 9 to the Storting (2006–2007)
62) Report No 15 to the Storting (2001–2002) *Amendment to Report No 54 to the Storting* (2000–2001) *Norwegian Climate Policy* and Recommendation No 240 to the Storting (2001–2002).

Recommendation No 122 to the Storting (1999–2000), targets were set to limit energy consumption considerably, as well as targets relating to increased production and use or renewable energy.[63] The goals for increased production and user of renewable energy have since been applied to Enova's administration of Energy Fund funds. In the consideration of Proposition No 35 to the Odelsting (2000–2001) *Om lov og endringar i lov 29. juni 1990 nr. 50 om produksjon, omforming, overføring, omsetning og fordeling av energi m.m. (energilova) ('On Act and amendments to Act No 50 of 29 June 1990 relating to the generation, conversion, transmission, trading distribution and use of energy etc. (The Energy Act)')*, a majority in the Standing Committee on Energy and the Environment emphasised that the funds in the Energy Fund shall go to measures aimed at use and production that stimulates the long-term restructuring of the energy sector. The funds must also be aimed at achieving the targets set for the development of wind power and other renewable sources of energy, environmentally friendly production of heat and reduced consumption.[64]

During the consideration of Report No 29 to the Storting (1998–99) *Norwegian Energy Policy*, it was recommended that by the end of 2010, the stimulation programme shall have increased the use of water-borne heating by a minimum of 4 TWh/year on the basis of new renewable energy sources, waste heat and heat pumps, and that wind power plants shall be built that will ensure a minimum increase in the production of wind power of 3 TWh/year.[65]

Proposition No 1 to the Storting (2008–2009) for the Ministry of Petroleum and Energy takes as its starting point that Enova, through its use of policy instruments, will 'trigger projects that will provide new environmental energy production and energy saving corresponding to 18 TWh/year by the end of 2011'. The basis year is 2001.

The use of the funds in the Energy Fund shall be considered in a long-term perspective with a working target of 40 TWh of saved and produced new renewable energy by the end of 2020.[66] The total target for new renewable energy and reduced energy use is 12 TWh by 2010,[67] 18 TWh by 2011, and 30 TWh by 2016,[68] while the rest has not yet been allocated to result areas.

According to Recommendation No 145 to the Storting (2007–2008), the majority of the Standing Committee on Energy and the Environment agrees that a targeted and coordinated use of policy instruments to increase the development of bioenergy by up to 14 TWh by 2020 must be ensured. The committee's majority also agreed on a considerably increased level of activity in the development of energy-efficient buildings.[69]

3.6.3 The transport sector

The target is for existing and new policy instruments in the transport sector to trigger a reduction in greenhouse gas emissions of 2.5–4 million tonnes of CO_2 equivalents by 2020 compared with the baseline scenario on which the Norwegian Pollution Control Authority based its mitigation analysis.[70] The targets relating to this sector are based on estimates, and it will be necessary to reconsider them if changes in future forecasts, costs, technology development or other significantly changed conditions so indicate. The starting point is that the climate targets for the transport sector will then be maintained or made stricter.[71]

The annual budget propositions from the Ministry of Transport and Communications strongly emphasise reduction of the environmental disadvantages that transport inflicts on society. Transport is emphasised as one of the most important sectors with major climate challenges. It is necessary both to reduce traffic growth, achieve a transition to more environmentally friendly forms of transport and reduce emissions from each vehicle.[72]

63) Recommendation No 122 to the Storting (1999–2000).
64) Recommendation No 59 to the Odelsting (2000–2001) *Innstilling frå energi- og miljøkomiteen om lov om endringar i lov 29. juni 1990 nr. 50 om produksjon, omforming, overføring, omsetning og fordeling av energi m.m.(energilova)('Recommendation from the Standing Committee on Energy and the Environment about Act on amendments to Act No 50 of 29 June 1990 relating to the generation, conversion, transmission, trading distribution and use of energy etc. (The Energy Act)').*
65) Cf. Recommendation No 122 to the Storting (1999–2000).
66) Agreement between the Norwegian state, represented by the Ministry of Petroleum and Energy, and Enova SF on the administration of the funds in the Energy Fund in the period from 1 June 2008 until 31 December 2011.
67) The total target has changed somewhat over time, in Report No 9 to the Storting (2002–2003) the total target was 10 TWh. However, 3 TWh of wind and 4 TWh of heat have remained unchanged.
68) Report No 11 to the Storting (2006–2007) *Om støtteordningen for elektrisitetsproduksjon fra fornybare energikilder (fornybar elektrisitet) ('On the funding scheme for electricity production from renewable energy sources (renewable electricity)').*
69) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
70) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
71) Recommendation No 300 to the Storting (2008–2009), cf. Report No 16 to the Storting (2008–2009) *National Transport Plan 2010–2019*.
72) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

The Climate Settlement states that the climate objectives are important in connection with the work on the National Transport Plan, and reference is made to measures to reduce road traffic. In Recommendation No 132 to the Storting (2007–2008) *On the Government's Environmental Policy and the State of the Environment in Norway* the committee refers to the wish for a more coordinated land use and transport policy, and states that local authorities should encourage a development and zoning policy that reduces the need for transport. The committee refers to the fact that good land use planning may, among other things, reduce emissions from the road traffic sector.

The need for a reduction in car use was also pointed out during the consideration of Norwegian follow-up of the Kyoto Protocol.[73] The majority of the committee pointed out that the car is the most expedient form of transport in many rural areas, but in urban areas, public transport must be strengthened and car use reduced. The majority is therefore of the opinion that transport and communications investments must be shifted from road to rail. The main focus should be on short-distance traffic in the major cities, and on intercity traffic. Tilting trains should be introduced on the busiest long-distance stretches in order to make railway a better alternative to airplane and car travel. As much long-distance freight transport as possible must be transferred from road to rail.

It is also a goal to reduce emissions from each car, cf. Recommendation No 145 to the Storting (2007–2008) *Om norsk klimapolitikk ('On Norwegian climate policy')*. This goal is to be reached by means of reduction of emissions from new cars and development of alternative fuels. The average emissions from new passenger cars are to be below 120 g CO_2/km by 2012. Norway wishes to be a leading country and facilitate a market for more environmentally friendly cars. The government wants to be a driving force in the European work on requirements for vehicles to reduce greenhouse gas emissions from vehicles, including working to ensure that new cars sold after 2015 should be able to use significant proportions of carbon neutral or emission-free fuels.[74]

Increased use of biofuels has been mentioned as a policy instrument in all climate policy reports since 1998. In Report No 21 to the Storting (2004–2005) *The Government's Environmental Policy and the State of the Environment in Norway* states that one aims to prepare a proposal for further national biofuel initiative adapted to the Norwegian situation by 1 July 2005. In Report No 34 to the Storting (2006–2007) section 9.2.2.1 Technical measures, it is proposed to introduce a regulations amendment requiring a minimum of 2 volume per cent of the annual sales volume of road traffic fuel to consist of biofuel from 2008, increasing to 5 volume per cent from 2009. This target was adjusted following the consultation round, and the Product Control Regulations section 3.16 requires a minimum of 2.5 volume per cent of the total amount of road traffic fuel sold from 1 April 2009 until the end of the year to consist of biofuels.

3.6.4 The industrial sector

The industrial sector's target is for existing and new policy instruments in industry to trigger a reduction in greenhouse gas emissions of 2 to 4 million of tonnes CO_2 equivalents by 2020 compared with the baseline scenario on which the Norwegian Pollution Control Authority based its mitigation analysis.[75] The targets relating to this sector are based on estimates, and it will be necessary to reconsider them if changes in future forecasts, costs, technology development or other significantly changed conditions so indicate.

The parties in the Climate Settlement agree that in the course of 2008, the Government, in dialogue with industry, will evaluate policy instruments, including incorporation into the emissions trading scheme and voluntary agreements, that can apply to industries not currently subject to the carbon tax or obliged to take part in the emissions trading scheme.[76]

3.6.5 The agricultural sector

The Storting has expressed goals and ambitions for the agricultural sector both in terms of reducing the sector's contribution to the climate gas emissions and increasing the production of bioenergy. The goal is for existing and new policy instruments in the primary industries and the

73) Recommendation No 233 to the Storting (1997–98) Recommendation from the Standing Committee on Energy and the Environment on *Norwegian follow-up of the Kyoto Protocol*.

74) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* and letter of 2 December 2009 from the Ministry of Transport and Communications.

75) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*; the Norwegian Pollution Control Authority. *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020'*) Report TA-2254/2007.

76) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

waste sector to trigger a reduction in greenhouse gas emissions of 1–1.5 million tonnes of CO_2 equivalents by 2020 compared with the baseline scenario on which the Norwegian Pollution Control Authority based its mitigation analysis.[77] The target includes reductions for the fisheries and waste sector and bioenergy in accordance with the technological potential in the Norwegian Pollution Control Authority's mitigation analysis.[78] The targets relating to the sectors are based on estimates, and it will be necessary to reconsider them if changes in future forecasts, costs, technology development or other significantly changed conditions so indicate.

The Standing Committee on Business and Industry refers to a sensible agricultural policy and a good and dynamic industry as part of the solution to the environmental and climate challenges we are facing. Agriculture has a number of important functions, including preserving biological diversity, producing food in a climate-friendly manner and maintaining the valuable cultural landscape. It is the committee's opinion that agriculture, like other sectors, is facing a number of environmental challenges and has the potential to improve its performance. This applies not least to greenhouse gas emissions.[79]

The majority of the Standing Committee on Business and Industry asks the government to contribute actively to the realisation of as many development projects for climate measures in agriculture as possible in order to enable financial contributions to farming from a resource that goes unutilised today, and which represents a problem to many farms.[80]

The forest's value creation potential is great, not least as part of the national goals to reduce greenhouse gas emissions, both in terms of the renewable energy initiative and CO_2 removal, cf. Recommendation No 320 to the Storting (2007–2008). The Forest Report, Recommendation No 208 to the Storting (1998–99), cf. Report No 17 to the Storting (1998–99) *Verdiskaping og miljø – muligheter i skogsektoren ('Value creation and environment – opportunities in the forest sector')* (the Forest Report) emphasised forest measures as important elements in the climate effort. The Standing Committee on Business and Industry stressed that the government administration was to emphasise the environmental aspects of forest policy strongly in the time ahead. It will be important that the forest is managed in such a way that large amounts of carbon are not released from these great stores.[81] Norway's annual net carbon removals is to be increased through measures in forestry and agriculture, provided that the measures do not entail other negative effects on the environment.[82]

The Forest Report and subsequent reports to the Storting aims for a policy of increased felling. The Standing Committee on Business and Industry specifies that the forest policy must be determined within the framework of sustainable resource management and adopted environmental targets. The committee's majority underlines the importance of an active and goal-oriented silviculture. This is necessary among other things because the forest is important to the climate and represents a large potential for value creation. The committee's majority agrees that a situation where the investment and activity levels in silviculture are too low cannot continue. The majority of the Standing Committee on Business and Industry supports further strengthening of the forestry policy from 2007.[83]

The Standing Committee on Business and Industry has on a number of occasions emphasised the need to strengthen the bioenergy production effort.[84] This applies both to efficient solutions to obtain biofuel from the forest and a tax system that would make biofuel competitive in relation to other forms of energy.[85] The committee's majority attaches great importance to the forest's positive role in environmental contexts, and refers to the fact that resources from forests and cultural landscape represent a great potential for future Norwegian production of second-generation biofuel. The majority has noted that more research and technology development are required in this field.

77) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*; the Norwegian Pollution Control Authority. *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020'*) Report TA-2254/2007.
78) Three million tonnes of CO_2 from forest that are included in the national target are not included in the sector target (information from the Ministry of the Environment).
79) Recommendation No 320 to the Storting (2007–2008).
80) Budget Recommendation No 8 to the Storting (2007–2008).
81) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
82) Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy*, cf. Recommendation No 240 to the Storting (2001–2002).
83) Budget Recommendation No 8 to the Storting (2007–2008).
84) Recommendation No 208 to the Storting (1998–99), Budget Recommendation No 8 to the Storting (2001–2002), (2005–2006) and (2007–2008).
85) Budget Recommendation No 8 to the Storting (2007–2008).

The Standing Committee on Business and Industry has been focused on environmental concern in connection with the felling of timber for bioenergy:

- The majority assumes that the ambitious bioenergy goal will be balanced by a correspondingly strong effort in afforestation and silviculture to ensure that the bioenergy effort does not result in a net increase in emissions[86]
- The majority is of the opinion that the bioenergy effort should be seen in conjunction with the goal of preventing the cultural landscape from becoming overgrown, and that it should be designed in such a way that it will also help to achieve that goal[87]

The Storting has pointed out the importance of good management information in forest management. The committee has emphasised that the consequences of an alteration of the forest policy must be given considerable attention, and that the implementation of an active value creation programme requires decision makers to have access to high-quality information for the whole country.[88]

It emerges from Report No 26 to the Storting (2006–2007) *On the Government's Environmental Policy and the State of the Environment in Norway* and Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* that generally speaking, the plan is to give priority to measures that have a positive effect both in terms of counteracting climate change and preserving biological diversity and other important environmental assets. According to the bioenergy strategy (strategy for increased development of bioenergy), felling of raw materials from the forest for bioenergy must be done in a way that has a positive or acceptable effect on biological diversity, the landscape, outdoor pursuits and cultural heritage.

86) Budget Recommendation No 8 to the Storting (2007–2008).
87) Budget Recommendation No 8 to the Storting (2006–2007).
88) Recommendation No 208 to the Storting (1998–1999).

4 To what extent do the cross-sectoral policy instruments contribute to target achievement?

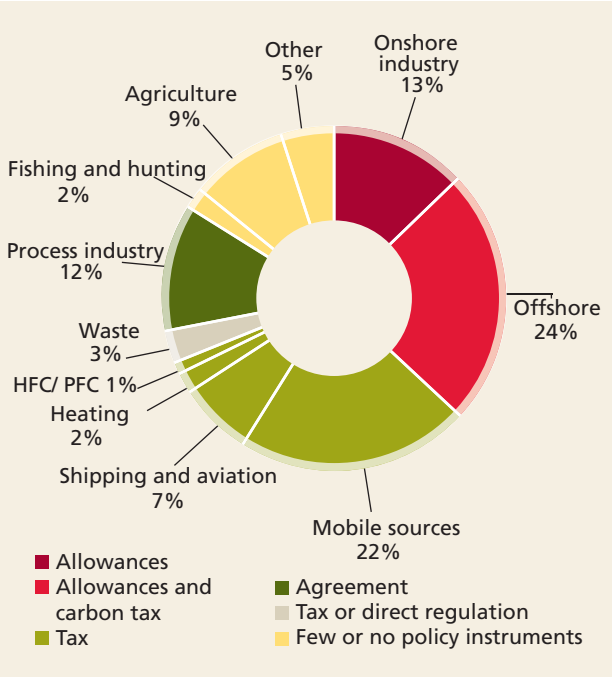
4.1 Introduction

The cross-sectoral policy instruments have been important in Norwegian climate policy.[89] Emission allowances and taxes are cross-sectoral policy instruments introduced to reduce greenhouse gas emissions. The Pollution Control Act is also considered a cross-sector policy instrument to regulate greenhouse gas emissions.[90]

4.2 How are greenhouse gas emissions regulated?

Figure 4.1 shows greenhouse gas emissions by source and main policy instrument (indicated by colours) aimed at reducing emissions. The figure shows that in 2008, about 70 per cent of greenhouse gas emissions were regulated by means of either taxes (light green and gray), allowances (dark red) or both (red).[91] About 16 per cent of greenhouse gas emissions are subject to few or no policy instruments (yellow), and this entails fishing and hunting, agricultural process emissions and gas for heating.

Figure 4.1 Greenhouse gas emissions by sources and policy instruments



Source: Report No 1 to the Storting (2009–2010) The National Budget 2010 updated for policy instruments adopted in 2009

4.3 To what extent do taxes on greenhouse gas emissions contribute to target achievement?

Based on the 'polluter pays' principle, Norwegian climate policy is characterised by the development of a number of special taxes, often referred to as environmental taxes. Environmental taxes impose a price for damage to the environment and provide incentives to reduce the amount of damage an activity does to the environment. It is assumed that a correct tax level will trigger emission-reducing measures, and this ensures that the tax is effective. Special taxes that may have an indirect environmental effect may also be levied.[92] The special tax on electric power, for example, has fiscal grounds, but is also intended to contribute to more efficient utilisation of energy, thus producing positive environmental effects because the electricity consumption has an indirect effect on the environment.[93]

The carbon tax on combustion of mineral oil, petrol and oil and gas offshore was introduced in 1991, but since then, the scope of special taxes on emissions have been extended to apply to more sectors, sources of emissions and gases.

4.3.1 Work processes to develop and stipulate the level of environmental taxes

The Ministry of Finance stated in an interview that effectiveness, cost-effectiveness, environmental efficiency and business and industry policy are all taken into consideration when the tax level is set. Expert assessments of the tax level is made both by interministerial working groups and through reports drawn up by appointed committees, like

89) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyoto-protokollen ('Norwegian follow-up of the Kyoto Protocol')*, Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy* and Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

90) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*

91) The figure also includes the agreement with the process industry entered into as late as in 2009.

92) Cf. the Ministry of Finance website: Generelt om særavgifter *('General information about special taxes')*.

93) Cf. the Ministry of Finance website: Avgift på elektrisk kraft *('Taxes on electric power')* and Official Norwegian Report NOU 1998:11 *Kraftbalansen fram mot 2020*. ('*The Energy and Power Balance towards 2020*').

in the work on green taxes described in more detail in fact box 4.1.[94]

Fact box 4.1 Cost-effectiveness and design principles for environmental taxation

The report on green taxes recommended a universal carbon tax as the most cost-effective policy instrument to achieve reductions in greenhouse gas emissions. The commission concluded that a carbon tax with the following characteristics would function in an optimum manner:

- identical tax level for all countries
- identical tax level for all sectors of the economy
- tax level graded by the carbon content of types of fuel

A cost-effective tax ensures that the measures to reduce emissions will first be implemented where they are cheapest, regardless of sector and source. The green taxation commission also recommended that if tax levels were to be differentiated, they should be differentiated on the basis of carbon content, so that fuels with high carbon contents would be subject to higher tax rates than fuels with lower carbon contents.

Source: NOU 1996:9 Green Taxes – policies for a better environment and high employment

As shown by fact box 4.1, the commission behind the report recommended that carbon tax rates be differentiated by carbon content, but that they should be the same for all sectors of the economy. This would mean a change in design compared with the design at the time, with varying tax rates and a number of exemptions. Based on the recommendations of the report on green taxes, a proposal to extend the scope of the carbon tax to apply to all sectors, at a tax rate of NOK 100 per tonne was submitted in Proposition no. 54 to the Storting (1997–98) *on Green Taxes*. This proposal meant that the process industry, aviation and the fishing fleet would be compensated for the financial consequences that the introduction of a tax would have for these sectors.

Recommendation No 247 to the Storting (1997–98) shows that the Standing Committee on Finance and Economic Affairs found a green tax restructuring to be right, but the majority opposed the proposal to extent the scope of tax liability. The committee majority supported the proposal to impose a carbon tax of NOK 100 per tonne on aviation, freight transport, domestic shipping and the supply fleet, but was of the opinion that the industrial sectors that would become liable to taxation were exposed to competition and that increased costs for these sectors could lead to the activities being moved to countries with less environmentally friendly production processes and a risk of reduced employment as a result of reduced profitability.[95] The committee was also critical of the fact that it was proposed that some sectors be compensated for their expenses. The majority was of the opinion that such differentiation would result in an unpredictable and complex use of policy instruments, which would also not be cost-effective.[96] The recommendation proposed a tax decision to maintain the present carbon tax at the existing rates, including reduced rates for mineral oil for the wood processing, herring meal and fishmeal industries and for petrol, and several other exemptions for a number of industries and activities.

The environmental taxes have since been evaluated in the report of the Indirect Taxes Commission *(Særavgiftsutvalget)*.[97] The commission concluded that the long-term targets in Norwegian climate policy will require significant technological breakthroughs and changes in structural conditions relating to production and energy consumption. These challenges cannot be solved solely by means of environmental taxes. However, an optimum design for carbon tax will depend on the national climate objective, whether the state participates in international emissions trading, and whether the financial policy that the tax aims to achieve has other objectives.

4.3.2 How are the taxes on greenhouse gas emissions designed?

The carbon tax

According to the Ministry of Finance, the purpose of the carbon tax is to contribute to cost-effective reductions in carbon emissions. The carbon tax covers carbon emissions resulting from combustion from stationary sources such as oil-fired boilers and turbines on the continental shelf and from mobile sources such as car and airplane engines. The carbon tax on emissions from combustion of mineral oil applies to kerosene, diesel oil, gas oil, fuel oil, special distillates and heavy fuel oil. The tax is differentiated by type of energy and sector. From 1992, the tax also

94) NOU 1996:9 *Green Taxes –policies for a better environment and high employment.*

95) Recommendation No 247 to the Storting (1997–98).

96) NOU 1996:9 *Green Taxes – policies for a better environment and high employment.*

97) NOU 2007:8 En vurdering av særavgiftene *('An evaluation of special taxes').*

Table 4.1 Carbon tax by tax rates in nominal NOK/litre (natural gas in NOK/ Sm³)

Sector/year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Petrol	0.89	0.92	0.94	0.72	0.73	0.75	0.76	0.78	0.79	0.80	0.82
- Reduced rate	-	0.24	0.24	0.25	0.26	0.27	0.28	-	-	-	-
Petroleum activity	0.89	1.07	0.70	0.72	0.73	0.75	0.76	0.78	0.79	0.80	0.45
Mineral oil	0.44	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55
- Reduced rate	-	0.26	0.26	0.27	0.28	0.30	0.31	-	-	-	-
Wood processing, herring meal and fishmeal industry	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.26	0.27	0.27	0.28

Source: The Ministry of Finance's propositions on decisions relating to direct and indirect taxes and customs duties

covered combustion of coke and coal, but this was discontinued in 2003.[98]

Table 4.1 shows the differentiated tax rates in nominal NOK. Petrol has had the highest tax rate. The table also shows that the tax rate for petrol was adjusted downward from 2001 so that the level was equivalent to the offshore carbon tax. The background for making these rates identical was the financial principle of ensuring that emission reductions were made at the lowest possible cost.[99] Since the downward adjustment, the tax level has increased due to price adjustments. A conversion to 2009 kroner (as of October 2009) shows that the tax development adjusted for inflation is approximately flat for all the tax rates reproduced in the above table.

The tax rate for the petroleum sector has been consistently high, but there was a downwards adjustment from 2008, when other financial policy instruments were imposed on the sector as it was included in the emissions trading scheme.

Table 4.1 shows that the tax level for mineral oil, both the ordinary and the reduced rate, has been adjusted in the last ten years. The reduced rate for mineral oil was introduced in 1999[100] for the sectors domestic aviation, freight transport in domestic shipping and the supply fleet. Full taxes have applied to these sectors from 2005.[101] The table also shows that there is a tax rate that regulates emissions from the wood processing, herring meal and fishmeal industries. The tax rate corresponds to half carbon tax for mineral oil, and the table shows that the tax rate has been regulated through minor price adjustment increases.

In addition to the reduced rates, several activities are exempt from the tax. This applies to ships engaged in international traffic, fishing and hunting at sea (in near and distant waters) and airplanes in international traffic. In connection with the 2008 budget, an exemption from carbon tax was adopted for combustion of mineral products supplied for uses that result in emissions to which the duty to surrender allowances applies pursuant to the Greenhouse Gas Emission Trading Act.

Is the carbon tax a cost-effective and effective policy instrument?

In order to describe the costs of greenhouse gas emissions, the tax level is often expressed in NOK per tonne of CO_2, also called the carbon price. This enables the comparison of different taxes. In addition, the carbon price highlights which measure costs are within the framework of the tax (cf. chapter 6).

Figure 4.2 shows the carbon tax as a carbon price in NOK per tonne of CO_2 corresponding to the various tax rates (cf. table 4.1). The figure shows that the carbon tax level varies between NOK 80 and NOK 400 per tonne of CO_2 in nominal NOK (depending on the sector).

Figure 4.2 shows that during the period from 2001 to 2008, the carbon tax for petrol corresponded to NOK 300–350 per tonne of CO_2, corresponding to fixed prices of NOK 350–360 (2009 NOK). The carbon tax for offshore emissions has also been higher than for other sectors. The full tax rate for combustion of mineral oil has corresponded to a carbon price of NOK 100–150 less than the tax rate for petrol and offshore emissions. The lowest tax rate for CO_2 corresponds to about NOK 100 kroner per

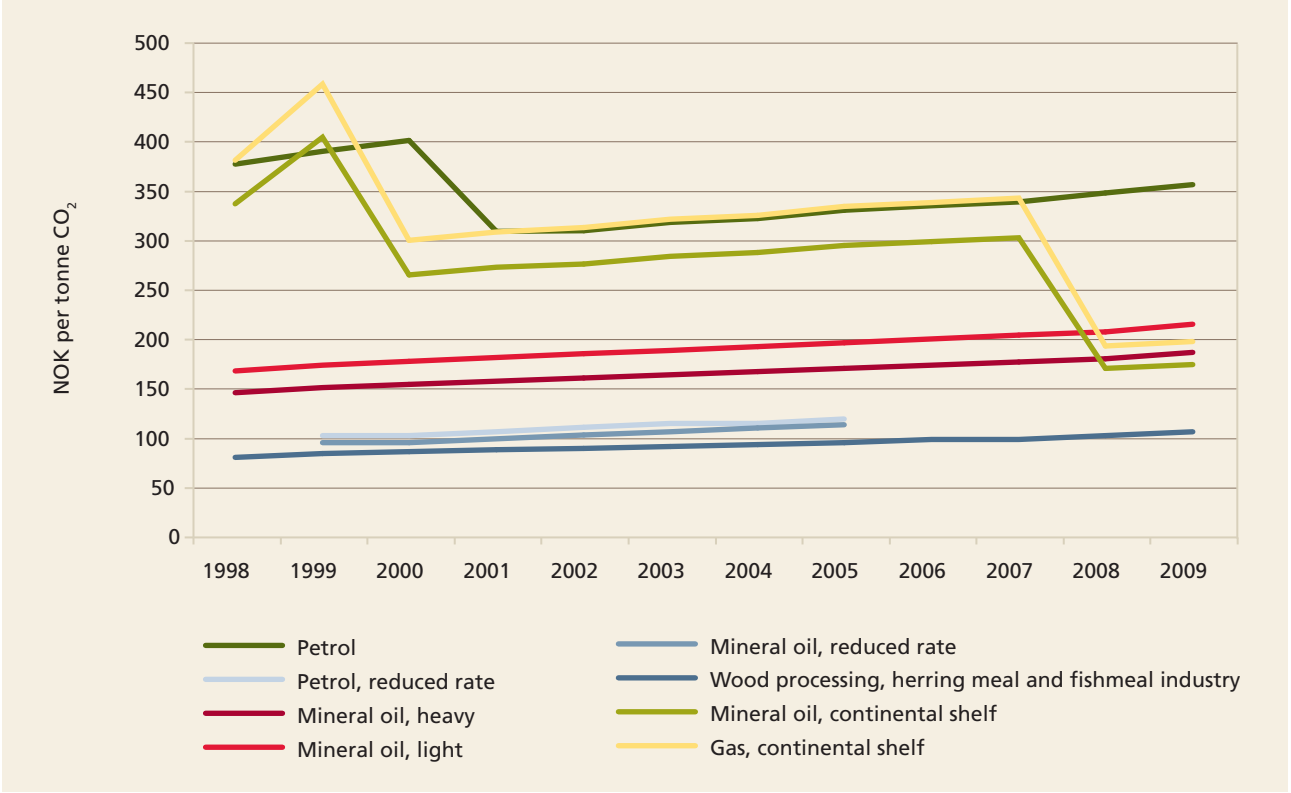
98) The exemptions covered 90 per cent of emissions from coke and coal, cf. Proposition No 1 to the Storting (2001–2002) *Skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties)* and Proposition No 1 to the Storting (2002–2003) *Skatte-, avgifts- og tollvedtak (Decisions relating to direct and indirect taxes and customs duties')*.

99) Proposition No 1 to the Storting (1999–2000).

100) Recommendation No 247 to the Storting (1997–98).

101) Budget Recommendation No 1 to the Storting (2005–2006).

Figure 4.2 Carbon tax for various fossil fuels and rates 1998–2009



Source: The Ministry of Finance's propositions on decisions relating to direct and indirect taxes and customs duties

tonne of CO_2 both in current and fixed NOK value, and the level has not changed much.

The high tax level for petrol will in principle provide stronger incentives for emission-reducing measures over time, but the high tax rate on petrol is part of a total taxation of fuel.[102] However, the underlying growth in the transport sector is so strong that the total taxation on fuel has only helped to limit it. The Ministry of the Environment stated in an interview that the carbon tax has not had any great effect in terms of reducing emissions from the transport sector. According to the Ministry, one of the reasons for this is that the tax makes up only a small proportion of fuel prices, and an even smaller proportion of the total costs of transport. The elasticity of this tax is low in the short and medium term, which means that great price changes would be required to have an impact on the driving pattern.

In the petroleum sector, the tax has given emissions costs that during the first years after the signing of the Kyoto Protocol made it profitable to trigger measures with costs of up to NOK 350 per tonne of CO_2 (corresponding to up to NOK 480 in 2009 NOK). Since the downward adjustment of the tax in 2000 the carbon price for the petroleum sector has been able to provide incentives to trigger measures with costs of about NOK 300 per tonne (corresponding to NOK 360 in 2009 NOK). The effect of the tax will be discussed in more detail in section 6.2.5.

For sectors with emissions from combustion of mineral oil and similar, the tax level has made it profitable to trigger measures between NOK 150 and NOK 250 in individual years. For sectors where the reduced rate apply, the tax level has not provided incentives to initiate measures with a cost of more than NOK 120 kroner per tonne of CO_2. Researchers have calculated that despite the fact that Norway has had a high carbon tax compared with other countries and seen in relation to the present allowance prices, the tax has only had a modest effect on greenhouse gas emissions outside the petroleum sector.[103] According to this study, the reason why the effect on domestic emissions is so low is that a number of industries have been exempt or given a reduced tax rate. The effect of the tax on domestic sources of emission has been calculated to be 1.5 per cent of the greenhouse gas emission reduction in the period 1990–1999.

102) The tax is described in more detail in section 6.7

103) A. Bruvoll and B.M. Larsen (2004): *Greenhouse gas emissions in Norway: Do carbon taxes work?* Energy Policy 32, 493–505.

Table 4.2 Tax on final processing of waste 1999–2009 (nominal NOK/tonne of waste)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Landfill*	300	306	314	320	327	400	409	416	423	434	447
Landfill**	-	-	-	-	427	522	533	542	552	566	583
Delivery for incineration***	75	77	79	80	82	-	-	-	-	-	-
	225	229	235	240	425	-	-	-	-	-	-
CO_2 emission from incineration	-	-	-	-	-	39,70	40,57	41,28	59	60,53	62,35

* High environmental standard ** Low environmental standard (differentiation introduced from 1 July 2003)[108] *** Divided by basic tax and additional charge

Source: Proposition No 1 to the Storting *The Ministry of Finance* 1998–2009

A working group headed by the Ministry of Finance has considered the carbon tax in connection with a report on car taxes.[104] It emerges from the report that carbon tax in its current form is not deemed to be cost-effective. According to the working group, this is due to differentiated tax rates with resulting different costs of measures for the players.

A peer review of Norwegian sustainable development policy carried out by experts from Sweden and Uganda also points to the carbon tax as a policy instrument that does not meet the cost-effectiveness criteria. The report emphasises that differentiated tax rates result in greatly varying prices per tonne of CO_2, and that this is not consistent with the principle that the tax is to trigger the cheapest measures.[105]

Tax on final processing of waste

Final processing of waste entails emission of the greenhouse gases methane and CO_2. The special tax was introduced from 1 January 1999[106] to contribute to increase sorting of waste at source and recycling. The tax differentiated between landfill, with a tax rate of NOK 300 per tonne of waste delivered, and delivery to incineration plants with a basic tax of NOK 75 per tonne and an additional charge of NOK 225 per tonne. The additional charge is reduced in proportion to the energy utilisation in connection with incineration.[107]

Table 4.2 shows how the level of the special tax has increased through price adjustments in connection with national budget processing in the period 1999–2008.[109] In 2004, the tax for waste delivered for incineration was changed to apply to emission of CO_2 per tonne of waste delivered.[110] In 2006, the tax basis was reviewed by the Norwegian Pollution Control Authority, and this resulted in an upward adjustment of the tax on carbon emissions from incineration that came into force on 1 January 2007.[111]

The Indirect Taxes Commission [112] deemed the tax rates for land filling to be very high, corresponding to a carbon price of NOK 850 per tonne of CO_2 equivalents, because the amount of methane emitted from landfills is significantly lower than the amount used as basis for the introduction of the tax. The commission pointed out that there is uncertainty relating to environmental costs for landfills.

It has been calculated that the tax on final processing of waste together with other policy instruments have contributed to an annual reduction in greenhouse gas emissions from the waste sector corresponding to 0.25 million tonnes of CO_2 equivalents in 2005 and 0.55 tonnes in 2010.[113] This makes up 18 and 41 per cent, respectively, of the level of emissions when the tax was introduced.

HFC and PFC taxes

Taxes on the greenhouse gases hydrofluorocarbons (HFC) and perfluorocarbons (PFC) were introduced in 2003 based on forecasts that emissions of these gases, which are used as cooling media

104) Report from an interministerial working group on car taxes submitted to the Ministry of Finance on 20 September 2007.
105) *A Peer Review of Norway's Policy for Sustainable Development.* 2007.
106) Pursuant to Act No 11 of 19 May 1933.
107) Exemptions from the tax were granted for certain types of final processing in the wood processing industry, and exemption from tax for energy plants in the processing industry that are based on waste fuel. Exemptions from the landfill charge are also granted for special waste and waste delivered to facilities for sorting, recycling and special storage. Cf. decision on charges on final processing of waste 2009, Proposition No 1 to the Storting (2008–2009).
108) Proposition No 1 to the Storting (2003–2004) *Skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties').*
109) Cf. Budget Recommendation No 1 *skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties)* for the years 1999–2009.
110) Cf. section 3, Budget Recommendation No 1 to the Storting (2003–2004) *om skatte-, avgifts- og tollvedtak for 2004 (' On decisions relating to direct and indirect taxes and customs duties for 2004').*
111) Cf. section 3 Decision on recommendation for final consideration, Budget Recommendation No 1 to the Storting (2006–2007).
112) NOU 2007:8 En vurdering av særavgiftene *('An evaluation of special taxes').*
113) Cf. table 9.1 and assessments carried out by the Ministry of the Environment and the Norwegian Pollution Control Authority.

in refrigeration and freezing systems, among other things, will increase in the period until 2020.[114] The tax was deemed to be a policy instrument that could contribute to the use of these gases being phased out. The tax level was set at NOK 180 per tonne, corresponding to the level of the carbon tax for mineral oil. The tax has been price adjusted since its introduction.

The tax on HFC and PFC has led to a 30 per cent reduction in emissions in 2005 compared with what was expected had the tax not been introduced (corresponding to 0.3 million tonnes of CO_2in 2005 and 0.5 million tonnes in 2010).[115] The tax has made it profitable for many players to switch to using alternative gases, implement measures to avoid leakages and, if relevant, use technology requiring smaller amounts of gas. The reimbursement scheme introduced in 2004 also provides an incentive to collect used gas and deliver it for safe destruction.[116]

4.4 To what extend does the emissions trading scheme contribute to target achievement?

The Kyoto Protocol provides for a possibility of meeting emissions commitments by purchasing credits under the Protocol's flexible implementation mechanisms, including emissions trading, se fact box 4.2.

Emissions trading has been facilitated through the creation of a national emissions trading scheme that covers defined activities and gases, and that are regulated by the Greenhouse Gas Emission Trading Act.[117] In this way, the government imposes climate commitments on Norwegian businesses through the emissions trading scheme. A national emissions trading scheme also ensures Norwegian businesses' right to start using the flexible mechanisms defined under the Protocol, provided that the system has been designed in line with the regulations under the Protocol.

The allocation principles are key elements in the design of an emissions trading scheme, and the most important terms are explained in fact box 4.3.

114) Proposition No 1 to the Storting (2002–2003) *Skatte-, avgifts- og tollvedtak (' Decisions relating to direct and indirect taxes and customs duties)* and Budget Recommendation No 1 to the Storting (2002–2003).
115) NOU 2007:8 En vurdering av særavgiftene *('An evaluation of special taxes').*
116) Letter of 7 December 2009 from the Ministry of the Environment.
117) Act No 99 of 17 December 2004: Act *Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances*.

Fact box 4.2 The flexible mechanisms

One unit carbon credit, or emission allowance, is a right to emit one tonne of CO_2 equivalents. The allowances are transferrable and therefore have value in a market, and emissions trading thereby provide financial incentives for countries or companies to reduce their own emissions. The Kyoto Protocol can be seen as an agreement where the countries have a duty to surrender allowances, and where Norway through its emission commitment has been allocated an emission allowance for the period 2008–2012 (the commitment period). The emission commitment can be fulfilled by reducing national emission in combination with use of the so-called Kyoto mechanisms. In this way, the Kyoto mechanisms are to make it possible to achieve a cost-effective reduction of global greenhouse gas emissions.

The Kyoto mechanisms consist of:

- International trading in allocated emissions allowances (Assigned Amount Unit, AAU) between countries with a duty to surrender allowances pursuant to the Kyoto Protocol
- The Clean Development Mechanism (CDM), which covers project collaboration between countries with a duty to surrender allowances and developing countries. Approved credits from the Clean Development Mechanism are tradable (transferrable to other countries) and are designated CERs (Certified Emission Reductions).
- Joint Implementation (JI) between countries with a duty to surrender allowances pursuant to the Kyoto Protocol. Approved credits from a Joint Implementation project can be traded (transferred to other countries) and are designated ERUs (Emission Reduction Units).

CDM and JI are often referred to using the collective term 'the project-based mechanisms'.

Sources: Report No 29 to the Storting (1997–98) Norges oppfølging av Kyoto-protokollen ('Norwegian follow-up of the Kyoto Protocol'), Report No 34 to the Storting (2006–2007) Norwegian Climate Policy and Report No 2 to the Storting (2006–2007) Revised National Budget 2007

Fact box 4.3 Principles of allocation of allowances

Allocation of allowances through sale means that the state sells allowances at market price and that this form of allocation creates revenue for the state. This is in line with the polluter pays principle and ensures that the greenhouse gas emission-related costs in connection with establishing new enterprises are taken into consideration.

Allocation of allowances free of charge means that the state allocates a specific number of allowances to enterprises with a duty to surrender allowances for free. The grounds for this form of allocation include consideration for the enterprises' competitiveness. Rules for allocation free of charge must be created unless all allowances are to be sold. The total of free and sold allowances must be below the total allowance quantity, which is set through political decisions. The allocation regulations and total allowance quantity are key elements in an allocation plan.

Allowances free of charge can for example be based on an enterprise's historical allowances, forecasts or benchmarks (in relation to emissions in other enterprises, technological possibilities or other criteria). In case of allocation of allowances free of charge, it must also be decided whether an new entrants' allowance reserve should be set aside to provide an opportunity to allocate new allowances free of charge to new enterprises established.

Source: NOU 2000:1 A quota system for greenhouse gases, Norwegian National Allocation Plan for the emissions trading system in 2008–2012 and a letter from the Ministry of the Environment of 7 December 2009

4.4.1 Work on the emissions trading scheme 2005–2007 (phase 1)

In 2001, Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy* (the Emissions Trading Report) was submitted, with a recommendation to the Storting to establish a national emissions trading scheme from 2008. According to the report, the proposed emissions trading scheme would ensure that Norway could meet its emission commitments pursuant to the Kyoto Protocol in the period 2008–2012. It was made provisional on the Kyoto Protocol coming into force. The plan was for the emissions trading scheme to be as broad-ranging as possible, and to cover about 80 per cent of the total Norwegian greenhouse gas emissions. Moreover, the plan was that, as a rule, allowances were to be sold. In order to limit the risk of carbon leakages (i.e. emissions increasing in countries not covered by the emissions trading scheme) and to avoid major reorganization costs, it was proposed that free allowances be allocated to enterprises particularly exposed to competition for a while and that there be no limitation on the use of the project-based mechanisms. The plan was to submit a proposition on regulations shortly after the Storting had considered the report.

After the change of government in 2002, an amendment to the Emissions Trading Report was submitted, Report No 15 to the Storting (2001–2002). This amendment proposed the introduction of a national emissions trading scheme as early as in 2005, but the proposed system was less exhaustive than the system proposed in the Emissions Trading Report. According to the amendment, the main goal in establishing an early emissions trading scheme was to trigger further cost-effective measures in Norway. The proposal meant that the emissions trading scheme would cover emissions of CO_2 and other greenhouse gases from enterprises that do not pay carbon tax on the main part of their emissions. The proposed system was to cover 27 per cent of greenhouse gas emissions. The plan was that allowances be allocated free of charge for the period 2005–2007. The emissions trading scheme was to take as its starting point a reduction of greenhouse gas emissions of 20 per cent compared with 1990 emissions from the enterprises in question. From 2008, the goal was to create a broad system that was to cover as many sources of emissions as practically possible, making the emissions trading scheme the primary policy instrument under the Kyoto Protocol.

A proposal for national emissions trading scheme legislation was submitted in Proposition No 13 to the Odelsting (2004–2005) *Om lov om kvoteplikt og handel med kvoter for utslipp av klimagasser* (klimakvoteloven) ('*On the Act Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances'(The Greenhouse Gas Emission Trading Act)*). This proposition proposed some changes, first and foremost in order to adapt the national emissions trading scheme to the Emissions Trading Directive (directive 2003/87/EC). Consideration for the competitiveness of Norwegian industry indicated that the design of the Norwegian emissions trading scheme should be closely based on the EU emissions trading scheme, both in terms of the scope of sources and gases and other elements. This meant, among other things, a significantly smaller scope than indicated in the amendment to the Emissions Trading Report, since the EU Directive only applied to CO_2 from major single point sources.

Photo: Kerstin Mertens / Samfoto

4.4.2 Connection to the EU emissions trading scheme

In parallel with the development of the Norwegian emissions trading scheme, the EU was developing an emissions trading scheme (the EU emissions trading scheme). The amendment report pointed out that the emissions trading scheme proposed by the EU commission was not in line with Norwegian needs, particularly not in relation to the Kyoto Protocol. Norway, being a hydropower nation and a major producer and exporter of energy, faces other challenges than most EU countries. The report therefore concluded that it was not expedient to await the design of an EU emissions trading regime, and it was instead planned to submit a proposal for a separate Norwegian emissions trading scheme for the period 2005–2007. The report also state that if, in a long-term perspective, Norway was forced to adapt its emissions trading scheme to an EU Directive, this could be done following negotiations about the various elements of the emissions trading scheme.

The Emissions Trading Directive's relationship to the EEA Agreement was assessed by the Ministry of Foreign Affairs in consultation with the Ministry of the Environment in February 2003. The preliminary conclusion was that based on its material content, the Directive was deemed to fall under the EEA Agreement, and thereby to be relevant for incorporation.[118] In accordance with standard procedure, the matter of incorporation of the Directive was postponed until after the Directive had been adopted.[119] The EU adopted the Emissions Trading Directive on 13 October 2003.[120] The Ministry of the Environment stated in an interview that they considered the clarification of the EEA relevance of the Directive to be in part a political process, not a purely legal matter. No external reports were made about the EEA relevance.

The draft of the *Greenhouse Gas Emission Trading Act* that was submitted to the Storting in November 2004, did not provide for incorporation of the Emissions Trading Directive into the EEA Agreement, but for affiliation with the EU emissions trading scheme through article 25 of the

118) Minutes from a meeting in the EEA Special Committee on the Environment. An interministerial committee chaired by the Ministry of the Environment that assesses and follows up EEA-relevant proposals in the environment field.
119) Letter of 7 December 2009 from the Ministry of the Environment.
120) Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

Emissions Trading Directive.[121] This provision provides for the opportunity for the EU to enter into agreements with third countries for mutual recognition of allowances. The purpose was to ensure that Norwegian enterprises would be able to buy and sell allowances in a market large enough to be financially well-functioning, and that they would face the same allowance prices as their European competitors. This has been confirmed during an interview with the Ministry of the Environment.

When the *Greenhouse Gas Emission Trading Act* was adopted in 2004, the intention was to link the Norwegian emissions trading scheme to the EU emissions trading scheme as soon as possible to ensure that Norwegian enterprises would be able to participate in emission allowance trading with European enterprises. The Ministry of the Environment states that in their opinion, the European Commission's position regarding Norway's form of affiliation with the European allowance market developed over time[122]. When informally sounded out in summer 2004, the commission expressed a positive attitude to mutual recognition of allowances under the Norwegian and EU emissions trading schemes respectively pursuant to article 25 of the Emissions Trading Directive. When the government presented the draft for the *Greenhouse Gas Emission Trading Act* on 5 November 2004, it envisaged such a form of affiliation with the European emissions trading scheme. A letter from Environment Commissioner Wallstrøm of 19 November 2004 opened for this solution for the period 2005–2007, but also expressed a preference for the Emissions Trading Directive to be incorporated into the EEA Agreement, preferably from 2008. The Ministry of the Environment also stated that when the formal sounding out started in 2005, the Commission was clear about their view that the directive had to be incorporated into the EEA Agreement.

The Ministry of the Environment stated in an interview that the European Commission argued that this is a regulation of enterprises in the internal market, and that enterprises in the same market should be regulated in the same way. Norway objected that the EEA Agreement should not be an obstacle to meeting commitments under other agreements. The background for this was, according to the Ministry of the Environment, a perception that the EU emissions trading scheme is not designed in a cost-effective manner. Norway would be freer to maintain a broader emissions trading scheme if the directive was not incorporated into the EEA Agreement. Norway would also have more control of the allocation rules for allowances (sale vs. allocation free of charge) and a higher degree of flexibility in terms of ways in which the enterprises with a duty to surrender allowances use the Kyoto mechanisms.

In March 2006, Norway accepted the incorporation of the directive into the EEA Agreement on certain conditions and with certain adaptations. Iceland and Liechtenstein were still reluctant to incorporate the directive, and for the next six months work continued on solutions to meet these countries' requirements. On 26 October 2007, the EEA Joint Committee decided that the directive was to be incorporated into the EEA Agreement with adaptations. This happened four years after the directive was adopted by the EU at a political level. The Ministry of the Environment states that the incorporation process has followed standard procedures. The Storting supported the commitment to the Emissions Trading Directive through its processing of Proposition No 26 to the Storting (2007–2008).[123] According to the Ministry of the Environment, it was too late to become attached to the EU emissions trading scheme's phase 1 (2005–2007) at the time when the decision to incorporate the directive into the EEA Agreement was reached.

4.4.3 What were the results of the emissions trading scheme 2005–2007 (phase 1)?

The Greenhouse Gas Emissions Trading Act that was adopted in 2005, specifies that the emissions trading scheme for the period 2005–2007 was to cover CO_2 emissions not subject to carbon tax, and that would have had a duty to surrender allowances under the EU Emissions Trading Directive, cf. Proposition No 13 to the Odelsting (2004–2005) *Om lov om kvoteplikt og handel med kvoter for utslipp av klimagasser (klimakvoteloven) ('On the Act Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances' (The Greenhouse Gas Emission Trading Act)*). That meant energy plants not subject to carbon tax, including

121) Proposition No 13 to the Odelsting (2004–2005).
122) Letter of 7 December 2009 from the Ministry of the Environment.
123) Om samtykke til godkjennelse av EØS-komiteens beslutning nr. 146/2007 av 26. oktober 2007 om innlemmelse i EØS-avtalen av direktiv 2003/87/EF av 13. oktober 2003 om en ordning for handel med kvoter for klimagassutslipp (kvotedirektivet), samt tilhørende rettsakter *(On consent to approval of the EEA Joint Committee's decision No 146/2007 of 26 October 2007 to incorporate into the EEA Agreement Directive 2003/87/EF of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community (the Emissions Trading Directive), and pertaining acts*).

the industries landing of oil and gas, gas refining and petrochemical industry, gas-fired power plants, oil refineries, coking plants, iron and steel manufacturers and manufacturers of cement, lime, glass, fibreglass and ceramic products. The Ministry of the Environment states that part of the purpose of the act was to test the emissions trading scheme as a policy instrument.[124]

According to the Greenhouse Gas Emission Trading Act, the main rule for allocation of allowances free of charge was to be historical emissions in the period 1998–2001. The enterprises covered by the system were allocated allowances corresponding to 95 per cent of their historical emissions free of charge. If emission have been or are with a reasonable degree of certainty expected to be significantly reduced or increased as a result of *material changes* in the nature or scope of the activities since 2001, then Section 8 c of the Act provided for importance to be attached to this during allocation. This opened up for the possibility for allocation based on prognoses.

Results

Greenhouse gas emissions from those subject to a duty to surrender allowances totalled nearly 18 million tonnes over a three-year period (11 per cent of total emissions during the period). According to the Norwegian Pollution Control Authority, this was 7 per cent (1.4 million tonnes) less than the emissions allowances allocated to the enterprises. The Norwegian Pollution Control Authority states that the reason why the emissions were lower than the maximum limit was partly that some enterprises reduced their emissions strongly, while other delayed start-up of activities (including the gas-fired power plant at Kårstø) or planned increases in production.

According to the Norwegian Pollution Control Authority's allocation decision, as many as 45 out of 51 enterprises were allocated allowances based on the enterprises' own forecasts. The Norwegian Pollution Control Authority stated in an interview that most enterprises submitted forecasts that exceeded the actual emissions. This is one of the reasons for the high number of allowances allocated during the period. The Norwegian Pollution Control Authority states that the reason why so many exemptions were made from the Act's main rule of allocation based on historical emissions was that the transition from using oil and gas was deemed to be a material change, and many enterprises presented plans for such transitions.

124) Letter of 7 December 2009 from the Ministry of the Environment.

Another important forecast-based allocation criterion was changes in production capacity. Many enterprises have also had problems obtaining gas as assumed on allocation of emissions allowances and have therefore used fuel oil, which is not subject to a duty to surrender allowances, instead. The Ministry of the Environment states that a number of allocation decisions were changed because the enterprises did not carry out their plans as stated in their applications for allowances.[125] These reversals of decisions reduced the number of allowances on the market in relation to the allocation decisions.

The Norwegian Pollution Control Authority's emission allowance register shows that few transactions (transfers of allowances between entities with emission allowance register accounts) took place in the Norwegian emissions trading scheme for the period 2005–2007 (7 in 2006, 9 in 2007 and 16 in 2008).[126] Total transfers for the three-year period amounted to less than two per cent of the allocated allowances, and most of the transaction took place in connection with the final settlement in 2008.[127] In addition, four enterprises used allowances from the EU emissions trading scheme to settle their duty to surrender allowances.[128] No enterprises used credits from the Clean Development Mechanism and Joint Implementation to settle their duty to surrender allowances.

The price of allowances for the period 2005–2007 is shown in figure 4.3. The figure shows the price of allowances in the EU emissions trading scheme (EUA) and for CDM credits (CER).[129] The figure shows that the price of allowances was as high as EUR 30 per tonne in early 2006. The price dropped to half this level during 2006, and it fell further at the end of 2006 and approached 0 during long periods of 2007. The figure also shows that the price of allowances from UN approved projects at

125) Letter of 7 December 2009 from the Ministry of the Environment.

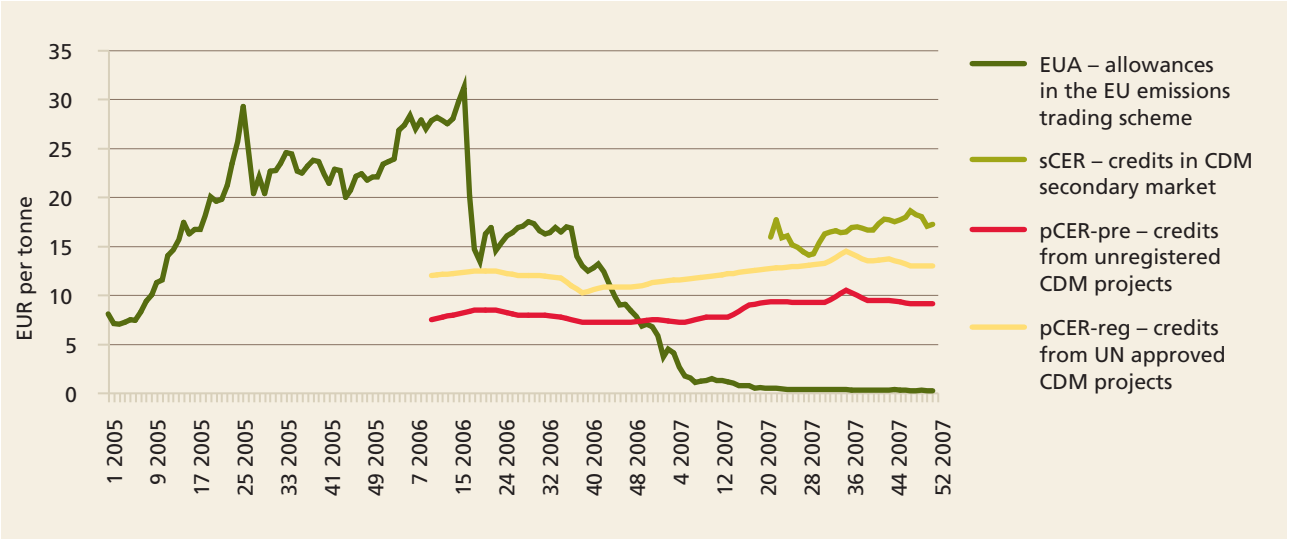
126) Letter of 18 December 2008 from the Norwegian Pollution Control Authority. The transactions were registered in the following year.

127) 19.2 million tonnes, cf. 'Kvotepliktig CO_2-utslipp godkjent' *('CO_2 emissions subject to duty to surrender allowances approved')*, article from the Norwegian Pollution Control Authority published on 8 April 2008.

128) The Greenhouse Gas Emission Trading Act with pertaining regulations provided for unilateral recognition of EU allowances. This means that Norwegian entities with a duty to surrender allowances could use allowances from the EU emissions trading system to settle their obligation. The EU, on the other hand, did not allow corresponding usage. According to the regulations, approval of EU allowances required documentatoin that the allowances were deleted from a national emission allowance register in the EU.

129) The figure shows the price of allowances in the EU emissions trading system. Prices in the Norwegian emissions trading system are unknown. Given that the enterprises had a certain possibility of trading in the EU emissions trading system, the price in the Norwegian emissions trading system was probably not higher than in the European system.

Figure 4.3 Prices of allowances in the EU emissions trading scheme (EUA) and for allowances from the Clean Development Mechanism (CER) for the period 2005–2007 (the allowance price is shown per week of each year)



Source: Point Carbon

an early stage (pCER-reg) was approx. EUR 5 more than for allowances from unregistered projects (pCER-pre).

The price of allowances (EUA) dropped dramatically and reached zero in the emissions trading market primarily due to the fact that too many allowances were allocated.[130] The countries proved to have lower emissions than anticipated. Once this became known, the emissions allowances were worthless. The right to transfer allowances between trading periods might have prevented such a marked drop in the price of allowances as in 2007. The Ministry of the Environment stated in an interview that the high price of allowances in 2005 probably made some of the enterprises implement measures. In the Norwegian Pollution Control Authority's assessment, the result for the first allowance period 2005–2007 was a cut in emissions of 5 per cent. This means a reduction of 0.3 million tonnes of CO_2 equivalents. The Norwegian Pollution Control Authority stated in an interview that the environmental effect in the early stage of the system has been limited because there have been too many allowances in the system, and this eventually resulted in too low prices. There has, however, been an effect with certain enterprises.

According to the Ministry of the Environment, the Norwegian emissions trading scheme has probably not been sufficiently extensive for the market for transferable allowances to function adequately.[131] During this period, the emissions trading scheme was not connected with the EU emissions trading scheme. Norwegian enterprises could use EU allowances to settle their own duty to surrender allowances, but they could not transfer Norwegian allowances to European countries. Interviews with representatives of business and industry and of the authorities have shown that the pre-2008 emissions trading scheme has had an important learning effect and contributed to the system being technically functional.

4.4.4 Work on the emissions trading scheme 2008–2012 (phase 2)

From 2008, there was a need for changes in the scope and allocation principles from the design in phase 1, among other things in order to further adapt the Norwegian allowance system to the EU emissions trading scheme. Phase 2 of the emissions trading scheme therefore required legislative amendment. Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* ('*On the Act relating to changes in the Greenhouse Gas Emission Trading Act etc.*') was considered by the Storting in June 2007. As described above, it had not been clarified at the time when the proposition was sent to the Storting whether Norway would have to become attached to the EU Emissions Trading Directive, but this clarification was in place before the Storting considered the proposal for legislative amendment. The Emissions Trading Directive requires each member state to submit a National Allocation

130) Letter of 7 December 2009 from the Ministry of Finance.

131) Letter of 13 June 2007 from the Ministry of the Environment to the Storting.

Plan.[132] This plan states the total emissions allowances for industry and the number of allowances to be allocated to each of the enterprises with a duty to surrender allowances, and the allocation criteria. The plan must also stipulate the size of the allowance reserve, if any, and a cap for the use of the project-based mechanisms. The allocation plan provides a description of the provisions both of the Greenhouse Gas Emission Trading Act and the Greenhouse Gas Emission Trading Regulations.[133] When incorporation of the Emissions Trading Directive into the EEA Agreement was considered by the Storting's Standing Committee on Energy and the Environment on 13 December 2007, it was emphasised in the recommendation that 'submitting the regulations with a national allocation plan for Norwegian enterprises is a matter of urgency'.[134]

The Ministry of the Environment stated in an interview that during the work on Proposition No 66 to the Storting (2006–2007), the potential implementation of the Emissions Trading Directive was taken into account. The framework for the total allowances was stipulated by the government prior to the EEA Joint Committee's decision of 26 October 2007, and the decision referred to this fact. According to the Ministry of the Environment, both the political goal of having the most ambitious system in Europe and the projections were important background information. It emerges in a memo from the Ministry of the Environment to ESA dated 30 May 2008 that the allocation plan has to a certain extent taken the technological potential for emission cuts into consideration, but that it is difficult to obtain reliable and useful information about the technological potential.[135]

4.4.5 ESA's processing of the allocation plan

ESA (the EFTA Surveillance Authority) was to approve the Norwegian allocation plan under the EEA Agreement, and approval of the plan was a precondition for linking the Norwegian and the EU emissions trading scheme. The allocation plan is to give ESA a basis for determining whether the Norwegian allocation system complies with the regulations of the EEA Agreement, including the EU Emissions Trading Directive.[136]

132) Proposition No 26 to the Storting (2007–2008) *the Ministry of Foreign Affairs*.
133) Regulations relating to *Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances* (Greenhouse Gas Emission Trading Regulations)Regulations No 1851 of 23 December 2004.
134) Recommendation No 107 to the Storting (2007–2008).
135) Response from the Norwegian government on the EFTA Surveillance Authority's request for additional information on the Norwegian National Allocation Plan for greenhouse gas allowances in the 2008–2012 trading period.
136) Letter of 21 December 2007 from the Ministry of the Environment.

The Norwegian allocation plan was submitted to ESA for approval in March 2008 following a public consultation round for the revised Greenhouse Gas Emission Trading Regulations and the draft allocation plan. A key element in the allocation plan prepared in 2007 was that the allowance reserve of 9 million tonnes in the period 2008–2012 was reserved for high-efficiency combined heat and power plants and gas-fired power plants based on cleaning. This meant that any other new entrants established in Norway would not be allocated allowances free of charge. The revised Greenhouse Gas Emission Trading Act adopted in 2007 based the allocation of free allowances on the entity with to a duty to surrender allowances' average emissions in the period 1998–2001. As a consequence, enterprises established after this period had no right to be allocated allowances free of charge. Proposition No 66 to the Storting (2006–2007) referred to the importance of new enterprises taking costs relating to greenhouse gas emissions into account in their investment decisions.

In autumn 2007, the Confederation of Norwegian Business and Industry (NHO) and the enterprise NorFraKalk filed a complaint with the EFTA Surveillance Authority (ESA) about the discrimination between existing and new industry in the allocation of free allowances.[137] They claimed that the Norwegian Greenhouse Gas Emission Trading Act was in violation of the EEA Agreement (provisions on state aid (article 61) and the ban on imposing restrictions on the freedom of establishment (article 31)).

In July 2008, it became clear that ESA did not approve the following three elements of the Norwegian allocation plan:[138]

1 The definition of new entrants in the revised Greenhouse Gas Emission Trading Act adopted in 2007 deviated from the definition in the Emissions Trading Directive. This meant that enterprises that were considered existing enterprises under the EU Emissions Trading Directive were considered new entrants in Norway. According to the wording of the Emissions Trading Directive, all enterprises who have been issued a complete allowance permit before the formal notification of the allocation plan was given (March 2008), were to be considered existing enterprises.

137) Letter of 25 October 2007 from the Confederation of Norwegian Business and Industry to EFTA
138) Decision of the EFTA Surveillance Authority ESA of 16 July 2008.

Fact box 4.4 The British National Audit Office's review of the EU emissions trading scheme

The British National Audit Office carried out a performance audit of the emissions trading schemes of the EU and UK in 2009. They found that only four member states exceeded their allocated allowances for the period 2005–2007 (Italy, Spain, Slovenia and the UK). The European Commission has set a more stringent allowance cap for phase 2 (2008–2012). However, the National Audit Office points out that the use of project-based mechanisms may weaken the impact of a stricter cap. If all entities with a duty to surrender allowances make full use of the flexible mechanisms, phase II will not entail an absolute reduction in total EU emissions compared to phase I, but will result in an increase in emissions of 7 per cent compared with 2005.

The UK wants to auction seven per cent of the phase II allowances. Germany is the only member state planning to auction more allowances. Few countries auctioned allowances in phase I, although the directive permitted the auctioning of up to 5 per cent. The allocation of allowances is based on enterprises' projections stipulated before 2009. The National Audit Office concluded that the state of the economy has changed significantly since the allocation plan was completed, and a reduced level of production will help to reduce the demand for allowances. Phase II of the emissions trading scheme will therefore not necessarily result in emission reductions in the UK. However, the opportunity to carry allowances forward to 2013 will prevent the allowance price from collapsing like it did in 2007.

The National Audit Office concludes that it is difficult to assess the effect of the EU emissions trading scheme, and that neither the allowance cap nor actual emissions in relation to the cap can be used as indicators because it may be that the allowances allocated exceed the need. They still conclude that there are effects that cannot be quantified, including increased awareness of emission reduction in industry and a carbon price as a policy instrument to achieve this. The allowance scheme under phase I was not very effective due to over-allocation, and overall emissions were below the cap. The current allowance prices (March 2009) are lower than expected for phase II and considerable below the required incentives to make major investments in low-carbon technology.

The report also states that it is the National Audit Office's opinion that phase III from 2013 will entail considerable improvements, particularly because member states will no longer be preparing their own allocation plans as the directive provides for a more centralised process to determine the allowance cap. The directive also provides for a larger portion of allowances to be auctioned.

Source: Briefing for the Environmental Audit Committee – European Union Emissions Trading Scheme: A review by the National Audit Office

2 The Norwegian Greenhouse Gas Emission Trading Act would allocate allowances free of charge to existing onshore installations based on their emissions during the period 1998–2001. ESA concluded that this would result in improper discrimination in that it favours installations established before 2002.
3 The Emissions Trading Directive read in conjunction with the regulations on government aid does not provide for the establishment of a selective allowance reserve that favours power plants 'that are to be based on cleaning'.

The Ministry of Finance refers to the fact that Norway was in a process of negotiation on adjustments to the directive, and that therefore adaptation to all definitions of the directive was in principle negotiable. This particularly applied to concrete deadlines.[139] Norway chose not to appeal ESA's decision. This meant that the revised Greenhouse Gas Emission Trading Act had to be changed in accordance with the remarks. The revised act was submitted to the Storting in December 2008.[140] The Storting adopted the revised act on 3 February 2009, and towards the end of February 2009 it became known that ESA accepted the revised Norwegian allocation plan.[141]

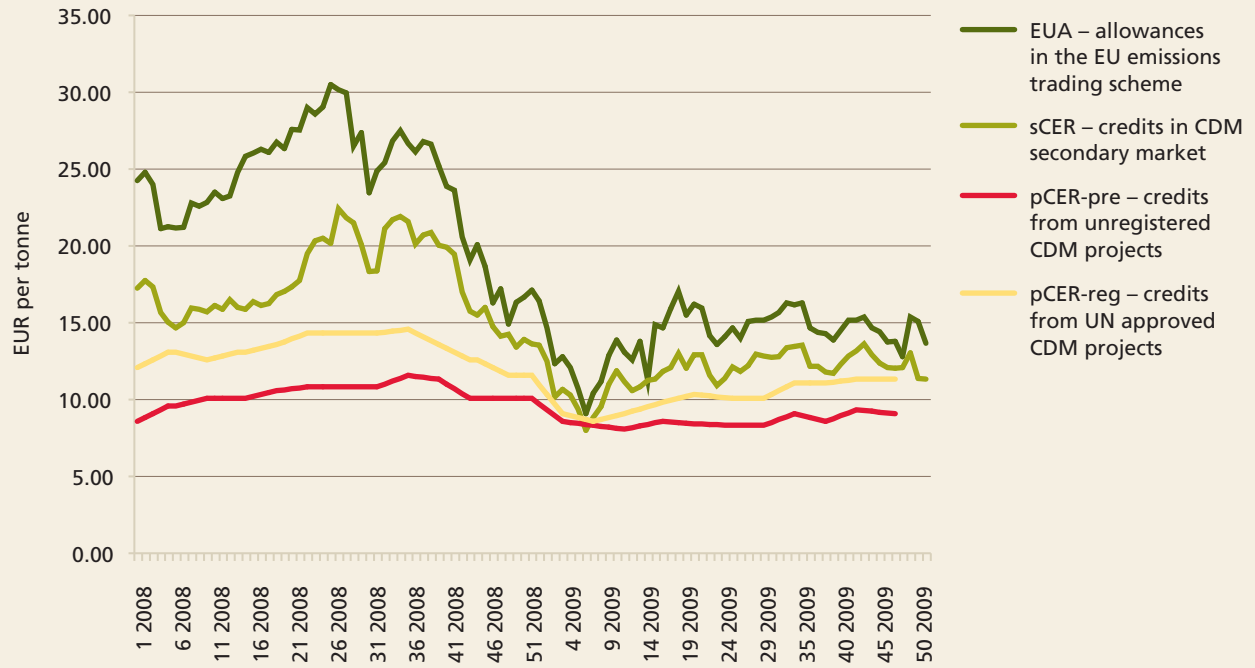
4.4.6 What is the expected result of the emissions trading scheme 2008–2012 (phase 2)?

The emissions trading scheme for the period 2008–2012 has been extended compared with the first period (2005–2007) in line with the EU Emissions Trading Directive. The scheme covered approx. 36 per cent of Norwegian greenhouse gas emissions in 2008.[142] It also included activities that were previously regulated through the carbon tax (including petroleum activities, to which a reduced rate still applies, and energy plants of more than

139) Letter of 7 December 2009 from the Ministry of Finance.

140) Proposition No 19 to the Odelsting (2008–2009) *Om lov om endringer i klimakvoteloven m.m.* ('*On the act relating to changes in the Greenhouse Gas Emission Trading Act* ').
141) Letter of 27 February 2009 from the Ministry of the Environment.
142) Press release from the Norwegian Pollution Control Authority on 11 May 2009.

Figure 4.4 Prices of allowances in the EU emissions trading scheme (EUA) and for credits from the Clean Development Mechanism (CER) for the period 2008-2009 (the allowance price is shown per week of each year)



Source: Point Carbon

20 MW). In winter 2009, ESA approved the Norwegian inclusion of nitrous oxide from the production of mineral fertiliser (nitric acid) under this system (with effect from 1 July 2008).

The directive does not provide for much sale of allowances allocated up to and including 2012. At least 90 per cent of allowances will be allocated free of charge during the period 2008–2012. The Ministry of the Environment stated in an interview that EEA/EFTA countries have been exempt from this provision of the EEA Joint Committee's decision and can therefore decide for themselves whether they wish to sell a larger proportion of the total allowances. The plan is to allocate fewer free allowances than any EU country, and Norway will sell just under half of the allowances. ESA accepted as part of the Norwegian allocation plan that no free allowances will be allocated in the petroleum sector.

In the EU, the use of emission units from the Clean Development Mechanism and Joint Implementation in the emissions trading scheme from 2008 is permitted up to a certain percentage of the allocation for each enterprise with a duty to surrender allowances. Norwegian enterprises have a different quantitative limitation on use of the project-based mechanisms than that stipulated in the Emissions Trading Directive.[143] This Norwegian rule is warranted by an adaptation in the EEA Joint Committee decision. The Ministry of the Environment states that the background for this adaptation was that it was desirable from a Norwegian point of view for all Norwegian enterprises – including those that are not allocated allowances free of charge – to be guaranteed the opportunity to use credits from the project-based mechanisms. This adaptation is particularly important to petroleum activities and any other activities that will not be allocated allowances free of charge.[144] There are certain qualitative limitations relating to project types on the right of those subject to a duty to surrender allowances to use emission units from the Clean Development Mechanism and Joint Implementation, see chapter 5.

The emissions trading scheme's effect on national greenhouse gas emissions

The Ministry of Finance states in an interview that they have not made any assessments regarding whether individual activities subject to a duty to

143) Under the EU system, the enterprise can surrender allowances from the project-based Kyoto mechanisms corresponding to one per cent of the allocation free of charge. The adaptation granted to the EFTA states mean that this right can be calculated as one per cent of allowances surrendered.

144) Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* ('*On the Act relating to changes in the Greenhouse Gas Emission Trading Act etc.* ').

Fact box 4.5 Allocation prices for long-term climate goals

In the Climate Settlement, the Storting has given its support for a strategic target of helping to prevent the global average temperature from increasing by more than 2°C. This is set out in the Ministry of the Environment's strategic goals for this area.[145] The UN Intergovernmental Panel on Climate Change has calculated that a stabilisation of the global average temperature at that level will require a reduction in global CO_2 emissions of 50–85 per cent of 2000 levels,[146] and for global emissions to peak by 2015. This target is thus highly ambitious according to the Climate Report. According to Report No 9 to the Storting (2008-2009) Long-term Perspectives for the Norwegian Economy, such a target means that the global price of emission allowances will rise to nearly NOK 400 in 2020 and just under NOK 800 kroner in 2030. The pertaining restructuring costs have been estimated to increase to two per cent of the world's GDP. These figures depend on all countries participating in a global climate agreement and implement emission reductions in a cost-effective manner.

The agency group Climate Cure 2020 has pointed out that great uncertainty is attached to allowance prices in 2020.[147] The group expects a price of EUR 40 per tonne of CO_2 equivalents, with EUR 20 as a low-cost possibility and EUR 60 as an high-cost one.

surrender allowances will contribute to emission reductions through the system either by cutting emissions or by buying allowances for the period 2008–2012.

The Ministry of the Environment states in an interview that it has not been considered expedient to carry out analyses of how the allowance scheme for 2008–2012 will contribute to national emission reductions. However, there is no reason to think that a change from tax to allowances will make a great difference in terms of incentives for offshore emission cuts. The Ministry of the Environment wrote in a letter to the Storting that there is a potential for reduction of emissions from those with a duty to surrender allowances, particularly in relation to energy efficiency and switching to biofuel, but that the implementation of the measures will depend on the price of allowances and of the various energy carriers.[148] According to the Ministry of the Environment, the duty to surrender allowances for nitrous oxide is expected to contribute emission reduction in the sector in the range of 0.5–1 million tonnes of CO_2 equivalents per year.

Figure 4.4 shows the allowance prices in 2008 and 2009. The figure shows that there have been great fluctuations in the price of allowances under the European emissions trading scheme. Since Norway is linked to the European emissions trading scheme, these are also the allowance prices that Norwegian enterprises face. The price of allowances has been stable at about EUR 15 per tonne during most of 2009 (corresponding to about NOK 135 per tonne). At the very end of 2009, the price of allowances dropped to approx. EUR 13 Euro per tonne (NOK 110 per tonne). The carbon tax level for mineral oil, for comparison, is about NOK 200 (full rate) and about NOK 100 (reduced rate) per tonne, see figure 4.2.

During 2009, the price of certified CERs (CDM credits in the secondary market) approached the price of allowances under the EU emissions trading scheme. This means that the price dropped from the 2008 level, just as for EUA prices. The price of CERs from projects at an early stage has been about EUR 9 per tonne.

4.4.7 Consequences of the long time it had taken to put a connection to the EU emissions trading scheme into place

The Norwegian emissions trading scheme became fully integrated with the EU emissions trading scheme on 27 May 2009 through ESA's approval of the allocation to individual enterprises. This was in time for the 2008 allowance settlement (which was carried out in late April 2009). As of February 2009, only Norway, Poland, Belgium, Cyprus and Hungary had not had their allocation plans approved for participation in the EU allocation system, which is a condition for enterprises being able to fully participate in emissions trading with enterprises in other countries.

It has emerged from interviews with ministries and industry associations that differing views exist on what the consequences has been of the time it has taken to put affiliation with the EU emissions trading scheme into place. The Ministry of Trade and Industry stated that the

145) Proposition No 1 to the Storting (2008–2009) *The Ministry of the Environment.*

146) IPCC (2007): *Summary for Policymakers.* In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

147) *Vurdering av framtidige kvotepriser ('Assessment of future prices of emissions allowances').* Norwegian Pollution Control Authority, report TA-2545/2009.

148) Letter of 13 June 2007 from the Ministry of the Environment to the Storting.

delays have had negative socio-economic effects. The longer the delay in the work on the emissions trading scheme in relation to the EU, the greater the competitive disadvantages, and the delay can also have consequences to enterprises' orientation (new technology or purchase of allowances). The Ministry of Trade and Industry also stated that unclear framework conditions can also mean that Norwegian enterprises are unable to participate in technological development on an equal footing with foreign enterprises.

The Confederation of Norwegian Enterprise and the Federation of Norwegian Industries states in interviews that for some enterprises, this delay could have great consequences in that it leaves them very little time to adapt to the system. Enterprises that are to implement climate measures have much less time to prepare than their competitors within the EU. There has also been great uncertainty relating to future expenses, as the question of form of allocation has been unclarified. The Confederation of Norwegian Business and Industry wrote in a letter to the Ministry of the Environment dated 7 November 2008 that the delay makes it more expensive and more demanding to meet Norway's climate commitments under the Kyoto Protocol, and that it hits the enterprises that has primary responsibility for meeting these commitments by purchasing emission allowances.

The Ministry of Finance stated in an interview that it does not consider the delay in implementation to be a real delay of a major or serious nature. The Ministry of the Environment stated that the delay will not necessarily have any major consequences, since there is a liquid market for allowances. The enterprises have had the opportunity to participate in this market and secure allowances to fulfil their duty to surrender allowances. However, the delay has contributed to uncertainty relating to the allocation of free allowances.

4.4.8 The design of the EU emissions trading scheme 2013–2020 (phase 3)

The Emission Trading Directive (phase 3) was formally adopted in April 2009.[149] The Ministry of the Environment stated in an interview that Norway's affiliation with the directive has not been clarified. It will be a matter for negotiation if Norway wants to design the Norwegian Greenhouse Gas Emission Trading Act in another way that within the framework of the directive. The changes to the Emissions Trading Directive mean that from 2013, the European emissions trading scheme will be extended to include CO_2 from petrochemical industry, ammonia and aluminium, and PFC from aluminium, among other things. The emissions trading scheme will also cover carbon capture and storage and aviation. Article 24 of the Directive still provides for the opportunity for member states to include more sectors/installations. Based on the experience that too many allowances were allocated under the EU emissions trading scheme in the period 2005–2007, the European Commission has concluded that the environmental effect has been limited[150] (see also fact box 4.4). The amount of allowances is gradually reduced, and allocation of allowances through sale will increase significantly. The revised Emissions Trading Directive involves a longer trading period (eight years).

The EU Commission has also concluded that experience indicates that improved harmonisation within the EU emissions trading scheme is required in order to ensure that the EU achieves its emission targets at the lowest possible cost and with the least possible differences between enterprises in terms of competitive situation.[151] The revised directive therefore entails reduced flexibility for national adaptation. From 2013, the allowance amount will be stipulated for the EU, and the allowances will be allocated in accordance with harmonised regulations.

Opportunities for use of the Clean Development Mechanism (and Joint Implementation) are expanded. However, further limitation on the use of credits from specific types of projects may be considered. The grounds given by the European Commission for this is that it will guarantee the environmental and financial integrity of future project types.[152] A global climate agreement may open for the possibility of increased use of the mechanism or approval of credits from more types of projects.

149) Directive of the European Parliament and of the council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the community. COM(2008) 16 final. 2008/0013 (COD).

150) Questions and Answers on the revised EU Emissions Trading System – MEMO/08/796 (17/12/08).

151) Questions and Answers on the revised EU Emissions Trading System – MEMO/08/796 (17/12/08).

152) Questions and Answers on the revised EU Emissions Trading System – MEMO/08/796 (17/12/08).

4.5 To what extend does the application of the Pollution Control Act contribute to target achievement?

The Act relating to Protection against Pollution and relating to Waste was adopted in 1981, and come into force in 1983.[153] The purpose of the Act is to regulate all polluting emissions from activities, and the act covers emission to air, water and ground etc. The Act also regulates waste.

The Norwegian Pollution Control Authority processes applications for emission permits for polluting activities, and its decisions can be appealed to the Ministry of the Environment. Enterprises with activities that involve CO_2 emission or other emissions which impacts the environment must apply to the Norwegian Pollution Control for emission permits. Through the emission permit, the Norwegian Pollution Control Authority can regulate emission levels, ensure introduction of technology solutions based on best available technique (BAT) and set other requirements that are necessary to prevent pollution. The county governors process emission permit applications for polluting activities in areas where this authority has been expressly delegated to the county governors, i.e. for many landfills. In these cases, decisions can be appealed to the Norwegian Pollution Control Authority.

4.5.1 The best available technique principle

The Pollution Control Act gives the pollution control authorities general authorisation to stipulate more detailed conditions in permits granted pursuant to the Pollution Control Act. This is to prevent pollution from causing damage or inconvenience and to promote efficient energy utilisation. The Pollution Regulations and Waste Regulations contain some provisions that impose a duty on the pollution control authorities to use their authority to set conditions in a certain way. The principle of best available technique (BAT) is particularly important, and has been made a guideline for discretionary judgment when the pollution control authorities set conditions for permits to activities covered by the IPPC Directive (Integrated Prevention and Pollution Control). The principle speaks to which standard of technology the polluter should be required to apply.

This principle has been clearly formulated in the Pollution Regulations chapter 36, in which the IPPC Directive is implemented. Following the implementation of the directive, one has started using the expression 'best available techniques', abbreviated BAT.[154] The guidelines in Appendix II elaborate on the meaning of the term, but provide no concrete instruction on what technology should be utilised. According to the guidelines, the authorities should use the EU's guideline BAT reference documents (BREFs) to determine whether a specific technique can be considered BAT.[155] The reference documents have been drawn up for the various industries, but contain no direct instructions and should be considered guidelines. The authorities must then assess whether each plant's technical solutions meet the BAT requirements.[156] New plants must be operated in accordance with the directive's requirements from the time when the activity is put into operation, pursuant to article 4 of the directive.

4.5.2 Implementation of the IPPC Directive

Council Directive 96/61/EC of 24 September 1996 *concerning integrated pollution prevention and control* (the IPPC Directive) has been incorporated into the EEA Agreement. The purpose of the IPPC Directive is to establish a common framework for integrated processing of emissions to air, water and ground, and waste and noise. This was largely in accordance with the existing Pollution Control Act. The goal was to establish a joint practice for the member states.[157] The Directive applies to industry enterprises and waste handling plants.

In connection with the incorporation of the directive, section 16 of the Pollution Control Act was amended to guarantee the possibility of setting conditions relating to energy utilisation, regardless of whether energy utilisation has a bearing on the quantity of emissions.[158] This amendment was intended to express the requirement for efficient energy utilisation more explicitly in accordance with the principle of energy efficiency in article 3d) of the IPPC Directive.

According to Proposition No 59 to the Storting (1998–99), making energy utilisation require-

153) Act No 6 of 13 March 1981: *Act relating to Protection against Pollution and relating to Waste* (the Pollution Control Act).

154) Further guidelines for what is meant by best available technique are provided in the Pollution Regulations chapter 36, appendix II.

155) Cf. Regulations No 931 of 1 June 2004 relating to Pollution Control (the Pollution Regulations) chapter 36 Appendix II ''The "BAT Reference Documents' drawn up in accordance with article 16.2 of Directive 1996/61/EC (the IPPC directive) shall be used as an aid for determining the best available techniques in each emission permit'.

156) 'BAT-prinsippet og BREF-enes status' ('The status of the BAT principle and the BREFs'), presentation, Norwegian Pollution Control Authority.

157) Proposition No 47 to the Storting (1997–98).

158) Proposition No 59 to the Odelsting (1998–99).

ments is only relevant in relation to activities that are already subject to licensing requirements due to their pollution potential. Polluting plants that are in themselves energy plants must also hold a licence under the Energy Act, which applies alongside the Pollution Control Act.

In the proposition, the Ministry of the Environment emphasised that the most relevant option was to make energy utilisation demands in connection with so-called production-related emissions. The main rule is that the energy utilisation evaluation should be based on application of the BAT principle. The Ministry of the Environment pointed out that the authorities must here consider what this means in individual cases. The administrative authorities wanted authorisation in the Pollution Control Act section 2 for taking the overall environmental assessment into account, as well as taking costs relating to measures into consideration. As regards the regulation of greenhouse gases through the IPPC Directive, that would have to be 'seen in conjunction with the establishment of the future emissions trading scheme'.

4.5.3 The relationship to the Greenhouse Gas Emission Trading Act

The Pollution Control Act was further amended in connection with decisions relating to the Greenhouse Gas Emission Trading Act in autumn 2004. The relationship between the two acts has been considered in Proposition No 13 to the Storting (2004–2005). The introduction of the Greenhouse Gas Emission Trading Act involved amendments to the Pollution Control Act section 11 second paragraph and section 18 second paragraph relating to special emission permits and altering of permits.

This change meant that the Norwegian Pollution Control Authority's authority to set maximum emission limit values for emissions subject to a duty to surrender allowances in connection with granting of emission permits was abolished. However, activities subject to a duty to surrender allowances nonetheless have a duty to apply for permission to emit CO_2 and other greenhouse gases pursuant to the Pollution Control Act.[159] It was explained in the proposition that the authorities still had the opportunity to make requirements relating to technology selection and energy efficiency in the emission permits.

159) Proposition No 13 to the Odelsting (2004–2005).

4.5.4 Application of the Pollution Control Act

In 1997, it was confirmed that the Pollution Control Act could be applied to CO_2 emissions.[160] Following this clarification of the application of the act, it was formulated that use of the Pollution Control Act was particularly relevant in cases where there is no basis for regulation of emissions by means of taxes. In the Kyoto report[161] it was stated that pursuant to the Act, one could make requirements relating to emission sources that were not regulated by means of taxes, or to sources that were regulated by taxes, but where taxes triggered measures with costs lower than the highest carbon tax rate. The report pointed out that use of the Pollution Control Act would be an effective policy instrument, but that it does not necessarily ensure cost-effectiveness. In the same report, the Ministry of the Environment estimated that such application of the Act could help to reduce emissions by an amount corresponding to 2–3 million tonnes. In its processing of the report, the majority of the Standing Committee on Energy and the Environment was of the opinion that these cuts could be carried out by means of an emissions trading scheme when such a scheme as put into place, and that double regulation should be avoided.[162] Later, in the 2001 Emissions Trading Report, the option of using the Pollution Control Act was accepted to a greater degree. The purpose was to be able to rationalise the use of policy instruments by 2008, when the emissions trading scheme would regulate emission sources that were not regulated by means of taxes at the time.[163] According to the report, the authorities intended to follow up the IPPC Directive by setting requirements relating to the use of BAT and energy utilisation.

The Ministry of the Environment stated in an interview that direct regulation authorised by the Pollution Control Act has not been deemed to be a suitable primary policy instrument for regulation of greenhouse gas emissions, but that it may be expedient in certain sectors and for certain types of emissions and to make technology requirements. For the main portion of the emissions, general policy instruments such as the emissions trading scheme and taxes are considered more cost-effective, and the emissions trading scheme more effective. According to the Ministry of the Environment, regulation of CO_2 emissions is

160) Statement of Minister of Petroleum and Energy, Ranveig Frøiland, Question Time in the Storting, 4 June 1997.
161) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*
162) Recommendation No 233 to the Storting (1997–98).
163) Letter of 7 December 2009 from the Ministry of the Environment.

often a matter of the continued existence of the enterprise. The Ministry also stated that the climate policy reports provide the most important signals on application of the act. The Ministry of the Environment refers to the fact that the Storting, in its processing of Report No 34 to the Storting (2006–2007), has provided for the use of more than one policy instrument for each source of emissions.[164]

The Norwegian Pollution Control Authority stated in an interview that conditions that involve actual requirements for reduction of greenhouse gas emissions have only to a limited degree been set in the permits.

Regulation of emission levels

In the waste sector, the Pollution Control Act has been used as authorisation to make requirements for collection of landfill gases in emission permits. A regulatory ban on landfilling of wet organic waste is also authorised by the Pollution Control Act. From 1 July 2009, the ban was expanded to cover other biodegradable waste as well.

The Norwegian Pollution Control Authority stated in an interview that the practice has been that any emission limits set for CO_2 emissions have reflected the wishes of the enterprises, and have not involved an actual regulation. Before the introduction of the emissions trading scheme, the Norwegian Pollution Control Authority could set limit values for greenhouse gas emission from activities. The Norwegian Pollution Control Authority does, however, point out that there is no doubt that the Pollution Control Act authorises the setting of limit values for greenhouse gases not covered by the duty to surrender allowances.

The Norwegian Pollution Control Authority has pointed out that there are also a few examples of conditions in permits pursuant to the Pollution Control Act really helping to reduce greenhouse gas emissions. Among other things, it was emphasised that methane emissions from the Kårstø plant are regulated. In the petroleum sector, emissions of volatile hydrocarbons (NMVOC) from offshore loading are regulated. Moreover, nitrous oxide from Yara has also actually been regulated through the Act, but this has probably had less of an impact on reductions. The Norwegian Pollution Control Authority has also made requirements relating to the environmental toxin PAH from the aluminium industry, and this has indirectly resulted in significant reductions in greenhouse gas emissions.

The use of technology based on BAT

The BAT principle does not give precise directions about which cleaning requirements should be made. When the authorities evaluate whether the BAT principle has been met, they make their assessments based on the plant's technical solutions in relation to the guidelines derived from the IPPC Directive. Energy efficiency requirements can be made based on the IPPC Directive's requirement for the use of BAT standards in order to avoid polluting emissions.[165] That means making requirements that ensure that a plant is operated in such a way that the energy is utilised efficiently. The IPPC Directive does not specify what is meant by efficient energy utilisation.

The Norwegian Pollution Control Authority determines what is deemed to be BAT in connection with individual applications for emission permits. The Norwegian Pollution Control Authority stated in an interview that they evaluate whether existing technology and techniques meet BAT standard. According to the Norwegian Pollution Control Authority, not much importance has been attached to greenhouse gases in the assessment of what constitutes BAT for individual enterprises. The effects mostly include other parameters than greenhouse gases, for example environmental toxins and NOx. When it comes to climate-related matters, the Norwegian Pollution Control Authority focuses on energy management. Energy management is that part of the activity's tasks which contribute actively to efficient energy utilisation. There is no national standard in this field, but it is recommended that the environmental standard ISO 14001 be used as a starting point.[166] A duty to report ensures that the Norwegian Pollution Control Authority can monitor whether the requirements are complied with.

Technology requirements

Making technology requirements means that the emission permit is granted on the condition that technology that will reduce emissions significantly will be used. The requirements do not specify a technological solution, but it may specify the degree of purification achievable. The Ministry of the Environment is authorised to make technology requirements in connection with processing of applications for emission permit for emissions

164) Letter of 7 December 2009 from the Ministry of the Environment.

165) Proposition No 13 to the Odelsting (2004–2005).

166) Veiledning for energiledelse *('Energy Management Guidelines')*. The Norwegian Oil Industry Association (OLF), 2006.

subject to a duty to surrender allowances. As far as emissions subject to a duty to surrender allowances are concerned, the Norwegian Pollution Control Authority only has authority to set conditions relating to estimation, measurement and reporting of emissions.

Proposition No 13 to the Storting (2004–2005) states that the use of technology requirements to limit CO_2 emissions is only seen as practically relevant to new gas-fired power plants. The Norwegian Pollution Control Authority has received a letter from the Ministry of the Environment in which the authority is asked to submit a recommendation to the Ministry in cases concerning emission applications from new gas-fired power plants. The Norwegian Pollution Control Authority stated in an interview that on one occasion, the Authority has on its own initiative indicated that it might be relevant to look into carbon capture and storage for industrial facilities in connection with an emission permit. The Ministry of the Environment confirmed in an interview that in practice, technology requirements will only be made for gas-fired power plants, and referred to Proposition No 13 to the Storting (2004–2005). The Ministry did, however, specify that requirements for carbon capture and storage can be included in emission permits pursuant to the Pollution Control Act, also for other sources than for gas-fired power plants.[167]

Whether an emission permit with conditions should be granted is normally a political matter, according to the Ministry of the Environment. The Ministry has made requirements for carbon capture and storage in some emission permits for emissions of CO_2 from gas-fired power plants subject to a duty to surrender allowances, see section 7.2.

The Ministry of the Environment states that requirements for supplementary conditions have no real bearing on total emissions under the emissions trading scheme. If Norwegian authorities impose carbon capture and storage on plants that fall under the allocation system, this will in principle not cause emission reductions in the relevant allocation period, since the total amount of allowances will remain unchanged.

4.5.5 Regulation of emissions from the continental shelf

Emissions on the continental shelf are also regulated by means of emission permits. The IPPC Directive also applies to offshore energy plants (existing and new facilities with a total rated thermal input exceeding 50 MW), and follow-up of the Directive involves setting new requirements for emissions to air from offshore energy plants.[168] Both the environment and the pollution control authorities can stipulate requirements for technological solutions in their case processing and make independent assessments.

The Norwegian Pollution Control Authority stated in an interview that it considers what can be deemed to constitute BAT when it stipulates conditions for emission permits pursuant to the Pollution Control Act. The Norwegian Pollution Control Authority states that environmental considerations are part of the background to the petroleum authorities' development decisions, and that therefore there is a certain amount of double work going on. It is the Ministry of Petroleum and Energy and the Petroleum Directorate that follows up that BAT assessments are part of the development planning phase through the so-called PDO process, see section 6.2. The process also entails specialist assessments not covered by the guidelines in the BREF documents.

The application for an emission permit is only submitted after the plan for development and operation (PDO) has been approved by the Ministry of Petroleum and Energy. The choice of concept is decided at a stage of the process where the Norwegian Pollution Control Authority has no formal role, and the authority has stated in an interview that it therefore often experiences that it becomes involved in the process at a late stage. Recently, the environmental authorities have indicated that the Pollution Control Authority must be involved at earlier stage, among other things through the guidelines to the Activity Regulations section 55 relating to emissions to air. There, it is underlined that conditions stipulated in an emission permit to limit emissions to air are connected with the choice of development solution, and that it is therefore important that the Norwegian Pollution Control Authority be informed of the operators' BAT assessments at an early stage. It also emerges in the guidelines that in order to make it possible to involve the environmental authorities at an earlier stage, the BAT assessments should be included in the impact assessment and in the application for an emission permit.

167) E-mail of 19 August 2009.

168) Cf. Guidelines to Regulations relating to conduct of activities in the petroleum activities, Petroleum Safety Authority website. Read on 10 January 2010.

The Norwegian Pollution Control Authority stated in an interview that it has not been formalised that an application for an emission permit must be submitted after the PDO has been processed, but that in practice, this has been the case. This is because a complete application for an emission permit cannot be submitted until the concept choice has been decided. According to the Norwegian Pollution Control Authority, the two authorities can judge matters differently, and in such situations it is perceived to be a disadvantage that the Norwegian Pollution Control Authority becomes involved in the process at a late stage, after the investment decision has been made.

4.6 Evaluations

Effectiveness and cost-effectiveness are two key criteria in the design of policy instruments in environmental policy like in other areas. Effectiveness means that a measure should lead to the goals being achieved with the highest degree of certainty possible. Cost-effectiveness means that the policy instruments trigger measures that result in the greatest possible reduction of emissions resulting from the resources invested.[169]

4.6.1 The tax has had limited effect on emissions outside the petroleum sector

Carbon tax is the primary Norwegian policy instrument for the reduction of greenhouse gas emissions for activities not covered by the emissions trading scheme.[170] The effectiveness of a tax depends on it being sufficiently high and accurate to trigger the required adaptations in businesses and households. The investigation shows that the introduction of taxes on final processing of waste and HFC/PFC is expected to help to reduce greenhouse gas emissions by about 0.55 and 0.5 million tonnes of CO_2 equivalents, respectively, in 2010. This corresponds to a total of just under two per cent of the expected total greenhouse gas emissions in 2010.

The current tax system is differentiated by sector and does not provide the same financial incentives to trigger measures within all sectors. The cost-effectiveness principle means that emission cuts should be made in the sector where they will be cheapest, and that the cheapest measures will be triggered first. A consequence of the current carbon tax scheme is that it does not necessarily lead to cost-effective solutions across sectors.

The carbon tax level has not increased much since 1998, in line with the Storting's tax decisions. The carbon tax has triggered a number of emission-reducing measures in the petroleum sector over time. The evaluation of the effect of the tax on domestic sources of emission is based on one single older research study. This study concluded that the effect has been relatively small. This is a result of, among other things, the fact that the carbon tax is differentiated by means of different tax rates and exemptions.

4.6.2 Work on the emissions trading scheme has taken time

The emissions trading scheme is one of the most important policy instruments for Norway in meeting its emission commitments under the Kyoto Protocol.[171] The investigation shows that the work to link the system with the EU emissions trading scheme took a long time. Proposition No 66 to the Odelsting (2006–2007) planned for the emissions trading scheme to be connected with the EU's emissions trading scheme from 1 January 2008. The final adoption of the allocation plan for the emissions trading scheme from 2008 as well as the affiliation with the EU emissions trading scheme did not take place until February 2009. The investigation shows that three factors in particular has resulted in it taking time to get an allocation plan for the period 2008–2012 into place:

- There has been a lack of clarity on the form of connection
- Drawing up the allocation plan took a long time
- ESA was of the opinion that the plan was incompatible with the Directive on three points

The investigation shows that Norway wanted to be affiliated with the European emissions trading scheme in the EU through a bilateral agreement rather than by incorporating the Emissions Trading Directive into the EEA Agreement. According to the Ministry of the Environment, the European Commission's position on this matter developed over time. When informally sounded out in summer 2004, the commission (Environment Directorate-General) expressed a positive attitude to mutual recognition of the Norwegian and EU emissions trading scheme respectively pursuant to article 25 of the Emissions Trading Directive. When the formal sounding out started in 2005, the Commission was clear about their view that the directive had to be incorporated into the EEA Agreement. The differing views of Norway and the EU led to negotiations, and the

169) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
170) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
171) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*

result was that it was not until 2007 that a final decision was made to incorporate the directive into the EEA Agreement.

ESA's objections to the Norwegian allocation plan meant that the Storting had to reconsider the revised Greenhouse Gas Emission Trading Act. It is difficult to see how Norwegian authorities could justify an expectation for the ESA to approve a diverging definition of 'new entrants', as the term is based on a definition set out in the directive. The consequence is that Norwegian enterprises have lived with uncertainty relating to the allocation for a longer time than most of their European competitors.

4.6.3 Limited effect of emissions trading scheme

The investigation shows that the emissions trading scheme before 2008 had only a limited effect in terms of reducing greenhouse gas emissions. However, the system has had an important learning effect both in terms of the technical design and the consequences of allocation principles.

From 2008, allowances have replaced taxes for certain sectors, and the petroleum sector is now regulated by means of both allowances and taxes. Relatively speaking, Norway has allocated fewer allowances free of charge to the enterprises participating in the emissions trading scheme than other countries within the European emissions trading scheme. Norwegian authorities have not evaluated the extent to which the emissions trading scheme for the period 2008–2012 will help to reduce national emissions. Allowance prices were about 40 per cent lower than the carbon tax on mineral oil for large parts of 2009. An allowance price lower than the previous tax provides weaker incentives for national emission reductions for most sectors. For some sectors, however, the tax was lower than the present allowance price.

4.6.4 The Pollution Control Act has only to a limited extent been applied to greenhouse gas emissions

Pursuant to the Pollution Control Act, the authorities can set conditions when processing emission permits in three different ways:

- They can set limits for the level of emissions
- They can ensure compliance of use of best available techniques to ensure low emission levels and efficient energy utilisation
- They can make requirements relating to technology

The Pollution Control Act has been considered a effective policy instrument, but application of the Act may go against the cost-effectiveness principle. Using the Pollution Control Act is primarily a relevant option for emissions that are not regulated by means of other policy instruments. Pursuant to the Storting's premises of avoiding double regulation, the environmental authorities have not been able to apply the Pollution Control Act in areas where other policy instruments were used. The consideration of Report No 34 to the Storting (2006–2007) has provided for the use of more than one policy instrument for each source of emissions.

The Pollution Control Act has been applied to methane from waste, and the use of this policy instrument has had documented effect in the waste sector, contributing to a 30-per cent reduction in methane emissions from landfills since 1990. The Pollution Control Act has only to a small extent been applied to other greenhouse gases and sectors. Although the Act authorises setting conditions in the emission permit, this has only to a small extent been carried out in the areas where the possibility exists. As regards technology requirements, the Ministry of the Environment has made requirements relating to carbon capture and storage for gas power, but other than that, few such requirements are made. For the offshore petroleum sector, requirements under the Pollution Control Act are not made of the developer to any significant extent. The environmental authorities become involved in the process after the investment decisions have been made, which limits their opportunity to influence the choice of emission-reducing development solutions. The overall effect of application of the Pollution Control Act in terms of reducing green-house gas emissions has not been significant.

5 To what extent does work on the project-based mechanisms contribute to achieving climate policy targets?

The purchase of credits from the project-based mechanisms Joint Implementation (JI) and the Clean Development Mechanism (CDM) is one of the key policy instruments employed to ensure that Norway achieves its climate policy targets. This chapter describes the work on development of projects and purchase of credits through the Clean Development Mechanism and Joint Implementation, and the results of this work.

5.1 What are the project-based mechanisms?

The project-based Kyoto mechanisms allow for the use of certified reductions from emission-reducing projects in third countries to meet own emission targets. They are based on the principle that it does not matter where the greenhouse gas emissions occur, and that emission-reducing measures can be implemented where they give the greatest reduction per NOK invested. When the EU's Linking Directive[172] was adopted in 2005, it also became possible for the enterprises participating in the EU emissions trading scheme to use credits from the project-based mechanisms to meet their allowance commitments under the EU emissions trading scheme.

CDM received a particularly warm welcome from developing countries, which had high hopes that the mechanism would contribute to sustainable development, including investments, technology and reduction of poverty.[173] JI, like CDM, is a project-based mechanism, but the projects are carried out in countries with quantified commitments under the Protocol.

172) Directive 2004/101/EC links CDM and EU ETS, allowing CDM credits to be imported into the European emissions trading system. Individual countries regulate the extent of these imports in their national allocation plans.

173) Econ Pöyry (2009) *CDM – Styrker og svakheter ('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.

5.2 What role did the Norwegian authorities play in relation to project development and allowance purchase before 2007?

5.2.1 Norwegian pilot programme for joint implementation of climate measures

The first trial projects for Activities Implemented Jointly (AIJs) were established in 1993 as a result of a Norwegian initiative. The Norwegian authorities had thus already gained experience in project cooperation with other countries when Norway signed the Kyoto Protocol in 1998.[174] During the pilot phase, a concrete bilateral project collaboration with other countries was developed with countries on all the relevant continents and in different sectors. Multilateral work was also carried out through collaboration with the World Bank. The Ministry of the Environment stated in an interview that the rationale for participation in the pilot phase was Norway's desire to gain an understanding of how this type of mechanism might function, and that there were no financial motives behind Norway's participation. The Ministry of Foreign Affairs stated in an interview that the Clean Development Mechanism has been a priority area for Norway as a method of competence-building in developing countries. An interministerial committee chaired by the Ministry of Foreign Affairs coordinated work on the Norwegian pilot programme.

Business and industry as a driving force in project development

Until 1998, Norwegian AIJ projects were mainly funded through the national budget, but after this the aim was for the private sector to play a more central role.[175] According to Report No 54 to the Storting (2000–2001), business and industry in the industrialised countries were expected to be the driving force in the identification and funding of projects, but the authorities would be able to facilitate project collaboration to some extent through bilateral agreements with other countries.

The Ministry of the Environment stated in an interview that the Ministry had informed interested enterprises of the opportunity for

174) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*.

175) Report No 15 to the Storting (2001–2002) *Amendment to Report No 54 to the Storting (2000–2001) Norwegian Climate Policy.*

Fact box 5.1 Work on the project-based mechanisms in other countries

The Netherlands

The Dutch government was the first to earmark public funds for the purchase of credits as early as in 2000. The purpose of the programme has not been to build capacity in developing countries, but to purchase credits at a reasonable price. Through this early involvement, the Dutch have indirectly helped to develop the mechanism and build capacity.

The Ministry of Housing, Spatial Planning and the Environment (VROM) is responsible for the overall Dutch climate strategy and the purchase of CDM credits. The Ministry of Economic Affairs is responsible for the purchase of ERUs from JI projects. VROM uses various intermediaries in its selection of projects and purchases. VROM purchases credits via five different channels: public tenders, multilateral and regional financial institutes, private banks, bilateral contracts with other governments or government institutions, and participation in carbon funds.

Denmark

The Danish state's JI and CDM strategy shall

- contribute to meeting Denmark's targets for reduced greenhouse gas emissions by purchasing certified emission reductions
- promote technology transfer to and sustainable development in Eastern Europe and developing countries
- promote integration of Danish companies into the CDM market
- expand the CDM market through improvement of institutions and capacity-building in developing countries

This strategy combines direct (bilateral) and indirect programmes (carbon funds) with systematic capacity-building, active project development and a targeted effort to involve the private sector. The authorities are to give priority to projects that contribute to the transfer of Danish technology and know-how (for example wind power). They are also to assist Danish companies that wish to develop projects to fulfil their emission commitments by assisting in the exchange of experience and contacts and providing guidance.

The Danish Ministry of Foreign Affairs was formerly responsible for the state's purchases of CDM credits from developing countries, while the Danish Ministry of the Environment was responsible for the purchase of JI credits in Eastern Europe. In 2007, a separate ministry for climate and the environment was established, under which 'Danish Carbon' now has responsibility for both CDM and JI.

Sweden

In the period from 1998 to 2000, the Swedish Energy Agency was responsible for pilot projects under Activities Implemented Jointly (AIJ). Since 2002, the Swedish Energy Agency has worked to initiate and support projects through its own climate investment programme, the Swedish International Climate Investment Programme (SICLIP). The purpose of SICLIP is to contribute to international cooperation on the development of CDM and JI as instruments for sustainable development and technology transfer, and also to gain experience. The experience from this programme and the Swedish Energy Agency's project participation is used to provide assistance to enterprises that are interested in investing in CDM and JI projects.

The Swedish Energy Agency invests in small and medium-sized projects. Five projects were selected for further development following a tender round in 2002. So far, purchase agreements have been entered into with four of these projects. Sweden has also purchased credits from a number of CDM projects in China in recent years. The Swedish Energy Agency is also involved in four JI projects in Eastern Europe, and has investments in various carbon funds.

Austria

Kommunalkredit Public Consulting (KPC) has been appointed to manage the CDM/JI programme on behalf of the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The programme involves

- purchase of credits from JI or CDM projects and investments in funds and facilities
- measures required to register projects, for example studies of emissions baseline scenarios

By January 2009, KPC had signed contracts for 49 CDM projects and 15 JI projects, as well as with four carbon funds. These projects are expected to generate credits corresponding to over 41 million tonnes of CO_2.

Source: Econ Pöyry

participation and of the system itself. The Ministry of Foreign Affairs pointed out that few enterprises had an actual incentive to purchase allowances, since the design of the emissions trading scheme and subsequently its allocation plan had remained unclear for a long time.

Capacity-building in potential project host countries and investments in funds

The authorities' role relating to the development of CDM projects after the pilot phase has been to encourage developing countries to participate in CDM projects. The method employed here has been to contribute to institutional and other capacities in the developing countries to allow them to make better and more expedient use of the project participation.[176] This work has primarily been organised via the Ministry of the Environment and the Ministry of Foreign Affairs. The Ministry of Foreign Affairs stated in an interview that the Ministry is engaged in capacity-building through multilateral bodies such as the Global Environment Facility (GEF) and the World Bank, as well as through the foreign service missions. The Ministry of the Environment states that Norway has also contributed financially to the development of the UN certification system and has been represented on the board of the certification scheme.[177] Norwegian authorities have also invested in the Prototype Carbon Fund (PCF), which was established under the World Bank in 2000.[178] Norway has invested NOK 80 million in PCF over a ten-year period. According to an interview with the Ministry of Foreign Affairs, Norway will receive certified credits from this fund during the period 2008–2012. According to the Ministry, the motivation for investing in PCF was to establish a market, not primarily to purchase credits. This has proven to be a sound investment and has also helped to generate understanding for the system.

5.2.2 Allowance purchases

The Kyoto Report[179] stated that a study would be carried out to identify ways of allowing the private sector to introduce flexible implementation mechanisms within the framework of the Kyoto Protocol. The Quota Commission subsequently also recommended that players in the emissions trading scheme should be allowed to use the flexible mechanisms.[180] Since then, discussions have primarily focused on the scope of private enterprises' right to purchase credits from the project-based mechanisms. The Emissions Trading Report[181] established that there was to be no limitation on the use of the project-based mechanisms, while it has subsequently become clear that the EU Emissions Trading Directive imposes quantitative limitations on enterprises' right to use credits from the project-based mechanisms (see section 4.4).

The Ministry of Foreign Affairs stated in an interview that one of the reasons why the government did not plan a state purchase programme until 2007 was that the political focus was on enterprises – not the State, as in some other countries – as the purchasers of credits via the emissions trading scheme (see fact box 5.1). State purchases were not discussed at the political level until 2005. At that time, according to the Ministry of Finance, it seemed unclear whether the national policy instruments would be sufficient to fulfil the whole emission commitment under the Kyoto Protocol. This was why the authorities started their work to identify additional policy instruments for State involvement in the use of Kyoto mechanisms. An interministerial working group at civil service level was appointed to follow up work on considering an increased governmental involvement in the use of the Kyoto mechanisms and how any such involvement could be implemented, cf. Proposition No 1 to the Storting (2004–2005) *The Ministry of the Environment.* The working group was chaired by the Ministry of the Environment.

The working group studied potential ways in which Norway could enable the authorities to contribute to developing the mechanism, and considered various measures to make it easier to access the Kyoto mechanisms.[182] According to the working group's report, one possible form of active facilitation would be for the authorities to contribute aid funds to help identify suitable projects for subsequent development by potential investors. The working group submitted its report in 2006, but made no clear recommendations regarding who should be responsible for any government purchase of allowances.[183]

176) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol').*
177) Letter of 7 December 2009 from the Ministry of the Environment.
178) PCF was the very first carbon fund.
179) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol').*
180) NOU 2000:1 *A Quota System for Greenhouse Gases – A policy instrument for fulfilling Norway's emission reduction commitments under the Kyoto Protocol.*
181) Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy.*
182) Report from the working group about the use of the Kyoto mechanisms. Internal memo from the Ministry of the Environment.
183) Report from the working group about the use of the Kyoto mechanisms. Internal memo from the Ministry of the Environment.

5.3 The design of the Norwegian purchase programme

5.3.1 The Ministry of Finance's mandate

The decision to organise a government purchase programme was taken during consideration of the National Budget in 2007, and responsibility for the programme was assigned to the Ministry of Finance.[184] More details on the purchase programme were given in the revised national budget for 2007, when it was established that Norway would meet its Kyoto Protocol commitment by covering its allowance deficit through net purchases of allowances abroad by private enterprises and the Norwegian State. However, there was uncertainty relating to the scope of government purchases, and it was pointed out that this would depend, among other things, on how much is allocated free of charge and how much is sold in the EU emissions trading market.[185] The Ministry of Finance has also been given responsibility for obtaining allowances to strengthen the Kyoto Protocol commitment, which entails a considerably greater need for government purchases.

The Ministry of Finance stated in an interview that the countries which established a government purchase programme at an early stage often chose to involve themselves as investors, which meant that they paid relatively high development costs with no guarantee to cover e.g. the risk relating to UN certification of the project. Norway will pay for its allowance purchases on delivery, which means that the government has no obligation to pay if the project fails to deliver credits. The Ministry points out that the countries that purchased at an early stage were able to buy cheaper credits, but their purchase programmes spent significantly more resources during the development phase. On the other hand, these countries have participated in the development of the market itself. The Ministry of Finance considers that its primary job is to obtain an adequate number of allowances, not to develop projects.

5.3.2 What work has been carried out to obtain a sufficient amount of credits?

A contact group has been established as a forum for general debate and exchange of opinions about governmental purchases.[186] This contact group comprises representatives from the Ministry of the Environment, the Ministry of Foreign Affairs, the Ministry of Petroleum and Energy, the Ministry of Trade and Industry and the Office of the Prime Minister. The Ministry of Finance stated in an interview that Norad has also been invited to meetings in the contact group since late 2008, and that the Ministry has worked closely with the Ministry of the Environment in these matters. The Ministry of the Environment also states that embassies have been systematically used in connection with credit/allowance purchases since 2007. The embassies are used as contact points both to notify of interesting projects and to inform players in the respective countries that Norway is interested in purchasing credits from projects.

The revised national budget for 2007 assumed that only credits actually delivered would be paid for.[187] The Ministry of Finance's budget proposition for 2007, however, proposed making up to half of the cost of purchasing carbon credits payable when the contract was *signed*, as was the case in several other countries (see fact box 5.1).[188] The Ministry of Finance also states that the purchase programme's inability to offer advance payment has not impaired the programme to any significant degree. Projects that depended on advance payment were mostly risky and sometimes not viable.

The Ministry of Finance stated in an interview that an important part of the Ministry's credit purchase work since 2007 has been to market itself as a buyer. It has, among other things, created a website and an associated profiling programme. An invitation to tender was announced with deadline in early November 2007. According to the Ministry, response to this tender procedure was limited. In 2008, the Ministry of Finance expanded the tender process by using as many channels of communication as possible and contacting potential tenderers in person.

The Ministry of Finance also stated in the interview that they received more offers in 2008, but that some of these projects had been taken by other buyers in the meantime. Some main reasons why the Ministry failed to sign agreements with all the projects that it would have liked to in 2008 were that the purchase process took a long time because all projects were treated in the same way, and that the most attractive projects had already been bought by others before the Ministry had time to bid. The Ministry of Finance states that other buyers offered a higher price and that; at the time, unreasonably little importance was attached

184) Proposition No 1 to the Storting (2006–2007) *The Ministry of Finance.*
185) Report No 2 to the Storting (2006–2007) *The revised National Budget 2007.*
186) Minutes of the contact group meeting on 15 June 2007.
187) Report No 2 to the Storting (2006–2007) *The revised National Budget 2007.*
188) Proposition No 1 to the Storting (2006–2007) *The Ministry of Finance.*

to a buyer's financial strength and reputation.[189] There were also many buyers in 2008, some of whom were able to cover project development costs. This was not within the Ministry of Finance's mandate at the time, and the Ministry therefore lost a few purchase opportunities, for example in China.

From 1 January 2009 the Ministry of Finance's mandate was extended to also cover transaction costs relating to project development.[190] According to the Ministry, this has made it significantly easier to gain access to projects in more countries. China, where it used to be the norm for the buyer to cover transaction costs, is the largest and most important of these countries. The Ministry of Finance stated in an interview that the sums involved are relatively small (EUR 10,000–20,000 for a major wind power project). However, it is still assumed that the State will not as a rule pay for emissions credits until they have been certified for delivery and registered in the government's account in line with the description of State credit purchases in the revised national budget for 2007.[191]

In the budget proposition for 2010, the Ministry of Finance also refers to the possibility of buying guaranteed credits in the secondary market. In December 2009, prices for these credits were about 25 per cent higher than prices for credits from projects in an early stage.[192]

5.3.3 Criteria for credit purchases

According to the revised national budget for 2007, the State shall promote strict environmental requirements through its purchases of credits. This means only purchasing credits certified by the UN. It is emphasised that hardly any goods or services purchased by the State are subject to an international certification scheme as strict as the one for emission credits. According to the Ministry of Finance's budget proposition for 2010, the plan is to follow up the EU's voluntary harmonisation of hydroelectric power projects with an installed capacity of more than 20MW.[193] Within these limitations, the State will endeavour to utilise the markets to achieve the best price possible in relation to a given risk and the desired diversity in its portfolio.[194]

The Ministry of Finance stated in an interview that, in its purchase programme, it makes no further requirements than the UN certification, except for stipulating that hydroelectric power projects in excess of 20 MW must comply with internationally recognised good practice for such projects.[195] Some other countries have drawn up supplementary criteria in connection with credit purchases, see fact box 5.1.The enterprises that are part of the EU emissions trading scheme are also subject to a number of limitations on purchases in that they cannot buy credits from nuclear power projects or from projects involving forest and land use changes.[196]

The Ministry of Finance states in the budget proposition for 2008 that the Ministry will put emphasis on finding projects in small developing countries where there are few or no projects to start with. The purchase of credits through the project-based mechanisms will entail considerable transfers of funds to developing countries, and according to the proposition it is the developing countries that will be the primary beneficiaries of the money paid for credits based on the Clean Development Mechanism.[197]

The Ministry of Finance stated in an interview that it uses various criteria to assess which projects it should sign contracts with. These criteria correspond to some extent with the UN goals, but are also based on a wish to spread risk in the portfolio. When assessing the projects in relation to criteria, price and risk are weighed against each other. The probability of UN certification is also evaluated, as well as other factors influencing the probability of the project generating credits. The Ministry of Finance points out that some projects, for example those scoring high on environmental and social sustainability criteria, are given priority, since they are assumed to be most likely to obtain UN certification. Local sustainability is also given more weight that in the UN system, because local acceptance is often important in order for a project to be carried out according to plan. The Ministry of Finance also states that it takes account of its status as a portfolio manager,

189) Letter of 7 December 2009 from the Ministry of Finance.
190) Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance*.
191) Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance*.
192) Point Carbon. See also chapter 4.
193) Proposition No 1 to the Storting (2009–2010) *The Ministry of Finance.*
194) Report No 2 to the Storting (2006–2007) *The revised National Budget 2007 The Ministry of Finance.*
195) In the interview, the Ministry of Finance referred to the ongoing work in the EU to specify the guidelines for hydroelectric power projects in light of the reference to the *World Commission on Dams* report in the EU Linking Directive. Formally speaking, the *World Commission on Dams* provision only applies to the commercial market within the EEA, but voluntary adherence may also be relevant for the purchase programmes of nation states (including Norway).
196) Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.
197) Proposition No 1 to the Storting (2007–2008) *The Ministry of Finance*.

Fact box 5.2 Parties in the implementation of CDM projects

A number of parties are involved in the initiation, implementation and certification of a project. Below are brief descriptions of some of the key parties.

Project owner/ project developer
The project owner is normally the entity that owns the 'clean investment', for example the owner of a hydroelectric power plant or a factory implementing an energy efficiency project. The project developer may be the project owner, or it may be an external consultant specialising in CDM that develops the project in accordance with the CDM regulations. The emission credits can go to the project owner or the project developer depending on the agreement between the parties. In some host countries, for example China, the credits are considered a national resource and go in part to the government. In practice, the roles of project owner and project developer overlaps, and the terms are often used interchangeably.

Buyer
Anyone can buy a CDM credit, but the buyers are usually governments, private companies and financial institutions. Countries with a duty to surrender allowances and enterprises in the EU emissions trading scheme accounted for 86 per cent of trading in CDM/JI credits in 2007. A buyer is free to sell the credits directly to another buyer or to trade them on an exchange.

CDM Executive Board
The CDM Executive Board is appointed by the United Nations Framework Convention on Climate Change. The CDM Executive Board evaluates and certifies projects, including their methods for calculation of additionality and baseline, and it stipulates the size of and issues the credits.

Designated Operational Entity (DOE)
A Designated Operational Entity (DOE) is a company certified by the CDM Executive Board. The DOE checks the project at two different stages: on validation and on verification. A DOE is accredited to monitor some or all types of projects.

DNA
A Designated National Authority (DNA) is an institution in the host country or investor country that has to approve projects in which the country is involved. The DNA in the host country must also confirm that the project is in accordance with the country's sustainable development criteria. The DNA must give its written approval in a LOA (Letter of Approval). In Norway, this function lies with the Norwegian Pollution Control Authority.

Source: Econ Pöyry

and endeavours to ensure that commercial assessments tally with political priorities. The Ministry refers to the focus on projects in Africa as an example. The wish for risk diversification makes the Ministry of Finance willing to pay more for a credit in Africa than for one in China with the same risk profile.

5.4 To what extent does the Clean Development Mechanism help to achieve the targets under the Protocol?

All CDM projects must go through an extensive certification process in which emission reductions and their contribution to sustainability in the host country must be documented. This process is intended to ensure that projects are implemented in accordance with the CDM regulations negotiated by the parties to the Protocol. The project must be approved by an external designated operating entity, by the CDM Executive Board appointed by the United Nations Framework Convention on Climate Change and by the host country. The roles of key parties in the certification scheme are explained in fact box 5.2.

5.4.1 The CDM mechanism's contribution to global emission reductions

The mechanism is not intended to promote projects that are viable without income from CDM, so it is a fundamental principle that the additionality of the project must be documented. The CDM mechanism's contribution to global emission reductions is also contingent on a project not causing emission leakage, i.e. not contributing to increased emissions outside the limits drawn up for the project.

Additionality
As mentioned above, additionality is one of the key principles in ensuring that the CDM projects contribute to real emission reduction. In the absence of emission commitments for developing

countries, additionality is necessary to maintain environmental integrity and ensure a successful implementation of the Kyoto Protocol.[198]

Additionality assessments are based on a reference emission level (emissions in the absence of the project) called a baseline. A review of studies of additionality in CDM projects shows that there is no perfect way of testing whether a project is additional, and that the additionality testing tool is in continuous development.[199] Various studies indicate that not all registered projects can be assumed to be additional. Among other things, studies have pointed out that there is weak or inadequate documentation of additionality calculation, and that much of the information is highly subjective and not particularly verifiable. For example, project developers have been unable to sufficiently document use of sources, and in many cases the data basis and calculations have not been made official. Various studies that have tested additionality have reached different conclusions about the degree to which projects are additional. While one study shows additionality to be questionable in 40 per cent of the projects, other studies have questioned the additionality in an even greater proportion of projects.[200] Critics have therefore claimed that the requirements for documentation of additionality must be tightened. These conclusions are also supported by an investigation carried out by the supreme audit institution of the USA, see fact box 5.3. There is ongoing and continuous assessment and development of the regulations to meet challenges as they arise. Experts and special interest groups therefore expect the proportion of non-additional projects to decrease steadily.[201]

In an interview, the Ministry of the Environment pointed out that a system such as the UN certification system can never guarantee the additionality of every project. It also points out that, although it is difficult to fully assess additionality, the Executive Board, which approves projects in the final phase, is considered conservative in its methodology. Moreover, methodology is developing continuously. According to the Ministry of the Environment, the result is that for many projects, fewer credits are issued than the actual emission reductions in the project.

198) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
199) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
200) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
201) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.

In an interview, the Ministry of Foreign Affairs expressed general confidence in the UN system when it comes to evaluating the additionality of the projects. The Ministry also pointed out that opinions differs on this matter and on what constitutes adequate argumentation. The Ministry is of the opinion that development is heading in the right direction as more and more experience is being gained and the rules are becoming clearer and more predictable.

Fact box 5.3 The supreme audit institution of the USA's evaluation of the clean development mechanism

The United States Government Accountability Office (GAO) was asked by the United States Congress to evaluate experience with emission trading and the Clean Development Mechanism. The GAO concluded that the use of CDM has helped provide flexibility and reduced the costs involved in implementing the Kyoto Protocol commitments and has involved developing countries in efforts to reduce greenhouse gas emissions. However, the effect on greenhouse gas emissions is uncertain, and the contribution to sustainability is limited. The GAO points to the lack of additionality in some projects in particular. It also concludes that cost-effectiveness and overall scale of emission reductions are limited by the current project certification process. This is due to the resource-intensive nature of project certification, and the challenge faced by the CDM Executive Board in verifying a project's credibility. The GAO concludes that CDM programmes will be a temporary solution at best.

Source: Lesson Learned from the European Union's Emission Trading Scheme and the Kyoto Protocol's Clean Development Mechanism. GAO-09-151

Emission leakages

A leakage is a measurable increase in emissions outside the project that can be attributed to the project. We can distinguish between direct leakages and market leakages. The former are attributable to e.g. increased emissions relating to a project delivery, or changes in transport patterns in connection with the project. Some have also argued that the CDM can cause emission leakages in the economy (market leakages) through changing prices, and because not all countries have emission commitments under the Kyoto Protocol.[202]

As regards the matter of possible carbon leakage from the projects, both the Ministry of the Environment and the Ministry of Foreign Affairs stated in interview that it is the UN system's responsibility to attend to this. The Ministry of

202) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.

Foreign Affairs states that evaluation of leakages is, however, very difficult in practice. Many of the leakage problems are not caused by the certification, but by the fact that the mechanism targets countries without emission commitments. According to the Ministry, the only way to solve this problem is to introduce a new type of agreement setting up emissions trading schemes that also cover countries without emission commitments.

5.4.2 The CDM mechanism's contribution to sustainable development and technology transfer

Sustainable development

In addition to reducing greenhouse gas emissions, the CDM is also intended to contribute to sustainable development in the host country (cf. article 12.2 in the Kyoto Protocol). Sustainability criteria could, for example, include a project's contribution to employment or improved health or use of renewable resources.[203] Studies of CDM projects show that the CDM has had a limited effect on sustainable development. Moreover, studies show that the projects seem to either be additional or contribute to sustainable development, the two being virtually mutually exclusive.[204] There are two reasons in particular why sustainable development is overshadowed by emission reductions. Firstly, defining criteria for contribution to sustainable development is up to the host countries. Developing countries have no incentive to use very strict sustainable development criteria, as they are competing for investors and strict criteria could make for greater development costs. Secondly, the CDM is a market mechanism controlled by financial incentives. Recent studies, however, indicate that the CDM mechanism contributes to sustainable development to a greater extent than previously assumed. Separate standards or investment profiles have also been established in the market which may strengthen the sustainability aspect of CDM projects.[205]

The Ministry of Foreign Affairs pointed out in an interview that, although sustainability is one of the primary goals of the CDM, the minimum requirement is simply that the host country confirm that sustainability has been taken into consideration. According to the Ministry, the national procedures differ considerably, but some countries have established national priorities.

203) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
204) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
205) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.

Technology transfer

The Kyoto Protocol and the decisions made in the follow-up meeting in Marrakesh in 2001 emphasise that the CDM shall contribute to the development and transfer of technology, but have not defined the term or how it can be measured.[206] A number of empirical studies of technology transfer in CDM projects show that 33–50 per cent of all projects, corresponding to 64–84 per cent of all credits, are able to document such transfer. Technology transfer is greatest in large-scale projects and projects involving foreign players. In bilateral projects, technology transfer is greatest in projects in which European countries participate. The project-based mechanisms under the Kyoto Protocol can also contribute to technology development, in theory but probably not in practice. The reasons for this are that the Kyoto Protocol's perspective is too short-term and too uncertain, and that the price of credits is too low to promote research and development.[207]

5.5 What are the results of the purchase programme?

Table 5.1 shows that status as of 1 December 2009 for credit purchase contracts entered into by the Ministry of Finance or via carbon funds.[208] As of December 2009, the Ministry had signed sales contracts for a total of just over nine million carbon credits for delivery up to and including 2012, and agreements have also been signed for delivery of about 1.5 million credits after 2012.

The table shows that more than half of the contracts entered into by the Ministry of Finance are for wind power projects in China. Contracts for delivery of carbon credits from wind power projects in China account for five million carbon credits. In addition, contracts have been signed with an afforestation project in Tanzania, a compost project in Chile and a biomass power plant in South Africa. The Ministry of Finance states that the Ministry has made an active effort in the more marginal CDM countries, but that this work does not yield concrete results in the short term, since many of these countries have generally weak institutions.[209] In addition, some factors relating to the CDM regulations and the

206) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
207) Econ Pöyry (2009): CDM – *Styrker og svakheter('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
208) Several buyers can invest in a carbon fund that buys or develops projects. The fund is often managed by an external party. For example, the World Bank has a number of carbon funds.
209) Letter of 7 December 2009 from the Ministry of Finance.

Table 5.1 Status of government credit purchases and contracts as of December 2009

Projects	UN certification status	Number of credits delivery in the Kyoto period 2008–2012	Number of credits delivery after 2012
Projects from the World Bank (Prototype Carbon Fund)	-	1 400 000	1 000 000
Projects from Nordic Environment Finance Corporation (Nefco)	-	1 465 000	90 000
Four wind farms (Guohua), China	Applications documents are being prepared	1 500 000	
Seven wind farms (Guodian/Longyuan), China	Applications documents are being prepared	1 500 000	
Six wind farms (Tianrun), China	Applications documents are being prepared	2 000 000	
Heat recovery for electricity (Tata), India	Credits issued	24 896	
Forest project (Idete), Tanzania	In the process of UN certification	385 000	
Cement production (Indocement), Indonesia	Credits issued	250 000	
Biomass power plant (Cape Clean Energy), South Africa	For UN certification	150 000	450 000
Composting (Santa Marta de Liray), Chile	In the process of UN approval	62 000	
Forest credits, New Zealand	Credits issued and delivered	522 235	
Total		**9 259 131**	**1 540 000**

Source: The Ministry of Finance

structure of business and industry in some of these countries indicate that the number and scope of potential projects are limited.

In 2009, the Ministry of Finance invested NOK 260 million in a Nordic carbon fund, the Nordic Environment Finance Corporation Carbon Fond. This fund gives priority to both CDM and JI projects. An agreement has also been entered into with a forest project in New Zealand. The table shows that most of the projects involved, and the bulk of the volume, concern projects at an early stage.

The Ministry of Finance states that the average price of the contracts entered into is around EUR 10.3 (EUR 12.9 including VAT). For comparison, the price of allowances in the EU emissions trading scheme was about EUR 14 in December 2009. The prices of CDM credits at an early stage were between EUR 7 and EUR 10 in the period before 2008 (see chapter 4).

Eighty per cent of all CDM projects are in Asia and in Pacific nations.[210] About 66 per cent of expected credits in this area come from China. The projects vary in type, ranging from solar energy to transport and industry. The largest group is formed by hydroelectric and wind-power projects, and accounts for 45 per cent of the total number of registered projects. Bioenergy accounts for 15 per cent.

5.6 Evaluations

5.6.1 Further application of experience and expertise from the pilot phase has been limited

In the justification for ratification of the Kyoto Protocol, it was pointed out that Norway has accumulated considerable experience in the use of project-based mechanisms, and utilising and developing the Norwegian experience advantage was stated to be a goal in the transition to an operative system.[211] It was therefore the intention that active Norwegian work to gain experience with the JI and the CDM was to continue.

The investigation shows that, in line with the intentions of the Storting, cf. Recommendation No 204 to the Storting (2001–2002), Norwegian authorities carried out only a limited amount of work on developing projects after the end of the pilot phase in the period 2001–2007. Norwegian authorities have not been buyers of credits, and there have been few incentives for Norwegian enterprises to develop projects, partly because of the delay in setting up the emissions trading scheme.

210) http://www.cdmpipeline.org/cdm-projects-region.htm (Read in January 2010).

211) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol').*

Photo: Curt Carnemark / Samfoto

In addition to this, the Norwegian authorities have invested a small amount in a carbon fund and have, to some extent, contributed to capacity-building in potential host countries and the development of the UN certification scheme. Further application of the expertise and experience gained in the pilot phase has thus been limited. This means that the Norwegian authorities have made only a limited contribution to developing the project-based mechanisms through direct project development and the purchase of credits.

5.6.2 Procuring a sufficient number of credits proved more difficult than initially expected

The State purchase programme was established in 2007. The Ministry of Finance's budget proposition for 2008 envisaged signing contracts to purchase allowances/credits corresponding to a considerable portion of the total requirement in the 2008–2012 Phase. The investigations shows that no purchase contracts were signed in 2007, and only two in 2008 (one of which was subsequently cancelled). It seems that obtaining enough credits proved a greater challenge than expected when the purchase programme was established. In some cases, the Ministry of Finance has lost bidding rounds to other buyers. The fact that other countries have larger networks because they became involved as investors at an earlier stage has also proved challenging. The consequences of starting to buy credits at a later stage include higher prices, but also a reduced risk because the market is more mature.

Emphasis shall be placed on finding projects in small developing countries where there are few or no projects to start with. The investigation showed that few contracts have been signed with such countries. Most of the contracts entered into are for wind power projects in China.

5.6.3 Uncertain emission reductions and variable contributions to sustainable development

It is also one of the Kyoto Protocol's targets that the CDM projects shall have a real, measurable and long-term useful effect, and that reductions in emissions must be additional to reductions that would have been made in the absence of certified project activities.

The investigation shows that use of the CDM mechanism contributes to reducing emissions in developing countries, but that there is considerable uncertainty relating to the scope of actual reductions in relation to those claimed by the projects. This is due to uncertainty relating to whether each individual project is additional, that is whether it would have been carried out regardless of the income from CDM credits. It is also uncertain how much emissions increase in other places as a result of the implementation of the project. This is largely a consequence of methodological challenges relating to measuring such effects and of the absence of a global climate agreement. The investigation shows that the projects make some contribution to technology transfer.

The investigation also shows that the degree to which projects contribute to sustainable development varies. It is up to the host country to attend to the sustainability aspect, and developing countries have little incentive to make strict sustainability requirements. In many cases it seems that there are conflicts of interest between sustainability and additionality, with the two sometimes being almost mutually exclusive. Projects that safeguard one of these aspects often focus less on the other.

6 To what extent does the sector ministries' use of policy instruments contribute to achieving climate policy goals?

This chapter begins with a more detailed description of the Norwegian Pollution Control Authority's mitigation analyses, which form part of the knowledge basis for determining the costs of measures in all sectors and will be referred to in the subsequent sub-chapters. These deal with the sectors petroleum (6.2), energy restructuring (6.3), forestry (6.4), agriculture (6.5), industry (6.6) and transport (6.7).

6.1 The Norwegian Pollution Control Authority's mitigation analyses

In line with the mitigation analyses and common practice, this report differentiates between measures and the *policy instruments* that will be required to trigger measures. A mitigation analysis can be described as a catalogue of potential national measures for the reduction of existing greenhouse gas emissions.[212] The Norwegian Pollution Control Authority has published three mitigation analyses in recent years: in 2000[213], 2005[214] and 2007[215].

The Norwegian Pollution Control Authority's mitigation analyses have all been based on physical measures to help to reduce emissions, paying only limited attention to measures capable of producing significant changes in production structures or lifestyle. They are so-called bottom-up analyses, summarising the effect of individual measures but taking no account of macro-economic effects (see chapter 8). The costs of the measures are based on a calculation of annual additional costs, and cost-effectiveness is stated in NOK per reduced emission of CO_2 equivalents.[216] The 2007 mitigation analysis differentiates between measures costing less than NOK 200 per tonne of CO_2 equivalents, measures costing between NOK 200 and NOK 600 and those costing over NOK 600. The analysis also classifies the measures as having high, medium or low feasibility. The analysis does not include assessments of which policy instruments would be required to trigger the measures. Nor does the Norwegian Pollution Control Authority make recommendations about which measures should be implemented.

The Ministry of Finance states that the mitigation analysis is based on existing technological knowledge and considers new emission reduction possibilities with pertaining costs and benefits.[217] It does not, therefore, include emission reductions due to unknown changes in activity or immature technology. The Ministry of Finance also points out that the Norwegian Pollution Control Authority's mitigation analyses take only limited account of restructuring costs, and that there is reason to believe that the costs to society have been significantly underestimated.

It emerged from interviews with the Ministry of the Environment and the Norwegian Pollution Control Authority that the mitigation analyses have been used as a knowledge base by the Ministry of the Environment. The most recent analysis was used as a basis for stipulating national and sector targets in connection with Report No 34 to the Storting (2006–2007). The Ministry of the Environment states that the mitigation analyses have described many of the same measures since the 1990s, but that the figures have been updated. Some possible measures included in the analyses have not been implemented because of limitations relating to costs, technology and practical feasibility. There may also be other types of costs relating to the measures that are not shown in the analyses. The Norwegian Pollution Control Authority points out that the sector ministries made little use of earlier mitigation analyses because climate policy at that time focused primarily on general cross-sectoral policy instruments.

The Norwegian Pollution Control Authority stated in an interview that it has become clear in the last

212) Reduksjon av klimagasser i Norge: *En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2254/2007.
213) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2000')* Norwegian Pollution Control Authority. Report 1708:2000.
214) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010 og 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010 and 2020')* Norwegian Pollution Control Authority. Report TA-2121/2005.
215) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2254/2007.
216) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2254/2007.
217) Letter of 7 December 2009 from the Ministry of Finance.

few years that the use of policy instruments must be greatly intensified if we are to meet our ambitious climate targets. In 2008, the Ministry of the Environment requested the Norwegian Pollution Control Authority to chair an agency group, Climate Cure 2020, which is a collaborative project involving a number of government agencies. The expert group's main terms of reference are to prepare underlying material for the evaluation of climate policy and the need for modified policy instruments, which will be submitted to the Storting in 2010. The expert group will consider how far the existing policy instruments help to achieve Norwegian national emissions reduction targets and assess the need for new or modified policy instruments with a view to reducing Norwegian emissions in 2020 by 15–17 million tonnes of CO_2 equivalents compared with the baseline scenario.[218] Climate Cure submitted its report in February 2010. Through Climate Cure, the Norwegian Pollution Control Authority has for the first time been charged with examining possible use of policy instruments in all fields, in cooperation with the agencies involved. The Norwegian Pollution Control Authority also states that climate policy affects many sectors, which has made it difficult for the Ministry of the Environment to assign specific tasks to the Norwegian Pollution Control Authority without involving other agencies. The development of cross-sectoral policy instruments over the last 10–15 years has also made it difficult for the Norwegian Pollution Control Authority to make recommendation regarding the use of policy instruments.

6.2 How does the use of policy instruments in the petroleum sector help to achieve climate targets?

6.2.1 The sector's targets for climate mitigation

Petroleum activities involve fixed and mobile offshore installations, as well as fixed onshore installations. Processes in connection with exploration, the development of installations and recovery of oil and gas, and also compression and transport, produce emissions to air. Emissions to air are primarily caused by energy use on installations in the operating phase, but there are also emissions from the use of flares[219], from leakages and from product handling.

The Ministry of Petroleum and Energy has set itself the overriding environmental goal of 'environmentally and resource-friendly management of petroleum resources'[220], which includes facilitating a coordinated overall energy policy. This is to be achieved by means of efficient and environmentally friendly management of energy resources, and involves, among other things, implementing measures to ensure economically and environmentally adequate management.

In 1999, the Ministry of Petroleum and Energy presented an environmental action plan for the petroleum and energy sector that described the status and trends within the sector. With regard to climate, it formulated national strategy goals, performance targets and sector targets. The first two correspond to the Kyoto target. The sector target is to contribute to cost-effective realisation of the Norwegian Kyoto commitment.[221]

A review of management documents since 1998 shows that overall objectives for the sector and performance goals for oil and gas management have not been specifically formulated for climate, but deal rather with general environmental considerations. According to the Ministry of Petroleum and Energy's Proposition No 1 to the Storting for the years 1999–2000, the total environmental policy must be cost-effective. As regards climate, it is stated that active efforts are being made in the sector to identify and realise greenhouse gas reductions that are expedient in relation to the current use of policy instruments.[222]

In the years 1998–2002, the Ministry of Petroleum and Energy set a goal for Norway to combine its role of energy producer with being a leading nation in the environmental field.[223] In Proposition No 1 to the Storting (2001–2002), among other places, the Ministry formulates a performance goal for oil and gas management of 'continued work to minimise emissions from petroleum activities by applying and developing cost-effective policy measures'.[224] Emissions minimisation has been retained as a performance goal ever since.

Proposition No 1 to the Storting (2007–2008) for the Ministry of Petroleum and Energy includes climate and energy as a separate strategic area

218) http://www.klimakur2020.no/.
219) The use of flares will hereinafter be called flaring, and refers to controlled burning of natural gas on installations for safety reasons.
220) Proposition No 1 to the Storting (1999–98) *The Ministry of Petroleum and Energy*.
221) Miljøhandlingsplan for olje- og energisektoren 1999 (*'Environmental Action Plan for the Petroleum and Energy Sector 1999'*), published by the Ministry of Petroleum and Energy.
222) Proposition No 1 to the Storting (1999–2000) *The Ministry of Petroleum and Energy*.
223) Proposition No 1 to the Storting from 1998–99 to 2001–2002.
224) Proposition No 1 to the Storting (2001–2002) *The Ministry of Petroleum and Energy*.

with separate overall objectives for the first time. The Ministry of Petroleum and Energy stated here that it will continue to work for electrification of the continental shelf in accordance with Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*, and that it will do so by means of technology development and the application of general policy instruments. The report set a target for the petroleum and energy sector of emission reductions of three to five million tonnes, cf. the audit criteria. The Ministry of Petroleum and Energy stated in an interview that its own share of responsibility for achieving the national goal must be seen in conjunction with that of other ministries, and it stressed that sector targets may change.

Proposition No 1 to the Storting (2008–2009) for the Ministry of Petroleum and Energy is more clearly focused on greenhouse gas emissions. Among other things, it is stated that:

> 'One of the main tasks is to develop new clean energy and to produce fossil fuels without contributing to climate change by emitting large amounts of CO_2. Norway works to promote the cleanest energy production possible, concentrating on both renewable and fossil energy sources and technology development to help to reduce global greenhouse gas emissions.'

The proposition also states that the emphasis on reduction of emissions from the Norwegian continental shelf will continue.

A review of the Norwegian Petroleum Directorate's allocation letters for the period 1998–2008 shows that targets for greenhouse gas emission reductions have not been further operationalised in the Ministry's senior management signals. Overall environmental performance goals are described, where the Petroleum Directorate is asked to give priority to maintaining the emphasis on cost-effective measures, both in new fields and in the modification of existing fields.[225] The allocation letter for 2008 is the first document in which management signals are directly related to climate. The following is stated in the letter: '[due to] the need for stronger measures to reduce greenhouse gas emissions, the Petroleum Directorate will intensify efforts to induce the industry to implement technology solutions that give energy-efficient and climate-friendly production of oil and gas on the continental shelf'.[226]

225) Allocation letter to the Petroleum Directorate, performance goal 4.5.
226) Allocation letter to the Petroleum Directorate, 2008.

In the allocation letter to the Directorate of Petroleum for 2009, the climate target is specified within a separate overall objective of 'long-term management and value creation of petroleum resources within a satisfactory climatic and environmental framework'. According to this objective, the Petroleum Directorate shall work to ensure that oil and gas are recovered in the most efficient and environmentally friendly manner possible. The Petroleum Directorate is also to be a driving force in the development of climate-friendly technology.

The Petroleum Directorate stated in an interview that it is responsible for mapping emissions trends, and that it is in continuous contact with offshore operators to determine what can be done to reduce emissions. The Petroleum Directorate also stated that it has operationalised the emissions reduction targets by evaluating measures based on the cost-effectiveness principle. As regards management signals from the Ministry in relation to the sector's 2020 target for greenhouse gas emissions, the Petroleum Directorate complies with the Ministry's overall management signals, but points out that it has been clearly stated that emissions from the petroleum sector shall be reduced.

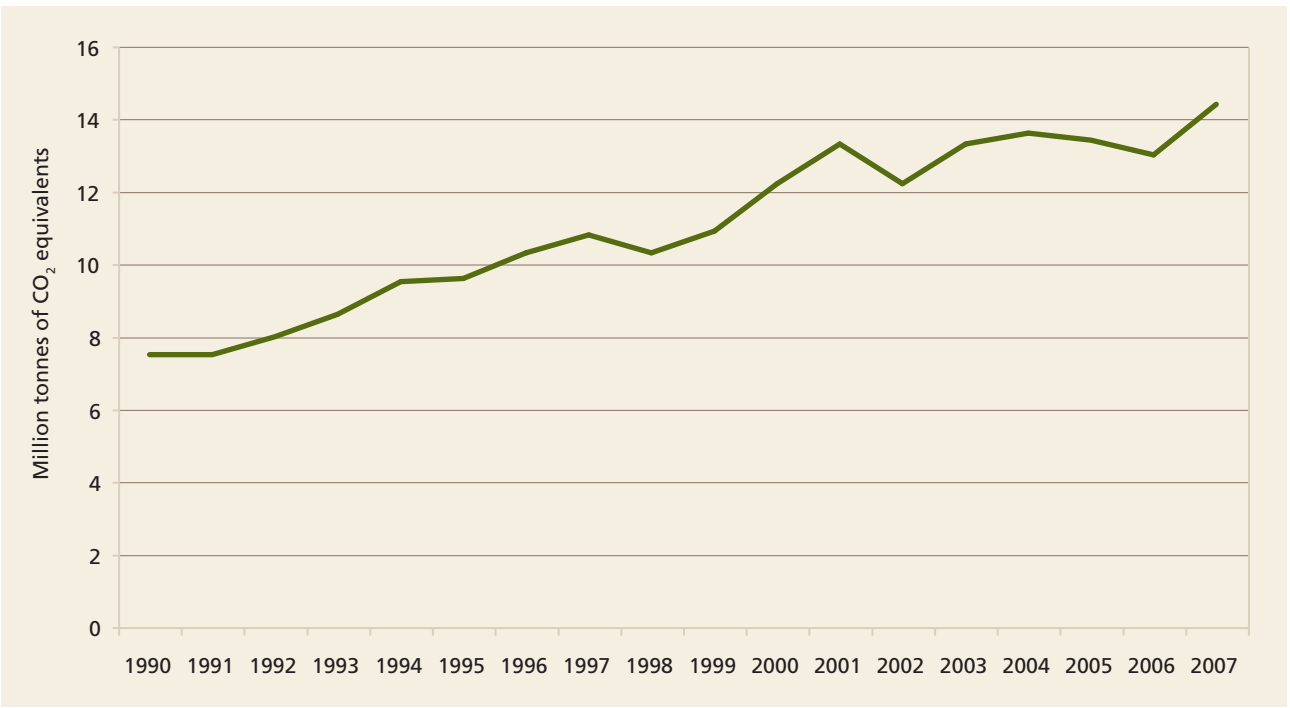
6.2.2 Emissions status

Petroleum recovery is a highly energy-intensive process. Large amounts of energy are required to supply pressure support in connection with recovery of oil and gas from mature fields and tail-end production. Energy is also needed for drilling, support functions and, in the last instance, for gas compression. Large gas turbines are used on most installations to supply power for these processes. The output from these turbines is poor compared with power generated onshore.

In 2007, the recovery of oil and gas from the Norwegian continental shelf caused emissions corresponding to 14.4 tonnes of CO_2 equivalents, which accounts for 26 per cent of total Norwegian greenhouse gas emissions. Emissions from power production account for about 90 per cent of emissions, while emissions from flaring account for about 10 per cent.[227] CO_2 makes up the majority of the greenhouse gas emissions from oil and gas recovery.[228]

227) Proposition No 1 to the Storting (2008–2009) *The Ministry of Petroleum and Energy*. Flaring used to be a greater source of emissions.
228) Proposition No 1 to the Storting (2008–2009) *The Ministry of Petroleum and Energy*.

Figure 6.1 Greenhouse gas emissions from petroleum recovery 1990–2007

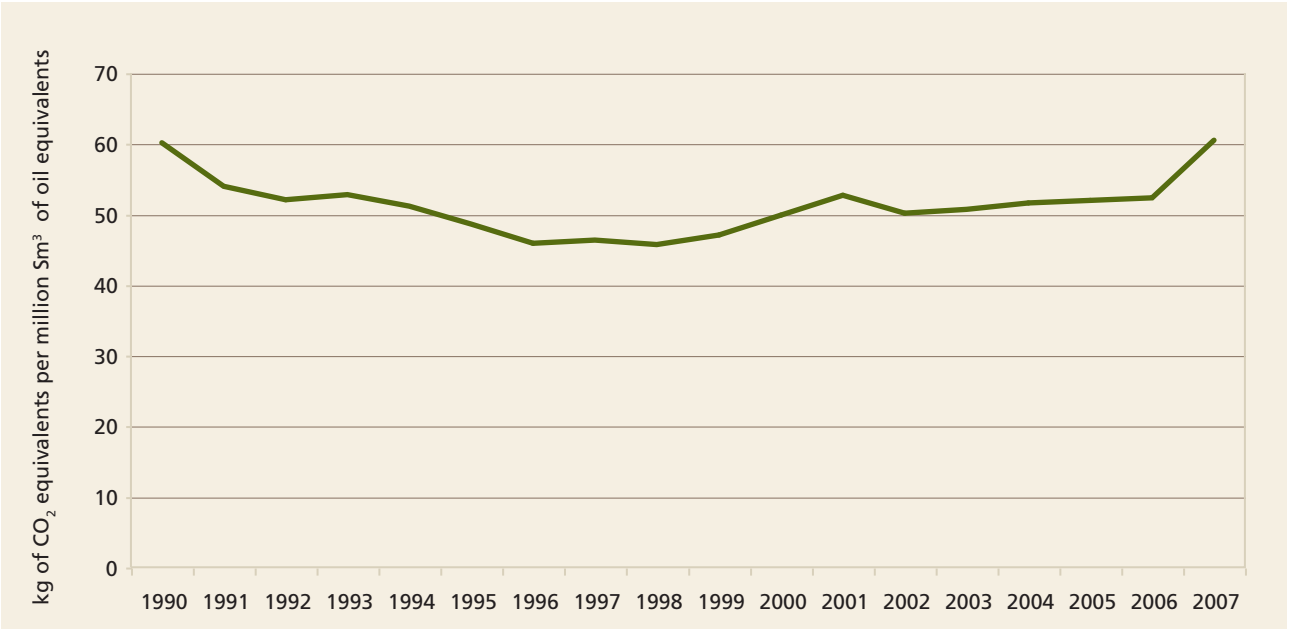


Source: Statistics Norway and the Norwegian Pollution Control Authority

Figure 6.1 shows that greenhouse gas emissions from the petroleum sector increased steadily from 1990 to 2007. Emissions from petroleum activities increased by 92 per cent in the period from 1990, and the increase after 1998 was 39 per cent. The Norwegian Petroleum Directorate explains this increase as a consequence of increased recovery on the continental shelf, an increase in reservoirs due to new discoveries and longer lives for existing fields.[229]

Figure 6.2 shows that emissions per produced unit decreased up to and including 1998. According to the Petroleum Directorate, this

Figure 6.2 Greenhouse gas emissions per produced unit for oil and gas recovery 1990–2007

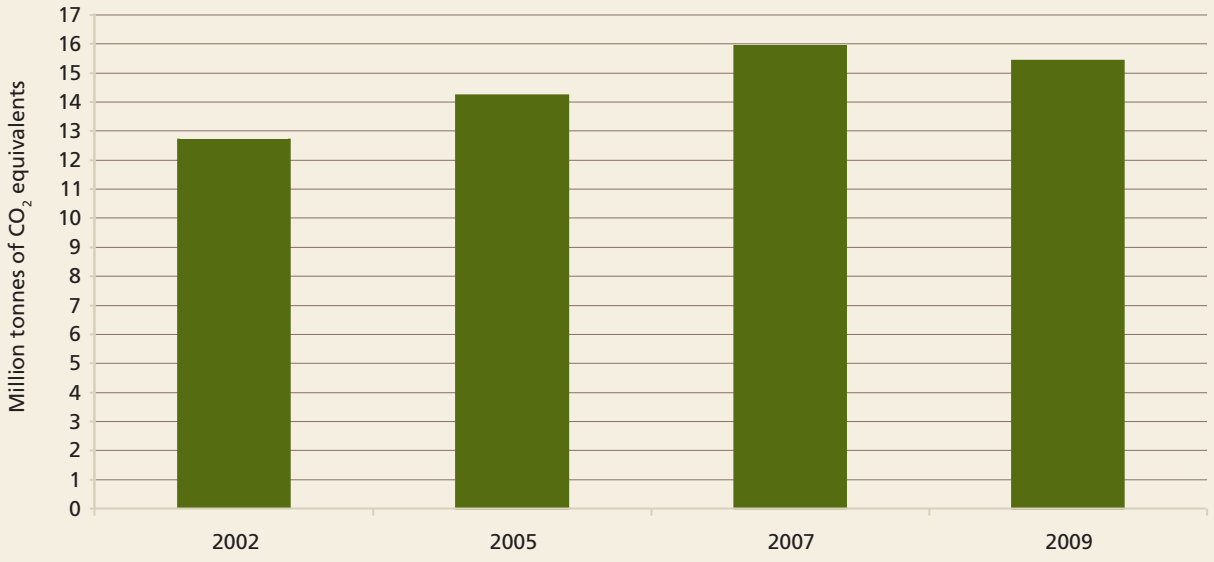


* Sm^3 is one cubic metre at standard pressure and temperature.

Source: Statistics Norway and the Norwegian Pollution Control Authority

229) Petroleum Directorate presentation – part of verified minutes from an interview with the Petroleum Directorate.

Figure 6.3 Historical emission projections for the petroleum sector in 2010 as published in the specified years



Source: Compilation of projections for the sector reported to the United Nations Framework Convention on Climate Change, the Norwegian Pollution Control Authority's mitigation analysis and unpublished data received from the Norwegian Pollution Control Authority

development was due to improved energy efficiency and reduced flaring.[230] The increase in emissions per produced unit from 1999 was due to an increase in energy consumption for offshore operations because more fields have reached a mature production phase.[231] Production of oil and gas on mature (older) fields requires more pressure support, which in turn demands more energy.

The Petroleum Directorate also emphasises the transition that has taken place from mostly oil production to increased gas production, which is more energy-intensive per produced unit. Moreover, production from fields in the far North augments energy requirements because gas and oil has to be transported across greater distances.

6.2.3 Emission projections

The Ministry of Petroleum and Energy states that production is at a historically high level, and that annual CO_2 emissions from the petroleum sector in the years to come will be around 14 million tonnes. This estimate is somewhat lower than the Norwegian Pollution Control Authority's petroleum sector projection for 2010 of 15 million tonnes of CO_2 equivalents.[232] The 2007 Climate Report estimated that the top emissions level would be reached in 2013. The Petroleum Directorate's newest forecasts estimate that emissions will peak in 2019.[233]

The Petroleum Directorate prepares its own projections based on reporting from the companies on the continental shelf. Both the Petroleum Directorate and the Ministry of Petroleum and Energy point out that the problem with these forecasts is that other factors, including economic and technological development, also influence production trends. Uncertainty about the lifetime of fields also influences forecasts.

Figure 6.3 shows projections of greenhouse gas emissions for 2010 as they were presented in different historical years. The figure shows that for various reasons, the growth in the petroleum sector in the first half of the first decade of this century was underestimated both compared with the newest projections and with the actual development registered, cf. figure 6.1.

230) The Norwegian Petroleum Directorate: *Facts 2008 – The Norwegian petroleum sector* 2008.

231) When a large part of the resources have been recovered from a field, more resources must be recovered from deeper down in the reservoir. This is what is called the mature phase.

232) Sector projections prepared by the Norwegian Pollution Control Authority based on Report No 9 to the Storting 2008–2009) *Long-term Perspectives for the Norwegian Economy* (unpublished). The Ministry of the Environment states in its letter of 7 December 2009 that the difference is due to the fact that emissions from the gas processing plant on Kårstø (gassled E) were not included in the Ministry of Petroleum and Energy's projections while they were included in the Norwegian Pollution Control Authority's projections.

233) The Norwegian Petroleum Directorate: *Facts 2009 – The Norwegian petroleum sector*.

6.2.4 The authorities' studies of measures

The reduction potential in the petroleum sector has been considered in the Norwegian Pollution Control Authority's mitigation analyses. In 2000, the analysis identified a total reduction potential of 1.8 million tonnes of CO_2 equivalents in relation to the target year 2010.[234] The costs of measures to promote reduced flaring and optimised processes were low, corresponding to NOK 200 or less per tonne. The estimated costs of the other groups of measures were NOK 360–1400 per tonne.

In the 2005 mitigation analysis, the reduction potential had increased to a total of 4 million tonnes of CO_2 equivalents in the period until 2010.[235] However, the calculations show that the costs of initiating the measures are high, and that it is unrealistic to realise emission reductions corresponding to more than 0.7 million tonnes within a cost limit of NOK 200 per tonne by 2010. There was also great uncertainty relating to the effect of measures by 2020, among other things because the projections at the time expected production to decrease between 2010 and 2020. Moreover, no potential measures targeting new discoveries during this period were included.

In its most recent mitigation analysis, from 2007, the Norwegian Pollution Control Authority identifies three measures: energy efficiency, electrification level 1 and electrification level 2 Electrification level 1 entails supplying power generated onshore to offshore installations close to shore, or new developments where using power generated onshore is already planned as part of the plans for development and operation. Electrification level 2 involves supplying electrical power generated onshore to older installations and fields far from shore.

The Petroleum Directorate stated in an interview that it is the Directorate's responsibility to examine various policy instruments and measures in the sector. Among other things, it has prepared three reports on electrification of the continental shelf and one report on efficient energy supply. The Petroleum Directorate states that it is in continuous contact with offshore operators to map potential ways of reducing emissions further.

The Directorate also states that it has primarily tried to identify which measures will be relevant from the point of view of cost-effectiveness. This means that it evaluates measures on the basis of cost per reduced emission, and that this has traditionally been viewed in relation to the carbon tax level. As regards technology development, the Petroleum Directorate states that higher costs are acceptable.

Electrification of the continental shelf

According to the Ministry of Petroleum and Energy, electrification is a costly measure, both with respect to supplying new developments with power generated onshore and to electrifying existing installations. Licensees must consider the possibility of using power generated onshore for new developments.[236] Electrification can contribute to major emission reductions by replacing gas and diesel-powered turbines on the installation with (renewable) power generated onshore. The most recent report from the Petroleum Directorate, which was based on electrifiable installations, estimated an emission reduction of 4 million tonnes of CO_2 per year from electrification of installations on the Norwegian continental shelf.[237] This gain is also seen in conjunction with the how the power that will supply the continental shelf is produced.

As of today, the Troll A platform, Ormen Lange and Snøhvit have their power supplied from shore, and work is underway to supply Valhall 2010 with power generated onshore during 2010. Gjøa and Goliat are new developments which it has been decided to supply with power generated onshore.

The studies carried out under the auspices of the Petroleum Directorate and the Directorate of Water Resources and Energy show that the cost of electrification of existing installations has increased from NOK 775 per tonne of CO_2 emission reduction in 2002, to NOK 1600–5000

234) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010')* Norwegian Pollution Control Authority. Report -1708:2000.
235) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010 og 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010 and 2020')* Norwegian Pollution Control Authority. TA-2121/2005.
236) Recommendation No 114 to the Storting (1995–96).
237) The reduction potential was calculated on the basis of preliminary emission figures from 2006. With current technology, it is not possible to electrify flaring and running of compressors and pumps, exploration activities and drilling operations. Nor have older facilities with a short remaining life been included in the report.

in the most recent study from 2008.[238] The Ministry of Petroleum and Energy stated in an interview that the increase is a consequence, among other things, of higher offshore construction costs, very complex modification processes and the fact that the remaining life of the fields is estimated to be shorter than previously assumed. The Ministry also points out the importance of differentiating between electrification of existing and new fields. The costs of choosing power generated onshore for new projects may be lower than retrofitting such power systems to existing facilities.

In addition to costs, supply solutions are also a challenge in connection with the electrification of installations on the Norwegian continental shelf. Transferring power to relevant connection points will present a challenge in relation to electrification based on supply from the power grid, as both the above-mentioned studies and statements from the petroleum authorities show that transmission grid instability will be a problem both in Central and Western Norway. The Petroleum Directorate also points out that the relationship between domestic and international emission reductions involves a conflict of goals in the event of inadequate domestic supply of renewable power, as this presupposes an alternative supply solution. The study from 2008 shows that if the power requirement is covered by imported power from coal-fired power plants in Europe, this will reduce the emission-reducing effect of electrification of fields by causing a global increase in emissions. Previous studies have pointed to the availability of emission-free power as a potential obstacle to electrification. According to the Norwegian Directorate of Water Resources and Energy, however, the present power balance is no longer an obstacle to the implementation of such measures. The Ministry of Petroleum and Energy points out that the power balance is not the only issue with a bearing on the supply of electric power and the expediency of connecting petroleum installations to the onshore power transfer grid. The availability of electric power in the years ahead will depend heavily on the renewable energy policy and investments in a new transfer grid, among other things.[239]

Energy efficiency measures

According to the Petroleum Directorate, gas turbines with heat recovery on the Norwegian continental shelf have an average efficiency of 40 per cent. The average efficiency without heat recovery is 31 per cent. Connecting the power supply to several installations by means of a ring cable is also a measure that could reduce the energy requirement and improve energy utilisation. However, a study shows that the ring cable option has so far been rejected because of its high costs.[240]

Combined cycle gas turbines are another measure. In combined cycle gas turbines, heat from turbine exhaust gas is used to produce steam, which in turn is used to generate electric power. The efficiency of this will approach 60 per cent. At present, this measure is being used on the Oseberg, Snorre and Eldfisk fields.[241] According to the Petroleum Directorate, combined cycle gas turbines on the continental shelf have an efficiency of 60 per cent.

The Petroleum Directorate stated in an interview that combined cycle gas turbines are very costly to install, and also require large available areas on the platforms. Such systems also experience frequent operating problems. The Petroleum Directorate therefore deems the potential for increased use of combined cycle gas turbines to be limited, and considers that using the heat directly where needed may be a more expedient measure.

A study carried out the Petroleum Directorate in 2004 identified further cost-effective measures in relation to the tax level, corresponding to reductions of 0.8 million tonnes per year by 2013.[242] The Petroleum Directorate pointed out in an interview that the study does not link reduction potential with costs, and that the report presupposes future technological advances. According to the Directorate, only minor technological progress has been made, and the progress made is related to energy management.

238) The Petroleum Directorate has carried out three studies on electrification of the installations on the Norwegian continental shelf in 1996/97, 2002 and 2008 respectively. These reports were prepared in cooperation with the Norwegian Directorate of Water Resources and Energy. The Petroleum Safety Authority Norway and the Norwegian Pollution Control Authority also participated in connection with the report *Kraft fra land til sokkelen ('Power generated onshore to the continental shelf')* (2008). The studies take the emission status and power balance on shore as their starting point, and evaluate the gain from partial or complete electrification based on estimated development in energy requirements on the continental shelf and the onshore supply situation.

239) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.

240) Einang, G. (2006): Olje- og gassproduksjon til havs – energibruk og effektivitet *('Offshore oil and gas production – energy use and efficiency').* Master's thesis, University of Stavanger.

241) *Facts 2009 – The Norwegian petroleum sector*, the Norwegian Petroleum Directorate.

242) *CO_2 – Utredning av muligheter for en mer effektiv energiforsyning på norsk sokkel ('CO_2 – A study of more efficient energy supply options on the Norwegian continental shelf').* The Petroleum Directorate (2004).

Carbon storage and injection
Injection and storage of CO_2 from produced gas in subsea geological formations are measures that can help reduce greenhouse gas emission greatly. Since 1996, about 1 million tonnes of CO_2 from the Sleipner field have been stored in the Utsira formation each year.[243] CO_2 from the Snøhvit field is stored in the Tubåen formation.

The Petroleum Directorate also aims to increase oil recovery from the fields on the Norwegian continental shelf by creating a value chain for CO_2, injecting CO_2 as pressure support. This use of CO_2 has been put forward as an argument to support the development of carbon capture and storage (CCS). The Petroleum Directorate states that so far, this measure has not proven profitable in terms of project economy.

6.2.5 To what extent does the use of policy instruments in the petroleum sector help to achieve climate policy targets?

The carbon tax
A carbon tax is levied on the use of gas, oil and diesel in petroleum activities on the continental shelf.[244] The sector's tax level remained stable from 2000 to 2008, when the tax was halved as a result of offshore petroleum activities being included in the emissions trading scheme. Since the petroleum sector became part of the emissions trading scheme in 2008, the carbon tax has been adjusted so that the total of the allowance price and carbon tax corresponds to the carbon tax level before 2008.

The Petroleum Directorate states that the carbon tax has been the primary policy instrument employed to trigger energy efficiency measures on the continental shelf. It is the Petroleum Directorate's opinion that the carbon tax has stimulated a number of technological measures costing not more than the tax. The Norwegian Oil Industry Association confirmed in an interview that the companies perceive the tax level as promoting technological development and improvement, but it also points out that technological development takes place regardless of such regulation.

In 2004, the Petroleum Directorate presented a report in which it was shown that emission-reducing measures from 1991 to 2003 led to a reduction of 2 million tonnes of CO_2 per year, due, among other things, to the introduction of the carbon tax.[245] The Ministry of the Environment calculated the effect of the carbon tax offshore to be 3 million tonnes of CO_2 per year (see table 9.1). This is consistent with the Norwegian Oil Industry Association's review of offshore measures during the period from 1994 to 2007.[246]

Regarding the effect of the carbon tax, the Ministry of Petroleum and Energy stated in an interview that the reduction in flaring has been particularly important. Extensive measures have been implemented over a prolonged period of time. The Ministry also points out that raising awareness of more energy-efficient operation and emission-reducing activities has influenced work procedures on the fields, resulted in company action plans and influenced the decision-making processes. According to the Ministry of Petroleum and Energy, the carbon tax was part of the motivation behind carbon capture and storage on the Sleipner and Snøhvit fields.

The Petroleum Directorate's reports on the effect of the carbon tax are based on the companies' reporting of measures implemented. The reports show a reduction in the number of measures that the companies stated to be motivated by the carbon tax during the 2000s. The reports show that both the petroleum authorities and the companies involved perceive a steady decrease in the carbon tax's importance as an incentive to new emission-reducing measures for existing activity on the continental shelf. In its 2007 report, the Petroleum Directorate explained this, among other things, by high oil prices and a steep increase in costs. Some companies have also pointed out to the Petroleum Directorate that there is more to be gained from such measures if they are implemented in the development phase. The companies also face the challenge of choosing BAT-standard technology (cf. section 4.5) to comply with the IPPC Directive. Some companies have reported for several years that they have delayed the implementation of measures pending clarification of what is deemed to constitute BAT.

The Petroleum Directorate confirms that it considers that most measures costing less that the carbon tax have been triggered, but points out that

243) *Facts 2009 – The Norwegian petroleum sector.* The Norwegian Petroleum Directorate.
244) *Facts 2009 – The Norwegian petroleum sector.* The Norwegian Petroleum Directorate. See also section 4.3.
245) The Petroleum Directorate (2004): *CO_2 – Utredning av muligheter for en mer effektiv energiforsyning på norsk sokkel ('CO_2 – A study of more efficient energy supply options on the Norwegian continental shelf').*
246) The Norwegian Oil Industry Association (OLF), 2009. *The petroleum industry and climate issues.* KonKraft report 5.

Photo: Bjørn Rørslett / NN / Samfoto

the carbon tax is a cost that companies include in all their investment and operations decisions. The Directorate states that in this way, the carbon tax is still a key policy instrument in promoting energy efficiency, among other things.

The Ministry of Petroleum and Energy states that the authorities have seen few direct effects of the carbon tax in recent years, but points out that the tax forms part of the investment basis when companies consider implementing new technology. In the Ministry's opinion, one of the reasons why it is so demanding to make further cuts in emissions from the Norwegian continental shelf is that major emission-reducing measures have already been implemented. The Norwegian Oil Industry Association also deems the potential for further cuts to be limited.

The Greenhouse Gas Emission Trading Act

From 2008, the petroleum sector was included in the emissions trading scheme, which is regulated by the Greenhouse Gas Emission Trading Act, but it remained subject to the carbon tax.[247] Offshore activities have not been allocated free allowances, and must purchase all their allowances. The Ministry of Petroleum and Energy stated in an interview that the emissions trading schemes will probably provide the same incentives for national emission reduction as regulation by tax, because the allowance price plus the tax will be at about the same level as the pre-2008 carbon tax. The Norwegian Oil Industry Association considers that the petroleum sector in Norway is exposed to higher emission costs than other sectors and other countries, since the tax rate is not adjusted in relation to the allowance price. The total combined financial regulation with a current tax rate of just under NOK 200 kroner per tonne of CO_2 and an allowance price of EUR 14 Euro, corresponding to about NOK 115, provides the incentive to initiate measures costing about NOK 315, which is slightly below the pre-2008 carbon tax level.[248]

The Petroleum Activities Act

The Petroleum Activities Act regulates activities on the continental shelf and contains provisions regarding emission from such activities. As regards emissions on the continental shelf, the most relevant measures under the Act are regulation of flaring on installations and regulation through approval of plans for development and operation and plans for Installation and Operation (PDO/PIO).

247) Cf. the Greenhouse Gas Emission Trading Act section 2.

248) In 2008, the carbon tax was NOK 0.80 per litre of oil and per standard cubic metre (sm^3) of gas, which corresponds to approximately NOK 330 per tonne of CO_2.

According to the Petroleum Activities Act, no more petroleum shall be burnt than safety reasons require.[249] Flaring permits are granted in connection with the granting of production permits by the Petroleum Directorate.

The Petroleum Directorate stated in an interview that it evaluates flaring levels in the fields during its annual processing of flaring permits, and in relation to extraordinary flaring permits. According to the Petroleum Directorate, the ban under the Petroleum Activities Act has helped to strongly reduce flaring, also compared with international flaring levels. According to figures from Statistics Norway and the Norwegian Pollution Control Authority, emissions from flaring in 2007 were down 30 per cent compared with 1990 levels.

The Petroleum Directorate also states that it wants to focus on flaring to ensure that the reduction in burning of petroleum continues. The Directorate also wants a review of the operators' flaring strategies, since operating problems and maintenance are the primary causes of flaring. A special evaluation for 2009 resulted in a reduction of flaring permit flexibility for eight fields. However, the Directorate points out that his change may not necessarily lead to further emission reductions. Further reductions can first and foremost be achieved by minimising the number of operational interruptions.

Processing of plans for development and operation (PDO)

The Ministry of Petroleum and Energy can stipulate environmental requirements through the plan for development and operation (PDO) or plan for installation and operation (PIO). As regards greenhouse gas emissions, the plan for development and operation is the most relevant policy instrument for consideration in this nvestigation, although requirements in the plan for installation and operation may also be relevant, as it deals with emissions in connection with e.g. transport of recovered gas and petroleum.

According to the PDO and PIO guidelines, the PDO must consist of two parts: a plan for development and operation and an impact assessment. The impact assessment must show the consequences of the development on a number of factors including the natural environment, natural resources and cultural environments.[250] In addition to the impact assessment, the development plan consists of a technical part containing a description of the development solution, reservoir studies, production profiles and assessments of the possibility of supplying the installation with power generated onshore.

The impact assessment describes the impact of the development on the environment, fisheries and other public interests, including emissions to air. It must state how the best available techniques (BAT) requirement will be met in the development. The licensee must also describe the remedial measures to be implemented to reduce emissions to air.[251]

The impact assessment will be sent for consultation to all involved parties, including the Ministry of the Environment and the Norwegian Pollution Control Authority. The operator then replies to the the consultation statements. The guidelines for PDO and PIO show that this is an important step because it opens up for other potential solutions to environmental problems. The Ministry of Petroleum and Energy then evaluates whether the operator has responded satisfactorily to the consultation statements.

Finally, the PDO is considered by the government, and submitted to the Storting if the development costs exceed NOK 10 billion. The processing of emission permits requires separate processes involving both the developer and the Norwegian Pollution Control Authority. These take place after the PDO has been processed.

The Petroleum Directorate stated in an interview that it considers the processing of company PDOs pursuant to the Petroleum Activities Act to be the most important policy instrument for which the Directorate is responsible. It perceives the PDO as important because the design chosen will determine which technical solutions can be implemented in a field, which will in turn determine the emission levels for many years to come. General practice is for the Petroleum Directorate to be involved in the so-called pre-PDO phase and request studies and evaluations from the companies well before a PDO is submitted to the Ministry of Petroleum and Energy. The Directorate will also provide recommendations for the

249) Cf. section 4.4 first paragraph of the Petroleum Activities Act.

250) Guidelines to plan for development and operation of a petroleum deposit and the Petroleum Activities Regulation section 21.

251) Guidelines to plan for development and operation of a petroleum deposit (2008).

Ministry for approval of the plan and any conditions for approval of the plan.

The Petroleum Directorate stated in an interview that the Directorate focuses strongly on the so-called pre-PDO phase assessments, since the most important decisions concerning subsequent emissions are made at an early stage. This has engendered the practice of requesting the licensees to carry out studies in connection with new developments and major modifications in order to assess the technical and financial impact of power generated onshore, energy efficiency and emission-reducing measures. The results are presented in the impact assessment that forms part of the PDO evaluations.

There are three important elements in the PDO that can identify ways in which the developer can reduce emissions to air in connection with the development and operation of a new field or a new installation. In accordance with Recommendation No 114 to the Storting (1995–96), the oil companies are required to submit assessments for electrification of new fields rather than the use of gas turbines when drawing up the PDO. The developer must also explain how BAT considerations will be attended to. The development plan must also include descriptions of the facility's energy efficiency and its choice of solutions and technology for reduction of greenhouse gas emissions.[252]

According to the Petroleum Activities Regulations section 20, the Ministry of Petroleum and Energy shall, in a separate document that is to be made public, justify its decision to approve or not to approve the plan for development and operation. This document must describe any environmental conditions relating to the approval, and any remedial measures required in order to compensate for substantial adverse environmental impacts.[253]

Review of PDO documents

Forty-five approved PDO documents have been reviewed in order to determine how the petroleum authorities handle the matter of greenhouse gas emissions when assessing potential electrification, BAT technology and other emission-reducing solutions. The review shows that the Petroleum Directorate's evaluations or the Ministry of Petroleum and Energy's conclusions base their approval of PDOs very much on the operator's justification for choice of solution. According to the Ministry of Petroleum and Energy, this is a natural consequence of the requirements imposed on the operator for the preparation of PDO, and the close follow-up in the pre-PDO phase.[254]

The review shows intensified focus on development solutions with power generated onshore since 1998, but reveals that few fields have actually been electrified. Out of the 45 developments reviewed, the operators chose solutions with power generated onshore for only three: the Gjøa field with Vega and Vega South, the further development on Valhall and the Goliat field. Document analysis shows that the reasons for deciding against using power generated onshore in the other developments are the costs relating to this solution, the distance from shore and the security of supply in the area. The documents vary in the amount of attention paid to describing electrification costs, particularly as regards comparing the cost of electrification measures with the use of gas turbines.

In the development of the Huldra field, the operator provided socioeconomic considerations for choosing the connection solution for the transfer of gas that the impact assessment presented as the poorest solution in terms of emissions to air. The impact assessment shows that the originally planned solution with a connection point on Kollsnes would have produced lower CO_2 emissions because of the possibility of using power generated onshore. In this case, the Petroleum Directorate supports the solution using the same justifications as the developer. Based on the Directorate's assessment, the Ministry of Petroleum and Energy writes that it approves the solution, and stresses that CO_2 emission considerations do not favour one solution over the other.[255] As far as this development is concerned, the Ministry of Petroleum and Energy refers in its letter to other policy instruments used in the sector and to the cost-effectiveness principle, and states that emissions to air cannot therefore be the deciding factor in the choice of onshore connection point.[256] The Ministry also points out that a comparison between the Heimdal and Kollsnes connection points is complex, as either option could be viewed as having the lowest CO_2 emissions, depending on the premises of the analysis. In the opinion of the Ministry, CO_2 considerations gave no clear indication that one solution was better than the other.

252) Guidelines to plan for development and operation of a petroleum deposit (2008).
253) Cf. section 20 of the Regulations relating to the Petroleum Activities Act.
254) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.
255) Proposition No 8 to the Storting (1998–99).
256) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.

The review of documents also shows that, in considering power generated onshore, the Ministry pays great attention to security of supply. In cases where power generated onshore is presented as the best option, the Ministry approves the solution, but stresses the challenges relating to electrification of offshore petroleum installations with regard to transfer capacity and security of supply to the onshore connection point. For the further development of Valhall, the Ministry says the following: 'The question of the connection of offshore petroleum facilities to the onshore power system must also be seen in relation to the development of the national and regional power supply.' And the Ministry concludes that: 'it is acceptable for the field's energy supply to be met by power generated onshore'.[257]

The Ministry of Petroleum and Energy states that extensive technological development has led to more and more field developments being based on subsea installations and to the development of multi-phase transport of unprocessed well-streams.[258] This has, among other things, resulted in the processing plants that used to be located on the platforms being located onshore and supplied by the local power grid. In addition, electricity cables have been laid to some oil and gas fields. Technological developments over time, partly as a result of official requirements, mean that power generated onshore has become a more cost-effective solution than it used to be. On Skarv, for example, a development solution with a floating production facility without power generated onshore was chosen. The authorities have required the operator to initiate a programme to study in more detail which technology is the most suited for building a future prototype for the transfer of large amounts of power generated onshore to floating production and storage vessels using the turret system.

The description of development solutions in PDOs often fail to state whether the technological solutions chosen by the developer are in line with the BAT standard. This could be because the choice of technology is described in more detail in the technical part of the PDO, which is exempt from public disclosure, or in the complete impact assessment of which only a summary appears in the PDO document submitted for approval. However, the Petroleum Directorate stated in an interview that the Directorate takes account of the BAT requirements and ensures that all new developments use BAT technology. Nevertheless, some consultation statements in the PDO called for descriptions of solutions based on BAT technology, and in these cases the operator referred to the coming emission permit application. From the PDO document for the Fram East development it emerges that, when the PDO was submitted, the developer had not considered whether the development solution was based on BAT technology but, at the consultation stage, told the Norwegian Pollution Control Authority, which was a consultation body, that this would be accounted for in connection with the emission permit application.

The developer must describe any so-called remedial measures, and also ensure that energy-efficient solutions are chosen. The review shows that these measures often coincide, i.e. the developer considers that the same measure will meet both requirements. This is because optimum energy utilisation in order to limit emissions requires, among other things, high-efficiency turbines. The review of the PDO documents shows that upgrading of turbines is one of the most common measures. Some developments choose heat recovery solutions to optimise operations.

The review shows that more than half the developments are small in size and linked in part to the existing infrastructure for power supply and transfer of recovered oil and gas in the same area. Some PDOs describe how such solutions can help to improve energy efficiency, even though they may increase emissions to air from the installation to which the new development is connected. As far as emission-reducing measures for such installations are concerned, the operator refers several times to the measures to be implemented on the field to which the new development is to be connected.

Other remedial measures considered include CO_2 injection for pressure support and reinjection. This measure has been considered in several PDOs, but rejected on grounds of poor cost-effectiveness due to high investment costs. The Petroleum Directorate pointed out in an interview that there are also a number of non-financial challenges relating to this measure, including space, pressure stability and storage solutions.

The review shows that the cost-effectiveness principle limits the choice of emission-reducing

257) Proposition No 76 to the Storting (2006–2007) *Utbygging og drift av Valhall videreutvikling ('Development and operation of Valhall further development')*.

258) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.

measures developers are willing to implement. In the modified PDO for the Statfjord field, for example, the operator states that measures have been considered, but rejected as not being sufficiently cost-effective.[259] In its consideration of the PDO for Ringhorne, the Petroleum Directorate recommends that the operator examine the possibility of joint power supply. In the PDO for Kvitebjørn and Grane, the operator refers to the recommendation and has considered the measure, but concluded that it would be too costly. The Petroleum Directorate's response was to ask the operator to reconsider the measure if the situation changes.

Another example of comments from the petroleum authorities is found in the PDO for Valhall water injection and Valhall flanks, which will also have its power supplied from this centre. In this case, requirements are made for the upgrading of the gas turbines on the Valhall centre unless it is decided to implement power generated onshore. However, such comments from the petroleum authorities are not found in many of the PDO documents.

For some developments, conditions are set for approval of the plan itself. The review shows that none of these conditions are directly related to emission-reducing solutions and remedial measures with a bearing on greenhouse gas emissions.[260]

The Norwegian Pollution Control Authority is one of the consultation bodies for the impact assessment in connection with the PDO and PIO. A review of the consultation statements reveals great variation in the level of detail in the Norwegian Pollution Control Authority's evaluation of submitted impact assessments. In several statements, the Pollution Control Authority calls for a more detailed description of remedial measures planned by the operator to reduce emissions to air. And on several occasions it comments on the lack of clarity relating to the operator's choice of BAT technology. In some cases, it also asks for a better description of alternative solutions and costs relating to them.

The responses from the operators show that the information requested by the Norwegian Pollution Control Authority has often already been given to the petroleum authorities, and that information that is relevant for the Norwegian Pollution Control Authority, particularly relating to the choice of technology solutions, is only submitted to it later, and only on request. This probably has to do with the fact that many of the development solutions and information relating to them are presented to the Petroleum Directorate in the pre-PDO phase, and the Norwegian Pollution Control Authority, as a consultation body, has no access to these studies. The Norwegian Pollution Control Authority receives additional information about the development and the choice of technology solutions when it processes the emission permit application after the PDO and PIO have been processed. The Norwegian Pollution Control Authority stated in an interview that the development of Goliat has been an exception in that the Pollution Control Authority has been in regular contact with the operator and the Petroleum Directorate during the process before and after the impact assessment was submitted. According to the Norwegian Pollution Control Authority, there has been a gradual improvement in this area. The Pollution Control Authority stated in an interview that electrification used to be ruled out at an early stage because it was considered expensive and impractical, but that in the authority's opinion, such assessments were marked by inadequate documentation of what the option of power generated onshore would mean to the development.

The Ministry of the Environment stated in an interview that there is potential for making greater use of the PDO processes to reduce greenhouse gas emissions.

The Pollution Control Act

As stated in section 4.5, the environmental authorities regulate petroleum activities by means of emission permits. As mentioned above, the emission permit application is generally submitted after the PDO has been approved. This means that the investment decisions regarding the choice of technology have already been made. The Norwegian Pollution Control Authority stated in an interview that it takes account of what can be considered BAT technology when it processes emission permits, but that in practice it is the Petroleum Directorate that follows up the operators and their BAT assessments during the planning phase. The Petroleum Directorate confirmed in an interview that it ensures that all new developments use BAT technology.

259) Proposition No 53 to the Storting (2004–2005) *Endra plan for utbygging og drift av Statfjordfeltet og for anlegg og drift av Tampen Link ('Modified plan for development and operation of the Statfjord field and for development and operation of Tampen Link').*

260) Conditions relating to the use of low-NO_X turbines are not considered in this investigation.

6.2.6 Evaluations

The first quantified emission reduction targets for the petroleum sector were set in Report No 34 to the Storting (2006–2007). This report stated that the target is that new policy instruments in the oil and energy sector shall trigger a reduction of between three and five million tonnes of CO_2 equivalents compared with the baseline scenario in the Norwegian Pollution Control Authority's mitigation analysis.

Emissions from the petroleum sector increased by 92 per cent from 1990 to 2007. Since 1998, new large developments have been adopted and targets set for improved recovery in older fields. The amount of emissions per produced unit fell in the 1990s, but has risen again due to an increased proportion of energy-intensive gas production and more production on fields in a mature phase. The actual increase in emissions from the sector has proven to exceed the level estimated in the emission projections. A number of fields have had a longer lifetime than expected, and the most recent projections for the sector show that the sector's greenhouse gas emissions have yet to peak. Another consequence of the extended lifetimes is that the profitability of emission-reducing measures may prove to have been underestimated at the time when the plan for the development was approved.

The policy instruments used to reduce greenhouse gas emissions from the petroleum sector have been based the cost-effectiveness principle. The carbon tax has been the most important policy instrument, contributing to emission reductions corresponding to 2–3 million tonnes per year over a period of 20 years. Although the carbon tax will be included in the companies' profitability calculations together with the expected allowance price when development alternatives are considered, reporting from the companies has shown that the tax level is increasingly ineffective in triggering new emission-reducing activities on the continental shelf. This indicates that the sector now has few remaining measures where the costs are equal to or lower than the total cost of allowances and taxes. There is reason to point out that, given the current allowance prices, total regulation of the petroleum sector through allowances and a lower carbon tax rate provides no greater financial incentive for implementing expensive measures than the tax did.

The most important long-term framework for emission-reducing solutions for individual installations is determined during the development of the plan for development and operations (PDO), based on the developer and the authorities' assessment of the overall regulation. The investigation shows that the documentation made available provides little evidence of the petroleum authorities requiring the developer to apply emission-reducing technology solutions. Moreover, the alternative development solutions are not sufficiently highlighted in the PDO documents submitted during the process. Few fields have been electrified, and the petroleum authorities generally emphasise profitability considerations and security of supply based on the companies' own assessments. The reduction potential of alternative solutions has been given little attention in the PDO documents. This makes it difficult to evaluate whether sufficient account is taken of the emission-reduction consideration.

6.3 How does restructuring of energy consumption and production help to achieve climate targets?

Energy production and consumption can have direct or indirect effects on greenhouse gas emissions. According to the Ministry of Petroleum and Energy's letter of 7 December 2009 the effort to restructure the consumption and production of energy takes as its starting point Report No 29 to the Storting (1998–99) *On Norwegian energy policy* (The Energy Report). This report states that, as regards energy policy, environmental goals will determine production possibilities, and that it is necessary to pursue an active policy to limit energy consumption. According to the Ministry, it is also necessary to establish a more diversified energy supply so as to make Norway less vulnerable to fluctuations in the hydropower situation, cf. Report No 18 to the Storting 2003–2004) *Om forsyningssikkerheten for strøm mv. (On security of supply for electricity etc.)*. The Ministry also points out that from the environmental point of view, it is important to reduce greenhouse gas emissions from use of oil burners in buildings. It is also important to limit the use of electricity, thereby reducing the need for new power production and new power lines that would involve considerable environmental encroachment. The Ministry plans for the use of a wide range of energy resources, including water-borne heating, wind power and domestic gas infrastructure, and emphasises that energy restructuring is a long-term project.

6.3.1 Targets in the energy restructuring work

In Report No 29 to the Storting (1998–99) *On Norwegian energy policy*, the Ministry of Petroleum

and Energy presented energy restructuring targets based on the energy committee's recommendations.[261] The Storting's recommendation after considering this report provided the framework for the energy restructuring objective presented in the Ministry of Petroleum and Energy's annual budget propositions.[262] The Energy Report set targets for increased use of renewable energy, with separate targets for wind power and water-borne heat. It also recommended limiting the consumption of oil for heating, and proposed targets to limit electricity consumption and become less reliant on electricity for heating.[263]

Increased production and consumption of renewable energy

In Proposition No 1 to the Storting (1998–99), the Ministry of Petroleum and Energy proposed that Norway should aim to be self-sufficient in electricity from renewable energy sources in normal years. The goal would be realised by ensuring that renewable energy sources in future would account for a significantly larger proportion of total energy use.

In Report No 29 to the Storting (1998–99), the Ministry of Petroleum and Energy presented the following objectives for increased use of renewable energy and reduced energy consumption:

- to limit energy consumption considerably more than would be the case if developments were allowed to continue unchecked
- to increase annual use of water-borne heat based on new renewable energy sources, heat pumps and waste heat by 4 TWh by 2010
- to construct wind power plants with an annual production capacity of 3 TWh by 2010

The committee's majority wanted to support the development of renewable energy sources, arguing that the development of renewable energy presupposes technological advances, and that it will take time for this development to produce competitive solutions.[264] The committee's majority pointed out that the wind power industry must be guaranteed stable framework conditions in order to attain the target of 3 TWh wind power per year. As regards hydropower, in Recommendation No 122 (1999–2000), the Storting asked the

261) Recommendations in official Norwegian report NOU 1998:11 *Energi- og kraftbalansen fram mot 2020 ('The Energy and Power Balance towards 2020')* have formed the basis for a number of energy policy targets in the past ten years.
262) Recommendation No 122 to the Storting (1999–2000).
263) The Energy Report describes an overall energy policy that is too wide-ranging for us to describe here. In this report we will only consider the objectives relevant to the investigation.
264) Recommendation No 122 to the Storting (1999–2000).

Photo: Espen Bratlie / Samfoto

government to propose incentives for realising the great potential for repairing and improving existing hydroelectric power plants, and also for improving energy recovery in industry.

In 2002, at the Storting's request,[265] the Ministry of Petroleum and Energy presented a strategy for a national infrastructure for water-borne heat in which it emphasised that the transition from fossil fuels to water-borne heat could help to reduce greenhouse gas emissions.[266] In this strategy, increased use of water-borne heat is a prerequisite for achieving the overriding energy and environmental goals. It was emphasised that water-borne heat allows for greater energy flexibility, increased security of supply, efficient utilisation of environmentally friendly energy sources and improved indoor climate and comfort. It also mentioned the use of other energy sources to replace fossil fuels as one of the measures that may reduce emissions.

Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* signalled that the Government wants increased production and use of bioenergy. Targeted and coordinated use of policy

265) Recommendation No 263 to the Storting (2000–2001).
266) *Strategi for utbygging av vannbåren varme ('Strategy for development of water-borne heat')*, 2002. The Ministry of Petroleum and Energy.

instruments is essential to promote the development of bioenergy by up to 14 TWh by 2020. This target is repeated in the Ministry of Petroleum and Energy's *Strategi for økt utbygging av bioenergi ('Strategy for increased bioenergy development')*.[267]

Reduced use of oil burners

The Energy Report[268] expressed a wish to limit the use of oil-fired heating. In 2002, a target was set to reduce the use of fuel oil by 25 per cent in the period 2008–2012 compared with the average for the period 1996–2000. In this context, a strategy was developed for the transition from oil-fired heating to heating using renewable energy sources.[269] The strategy states that the development of new renewable energy sources is a precondition for this. The target is viewed in conjunction with energy restructuring, and measures via Enova are considered the most important element in the strategy. Measures that result in energy saving and a transition to water-borne heat based on renewable energy, waste heat and heat pumps will be triggered via Enova.[270]

Reduced energy consumption and energy efficiency

In the processing of the Energy Report, an objective was set to limit energy consumption considerably more than would be the case if developments were allowed to continue unchecked.[271] The Ministry of Petroleum and Energy wanted to follow up by increasing electricity tax in order to reduce electricity consumption. A corresponding increase in the tax on fuel oil was also proposed to prevent transition from electricity to fuel oil.[272] Proposition No 1 to the Storting (2000–2001) favoured special focus on buildings and industry.

According to Recommendation No 145 to the Storting (2007–2008), the majority of the Standing Committee on Energy and the Environment were in favour of a setting a target of improving energy efficiency in the power grid and power production by 20 per cent by 2020. This was to be achieved by upgrading the power grid to reduce loss during hydroelectric power production, efficiency measures to reduce loss in the transfer grid and by repairing and renovating existing hydroelectric power plants. Smaller power plants would also be given better access to the power grid. In supporting Report No 34 to the Storting (2006–2007), the committee's majority also favoured the prioritisation of energy efficiency in buildings. The majority assumed that some of the extra money in the Energy Fund would be used for strengthening Enova's Programme for the Built Environment to expand the opportunities for developing and using new efficient building methods and materials.

6.3.2 Relevant energy restructuring measures

Stationary onshore energy consumption includes all energy except for that used in transport and in the energy sector, i.e. energy that is used to produce and convert energy. Figures from Statistics Norway show that electricity accounts for 50 per cent of final use of energy in Norway, and hydroelectric power for 98–99 per cent of the country's electricity production.

In Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy,* it was pointed out that Norway differs from other countries in that most of its domestic energy consumption is in the form of electricity, primarily hydroelectricity. This helps to keep greenhouse gas emissions from domestic energy consumption low compared with other countries, but it also means that Norway has fewer opportunities than other countries to reduce existing emissions in the energy sector.

Average power production in the past ten years has been 123.8 TWh.[273] The Ministry of Petroleum and Energy states that in the three-year period from 2006 to 2008, production was started up for hydroelectric power plants with an annual production capacity corresponding to about 2.5 TWh. The Norwegian Directorate of Water Resources and Energy stated in an interview that a major part of available hydroelectric power potential has already been developed, and that investments in wind power must be increased. The Norwegian Directorate of Water Resources and Energy is considering a total hydroelectric power potential of 37.7 TWh based on projects under construction, permits granted, projects for which applications have been submitted and remaining potential. The Directorate states that since 2003 there has been a special programme for small power plants to study ways of making operations more efficient and introducing new technology.

267) *Strategi for økt utbygging av bioenergi ('Strategy for increased bioenergy development')*, 2008. The Ministry of Petroleum and Energy.
268) Report No 29 to the Storting (1999–2000) *On Norwegian Energy Policy*
269) Proposition No 1 to the Storting (2003–2004) *The Ministry of Petroleum and Energy*.
270) Proposition No 1 to the Storting (2003–2004) *The Ministry of Petroleum and Energy*.
271) Recommendation No 122 to the Storting (1999–2000).
272) Proposition No 1 to the Storting (1999–2000) *The Ministry of Petroleum and Energy*.
273) The median for the same period was 121.5 TWh. The median is the middle measurement and is more stable in relation to extreme values. This value is a result of this period containing four or the highest production years ever recorded.

Fact box 6.1 Facts about energy carriers

Primary energy carriers include coal, crude oil and hydropower, which are all produced without using other forms of energy as raw materials. Different energy carriers differ in quality. High-quality energy carriers such as electricity can be used for a number of purposes. Lower-quality energy carriers such as district heating can be used for heating purposes. In order to reduce the use of electricity, the demand for energy where high quality is not required must be met by means of alternative energy carriers.

Source: NOU 1998:11 Energi- og kraftbalansen fram mot 2020 ('The Energy and Power Balance towards 2020')

The Norwegian Pollution Control Authority's mitigation analysis identifies measures relating to stationary combustion for mainland industry and the use of energy for heating. The 2002 analysis estimates that, on the basis of the projections available at that time, realisation of the entire energy efficiency potential would entail a reduction of 1.5 million tonnes of CO_2 equivalents, or 20 per cent of heating-related emissions. The mitigation analysis is based on the assumption that the 16–18 TWh of fossil fuels used for heating could be replaced by alternative energy sources.[274] According to the 2000 mitigation analysis, implementing these measures could result in as much as 60 TWh of heat from alternative energy sources in 2010. The higher costs compared with oil and electricity will limit the implementation of the measures in question.[275]

The 2005 mitigation analysis studied measures in stationary use and production of energy that will total reductions corresponding to 1.7 million tonnes of CO_2 equivalents in 2010 and 3 million tonnes in 2020.[276] The 2010 scenario could be realised at a cost corresponding to NOK 200 kroner per tonne of CO_2 equivalents. The Norwegian Pollution Control Authority's 2007 report is based on the measures from the 2005 analysis.[277] Reduction of energy consumption in buildings is the measure with highest feasibility, both in terms of costs and technological barriers. The total reduction potential for energy consumption in buildings for 2020 is estimated at about 3 million tonnes of CO_2 equivalents, but the Norwegian Pollution Control Authority does not deem it feasible to trigger all the measures. The report also identifies a large reduction potential in energy efficiency measures and modification of oil-fired boilers in industry. These measures are deemed to have a high degree of feasibility.

Table 6.1 shows the reduction potential of a transition to bioenergy through conversion from oil. As the table shows, the costs of implementing the measures are low, while feasibility varies from high to low. The measures with the highest feasibility potential are conversion from oil to solid and liquid biofuels in industry. The

Table 6.1 Emissions reductions and costs of bioenergy measures

Measure	Reduction potential (million tonnes of CO_2 equivalents)	Cost	Feasibility
Conversion from oil to solid biofuel in industry	0.750	Less than 200 NOK/tonne	Good possibility of implementation
Conversion from oil to liquid biofuel in industry	0.023	Less than 200 NOK/tonne	Good possibility of implementation
Transition to biogas in industry	0.040	Less than 200 NOK/tonne	Medium possibility of implementation
Conversion of oil boilers to bioenergy boilers	1.128	Less than 200 NOK/tonne and between 200 and 600 NOK/tonne	Medium to poor possibility of implementation
Total reduction potential	**1.941**		

Source: *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020 ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')*, Norwegian Pollution Control Authority, Report TA-2254/2007; Civitas AS and K. Gurigard (2005): *Nasjonal klimatiltaksanalyse: Delanalyse om tiltak innenfor energibruk og –produksjon (National Climate Measures Analysis: sub-mitigation analysis in the field of use and production of energy)*

274) The reduction potential from energy efficiency of 3 TWh has been deducted.

275) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010')* Norwegian Pollution Control Authority. TA-1708:2000 59.

276) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010 og 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010 and 2020')* Norwegian Pollution Control Authority. Report TA-2121/2005 38.

277) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2554/2007.

conversion of oil-fired boilers to bioenergy boilers has a reduction potential of more than 1 million tonnes of CO_2 equivalents, but costs and feasibility are uncertain.[278]

6.3.3 Roles and responsibilities in energy restructuring

Enova

The state-owned enterprise Enova SF has been fully operational since 1 January 2002. Enova's task is to promote the more efficient use of energy, the production of new renewable energy and the environmentally friendly use of natural gas. Enova is to manage the Energy Fund's resources as well as funds for realisation of natural gas infrastructure and a special grants scheme aimed at households. Separate statutes have been created stipulating, among other things, that the Energy Fund shall provide a long-term source of funding for energy restructuring.[279] The Energy Fund's income comes from an add-on to the network tariff of 0.01 NOK/kWh. The bulk of the yield from the Norwegian energy efficiency and renewable energy fund *Grunnfond for fornybar energi og energi-effektivisering (Grunnfondet)* is added to the Energy Fund. In addition, the Energy Fund receives funding through the national budget and from interest earned in the previous year on the balance of the fund. The Energy Fund's 2010 income is estimated to about NOK 1.8 billion.[280]

The Ministry of Petroleum and Energy states that in order to strengthen this effort, the government created *Grunnfondet* in 2007 with a fund capital of NOK 10 billion.[281] In 2009 another NOK 10 billion[282] were added, and it has been proposed to add a further NOK 5 billion in 2010. The fund is estimated to yield a sum in the order of NOK 1 billion from 2011[283], which will more than double the Energy Fund's annual income.

Enova's primary objectives are mostly aimed at long-term development of the market for renewable energy and energy efficiency. Enova manages a broad range of policy instruments developed on the basis of insight into the functioning of the various markets, and it is responsible for allocating funding and following up projects receiving support. Enova allocates funds in accordance with the objectives and criteria stipulated in the agreement with the Ministry of Petroleum and Energy on the management of the Energy Fund, and it seeks to utilise the funds as cost-effectively possible.[284]

One important criterion is that the projects must contribute to lasting change in the use and production of energy. The funding must function as a trigger for the projects. Importance is also attached to the players' implementation capacity, the projects' positive ripple effects and their importance to market development.[285]

The Ministry of Petroleum and Energy manages Enova and its activities through an agreement that describes the objectives and financial terms for the activity. The performance targets for reduced use of energy and increased production and use of renewable energy stipulated during the processing of the Energy Report have been operationalised through the agreement with Enova. The Ministry wanted an arrangement that was simple and targeted. The Ministry of Petroleum and Energy states that it receives reports on both the contractual and realised results, but emphasises that progressing from idea to implemented project takes years. The Ministry states that this sort of reporting was deemed preferable to a complete absence of quantification of target achievement.

The Norwegian Directorate of Water Resources and Energy

The Norwegian Directorate of Water Resources and Energy processes licences and is in practice the body regulating the development of renewable energy. When processing applications for power production licences the Ministry emphasises environmental considerations, security of supply and value creation. The Directorate administers the Energy Act and its seven pertaining regulation, which are designed to ensure socially rational power production and power system development. In addition, the Directorate has administrative tasks relating to the Water Resources Act, the Act relating to Regulations of Watercourses and the Industrial Licensing Act. The Directorate also administers a number of EU directives and is

278) Civitas and K. Gurigard (2005): *Nasjonal klimatiltaksanalyse: Delanalyse om tiltak innenfor energibruk og –produksjon (National Climate Measures Analysis: sub-mitigation analysis in the field of use and production of energy)*.
279) Proposition No 1 to the Storting (2009–2010) *The Ministry of Petroleum and Energy.*
280) Proposition No 1 to the Storting (2009–2010) *The Ministry of Petroleum and Energy.*
281) Proposition No 1 to the Storting (2006–2007) *The Ministry of Petroleum and Energy*.
282) Proposition No 1 to the Storting (2008–2009) *The Ministry of Petroleum and Energy*.
283) Proposition No 1 to the Storting (2009–2010) *The Ministry of Petroleum and Energy.*
284) Proposition No 1 to the Storting (2009–2010) *The Ministry of Petroleum and Energy.*
285) Proposition No 1 to the Storting (2009–2010) *The Ministry of Petroleum and Energy.*

responsible for an energy efficiency programme for power-intensive industry.

The Norwegian Directorate of Water Resources and Energy states that in the 2000s, its allocation letters from the Ministry of Petroleum and Energy contained no regular management signals for which climate considerations were given as basis. In recent years, however, the Ministry has stressed energy restructuring more in the allocation letters. A review of allocation letters show that the letters from 2007, 2008 and 2009 ask the Directorate to 'contribute to Norway's fulfilment of its climate commitments in its energy and watercourse administration'. In the allocation letters, the Directorate was asked to give priority to processing of licences for energy production, energy restructuring and adaptation to a changed climate. According to the Ministry of Petroleum and Energy, the Directorate shall give first priority to processing projects aimed at improving security of supply, particularly for regions at risk. This means that the Norwegian Directorate of Water Resources and Energy shall give top priority to power lines in the central and regional grids. Next in line are hydroelectric power, wind power and district heating projects. As regards energy restructuring, the 2009 allocation letter states that energy restructuring is 'a long-term investment in the development of the market for efficient and environmentally friendly energy solutions that help to improve the security of energy supply and reduce greenhouse gas emissions'.

6.3.4 Policy instruments and the effects of their use

Nearly all use of fossil fuel is subject to the carbon tax or included in the emissions trading scheme, see chapter 4. In addition, there is a separate tax for fuel oil and a consumer tax on electricity.

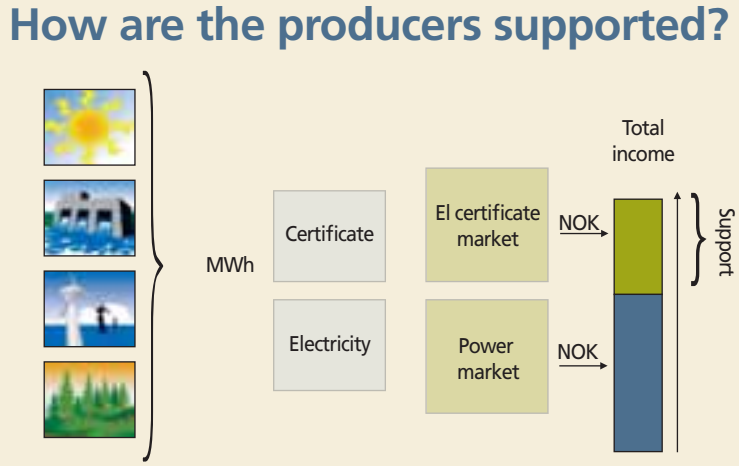
Use of policy instruments to increase the proportion of renewable energy

According to the energy authorities, the most important policy instruments for increasing the proportion of renewable energy sources are the licensing system and the agreement with Enova. Two funding schemes have also been adopted, but not implemented.

In a petition resolution in 2003, the Standing Committee on Energy and the Environment asked the government to take the initiative for a joint Norwegian-Swedish market for trade in electricity certificates, a so-called mandatory green certificate market.[286] It was the committee's opinion that a green certificate market would result in increased production of renewable energy and strengthen

Fact box 6.2 Green certificates

Green certificates are a market-based funding scheme for the development of renewable energy. The trading of certificates will provide power producers with income over and above the price they are paid for power. Producers of renewable electricity are allocated certificates corresponding to the amount of energy they produce. The annual allocation of electricity certificates corresponds to the desired production level for a given year. In addition, all purchasers of electricity also have to purchase a certain amount of certificates. The price of certificates will be determined by supply and demand in the market. These certificates function like a consumer tax – power becomes a little more expensive. They also function as a subsidy to suppliers.



Source: The Norwegian Directorate of Water Resources and Energy and the Ministry of Petroleum and Energy

286) Recommendation No 167 to the Storting (2002–2003), cf. Report No 9 to the Storting (2002–2003) *On domestic use of natural gas etc.*

the Norwegian and Nordic power balance, reducing price fluctuations and vulnerability to dry years with less water in the reservoirs. The Ministry of Petroleum and Energy stated in an interview that the negotiations with Sweden in 2006 failed to produce agreement on burden sharing. Norway initiated a new round of negotiations in 2007, and in 2009 it entered into an agreement with Sweden on the principles for further development of a joint market for electricity certificates.[287] The joint market is scheduled to come into effect on 1 January 2012. The Ministry of Petroleum and Energy stated in its letter of 7 December 2009 that the countries' obligations under the certificate scheme must be adapted to a potential future implementation of the EU Renewable Directive into the EEA Agreement.

The financial support scheme for renewable energy production proposed by the Government was to include power produced from the first 3 MW of installed output in new hydroelectric power plants, modernisation of existing hydroelectric power and all other new power production from renewable sources of energy.[288] The electricity funding scheme was to be introduced from 1 January 2008 and administered by Enova, but it was not implemented because the Climate Settlement in the Storting decided that an electricity certificate market should be established instead.

The Norwegian Directorate of Water Resources and Energy stated in an interview that uncertain framework conditions for developers have lessened the effect of efforts to develop renewable energy sources. The players have received changing signals over a number of years due to the uncertainty surrounding the green certificates project. According to the Directorate, developers have postponed construction of planned wind power plants and certain small power plants pending the implementation of new financial support schemes from which funding is anticipated. The Norwegian Directorate of Water Resources and Energy also points out that the fact that developers consider Enova funding to be a transitional scheme adds to the uncertainty.

The licensing system is founded on the Energy Act, which provides the framework for the requirements for granting licences to develop and run power plants. The processing of licences for hydroelectric power plants is founded in the Water Resources Act, the Act relating to Regulations of Watercourses and the Industrial Licensing Act. The Norwegian Directorate of Water Resources and Energy processes applications for development of hydroelectric power, wind power, district heating and gas power.

The Norwegian Directorate of Water Resources and Energy emphasised in an interview that inadequate licence processing capacity has been a challenge. The processing of licences for small power plants, for example, requires a lot of work in relation to the number of kilowatt hours for which the licence will apply. The development projects are becoming increasingly complex and encounter stronger resistance, which increases the workload. It would have been possible to develop more power from small power plants if capacity in all parts of the system had been greater. There are also capacity problems in relation to the processing of applications for wind power and district heating. The number of executive officers in the Directorate's licensing unit was increased since 2002, but the capacity was still not sufficient to cope with the increased workload. The licensing unit was therefore strengthened further both in 2008 and in 2009. The licence processing capacity of the Norwegian Directorate of Water Resources and Energy doubled from 2005 to 2009.

The Norwegian Directorate of Water Resources and Energy states that the most important challenge concerns whether to prioritise global climate considerations or local environmental considerations when licence applications are processed. Hydropower and wind power developments in particular encroach on Norwegian nature. The Directorate points out that this must be considered in relation to e.g. gas power, for which increased CO_2 emissions is a particular concern.

Another issue is whether increased production is necessary to ensure security of supply. Generally speaking, there will be opposition to all new power developments and power lines. The authorities need to get the message across that new lines are necessary to the development of renewable power. It is largely a matter of what local developments will be accepted by the community.

The Norwegian Directorate of Water Resources and Energy states that the EU Directive on renewable energy, which came into force in Norway in 2006 via the EEA Agreement, is

287) Agreement on principles for further development of a joint market for electricity certificates, 7 September 2009.

288) Report No 11 to the Storting (2006–2007) *Om støtteordningen for elektrisitetsproduksjon fra fornybare energikilder (fornybar elektrisitet) ('On the funding scheme for electricity production from renewable energy sources (renewable electricity)').*

considered an important policy instrument.[289] The directive stipulates requirements for increased use of renewable electricity, which has led to greater focus on the matter. This EU directive contains a target that the consumption of electricity based on renewable sources should account for 22.1 per cent of EU consumption by 2010. In collaboration with the European Commission, Norway set its own indicative target of 90 per cent renewable energy in Norway by 2010 based on the relationship between renewable electricity production and the total consumption of electricity. The Ministry of Petroleum and Energy stated in an interview that this target has not necessitated the initiation of new measures in Norway over and above those already planned for implementation. The Norwegian Directorate of Water Resources and Energy states that the guarantees of origin scheme was introduced as a result of the directive. Guarantees of origin provide consumers with an opportunity to choose electricity produced from renewable energy sources, see fact box 6.3. The scheme has also resulted in Norway exporting many guarantees of origin to environmentally conscious consumers in other countries. In an interview, the Ministry of Petroleum and Energy agreed that the creation of guarantees of origin is the most important development to have taken place in the wake of the directive, and deems it to have been very useful to the industry. According to the Ministry, the guarantees of origin scheme influences the development of renewable energy insofar as it provides predictable long-term income for producers.

Fact box 6.3 Guarantees of origin

A guarantee of origin can be issued for electric energy produced from renewable energy sources. A guarantee of origin allows the power producer to document that the enterprise's power consumptions does not pollute, neither in the form of CO_2 emissions nor of nuclear waste. This may give the producers an important edge, particularly in the international market where the focus on environmentally friendly production is strong.

Statnett SF has been appointed issuer of guarantees of origin by the Ministry of Petroleum and Energy. The requirement that the State shall create a system for the issuing of guarantees of origin follows from the EU Renewable Directive.

Source: Statnett SF

289) Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market (the Renewable Directive), also known as the RES Directive.

The Ministry of Petroleum and Energy states that the Ministry has reported target achievement to the ESA pursuant to the Renewable Directive, and that it stands to achieve the target for 2010.

The Norwegian Directorate of Water Resources and Energy states in an interview that the new Renewable Directive adopted by the EU in December 2008 will have a great impact on Norwegian national renewable energy targets if it is also implemented in Norway through the EEA Agreement. The Directive has shifted from stipulating guideline requirements for the use of renewable energy to stipulating binding requirements for the percentage of renewable energy. Should Norway be subject to corresponding requirements to those imposed on its neighbouring countries, that might entail the production of a further 30–40 TWh of renewable energy, provided that consumption remains stable.

Results for production of renewable energy

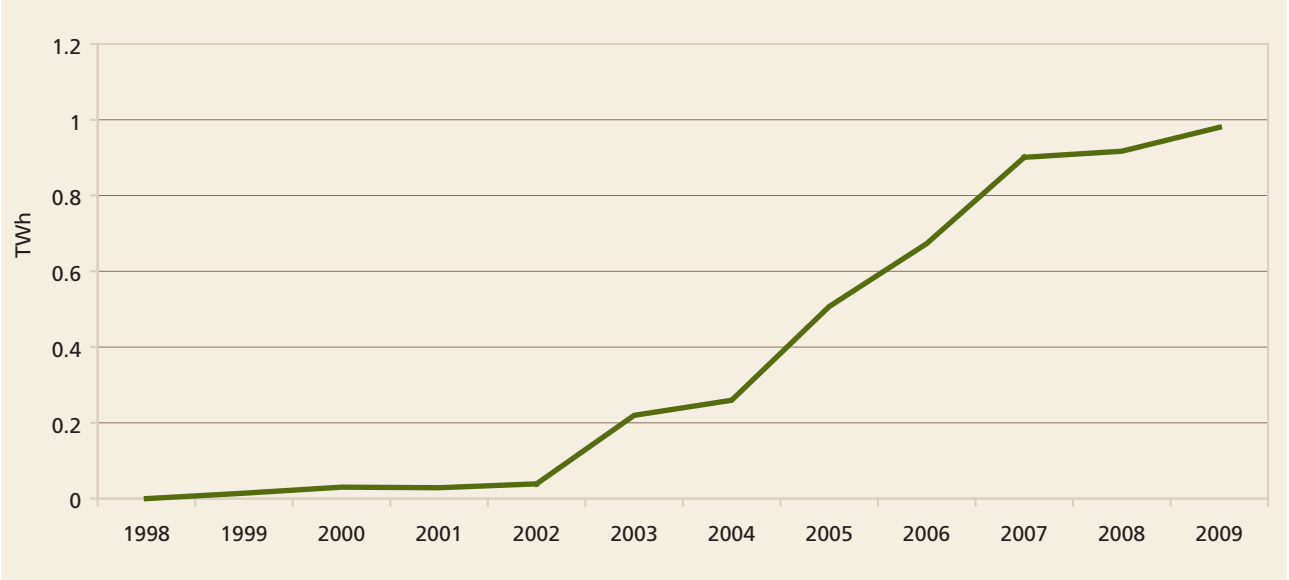
a) Wind power

Figures from Statistics Norway show that wind power accounts for just under 1 per cent of Norwegian electricity production. The Norwegian Directorate of Water Resources and Energy states on its website that, based on the power plant owners' own production estimates, wind power corresponding to an annual production of about 1 TWh had been developed by the end of 2007. Production statistics for 2007 show that the annual production of 0.9 TWh was lower than could be expected on the basis of estimated wind conditions in 2007.[290] Figure 6.4 shows the reported reported production figures for 2008 and 2009, too. The figures show that wind power production increased somewhat in 2008 and 2009. The main trend is that production during the period since the baseline year 2001 corresponds to one third of the target of 3 TWh per year. In October 2009, the Ministry of Petroleum and Energy informed the Storting that the Ministry does not expect the wind power target to be reached by 2010.

According to the Norwegian Water Resources and Energy Directorate, licences corresponding to more than 3 TWh per year have been granted, but many of the plants have not been realised for reasons of cost and profitability. Wind power technology still faces challenges, and the costs are higher than for traditional energy forms.

290) Norwegian wind power production in 2008. The Norwegian Water Resources and Energy Directorate website, 20 May 2009.

Figure 6.4 Wind power production 1998–2009[291]



Source: Statistics Norway

Several allocation letters from the Ministry of Petroleum and Energy state that the Norwegian Water Resources and Energy Directorate should take account of the renewable energy effort and give priority in licence processing to wind and hydroelectric power plants. However, in 2007 the Norwegian Water Resources and Energy Directorate guidelines for prioritisation of licence applications indicated that processing licences for wind power plants should be given low priority. It emerged in an interview with the Norwegian Water Resources and Energy Directorate that this list of priorities was drawn up in 2007 due to insufficient capacity and profitability. Wind power had low priority until summer 2008, when licence processing for wind power was upgraded and given the same priority as hydropower and district heating, cf. Proposition No 1 to the Storting (2007–2008).

By July 2009, Enova had supported the development of a total of 1.6 TWh of wind power production by allotting investment grants to players with licences to build wind power plants.[292] Enova gives priority to cost-effective projects that produce a lot of power per krone invested.[293] As of July 2009, Enova had actively supported 14 wind power projects, eight of which have been developed.[294]

The Norwegian Water Resources and Energy Directorate's 2007 publication on the costs of producing power and heat estimates that the unit costs for wind power plants larger than 1 MW exceed NOK 0.396 per kWh. This includes both investment and production costs. According to this report, the costs have increased and will, at least in Norway's case, continue to increase.[295] The reason for this is the limited grid capacity in coastal areas far away from the central grid, and the consequent need to improve the grid.

New renewable energy is not profitable at current prices. The Norwegian Water Resources and Energy Directorate states that the development and operation of wind power will require financial support given the current power price. Also, production targets for renewable energy are not being reached within the framework of the market-based energy system. The Ministry of Petroleum and Energy also states that it is the power market that determines the power price, thereby influencing the profitability of investments in renewable energy.

291) The figures for 2009 include production of wind power reported to the Norwegian Water Resources and Energy Directorate published on their website 3 Februay 2010.
292) Press release from Enova, 9 July 2009. The last allocation was completed in July 2009.
293) Cf. Enova's website.
294) The eight projects in question are: Gartefjellet, Sandhaugen, Nygårdsfjellet, Hundhammerfjellet, Bessakerfjellet, Valsneset, Hitra, Smøla I and II (counted as one project) and a test field in Tromsø. Enova Næring. Fornybar kraft *('Renewable energy')*, 28 July 2009.
295) Handbook 1-07: *Kostnader ved produksjon av kraft og varme ('The costs of producing power and heat').* The Norwegian Directorate of Water Resources and Energy 2007.

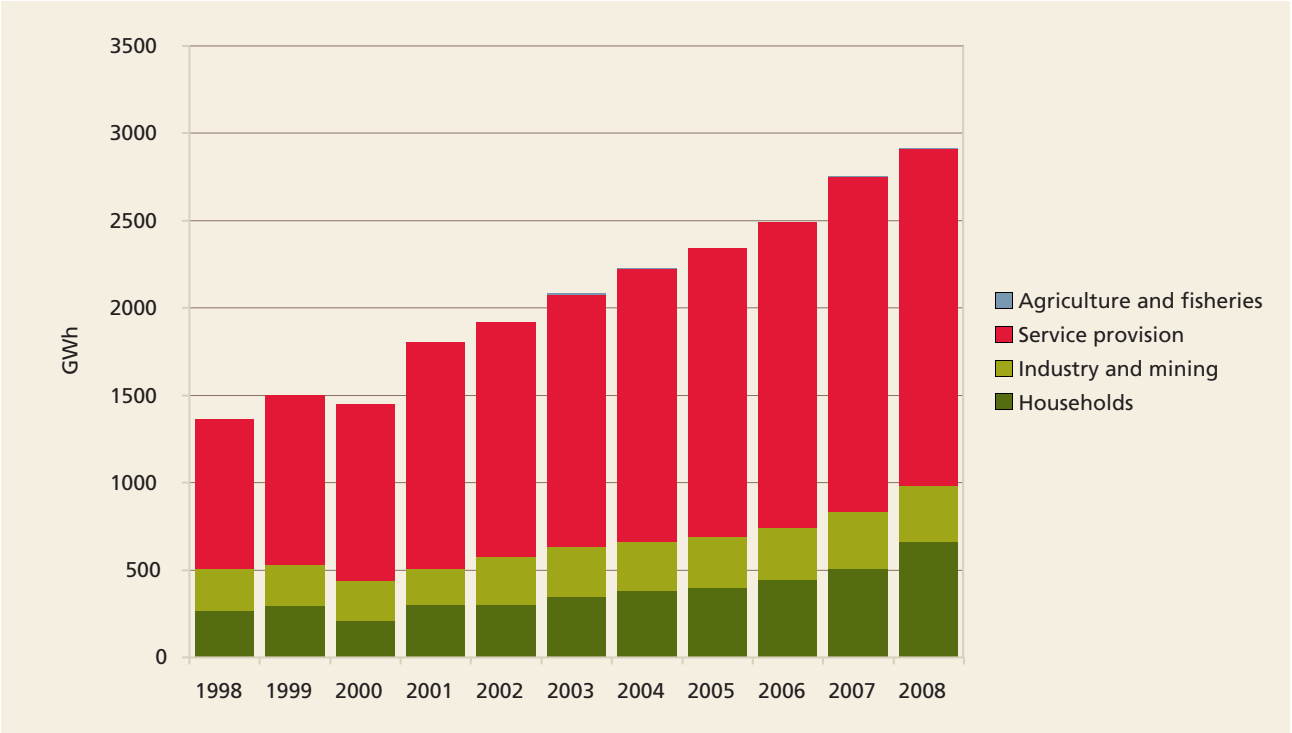
b) Heating solutions based on renewable energy
This investigation focuses its review of the work to increase the proportion of renewable heating solutions on district heating. The Ministry of Petroleum and Energy stated in an interview that the development of district heating is important because more use of district heating could mean less use of oil-fired heating. The Ministry has also stated that the most important market for district heating is buildings currently using oil-fired heating, but that bioenergy-fired central heating boilers are another alternative for these buildings.

The Ministry of Petroleum and Energy has wanted to prioritise this work using financial policy instruments, particularly Enova, to achieve the goal of increased use of renewable energy heating solutions.[296] Enova's performance reporting to the Ministry of Petroleum and Energy shows that contracts had been entered into for heating projects corresponding to 3,289 GWh by the end of 2008, but that contractually agreed projects corresponding to 878 GWh were cancelled during the period 2001–2008. The final result reported at the end of 2008 was 927 GWh.

Figure 6.5 shows that district heating consumption has increased, and in 2008 it totalled about 3 TWh. The figure shows that consumption has increased most in the service sector, which is also the sector with the greatest consumption. Consumption in households has increased somewhat, particularly from 2007 to 2008, but consumption in industry and mining has remained stable. Agriculture and fisheries account for the smallest percentage of total district heating consumption.

Increased development of district heating requires the necessary infrastructure to be in place. Licence processing is a precondition for achievement of this target. The Norwegian Directorate of Water Resources and Energy states that in recent years, several companies have applied to develop district heating in the same place, which has caused processing and assessments to take longer. Up to and including 2005, little district heating was developed, but interest has risen rapidly since 2006, with 80 applications. Some of these concerned projects for which applications for financial support had previously been rejected, but where the developers had been encouraged to re-apply. A large number of new district heating licences have been granted in recent years, and there is now significant growth in district heating

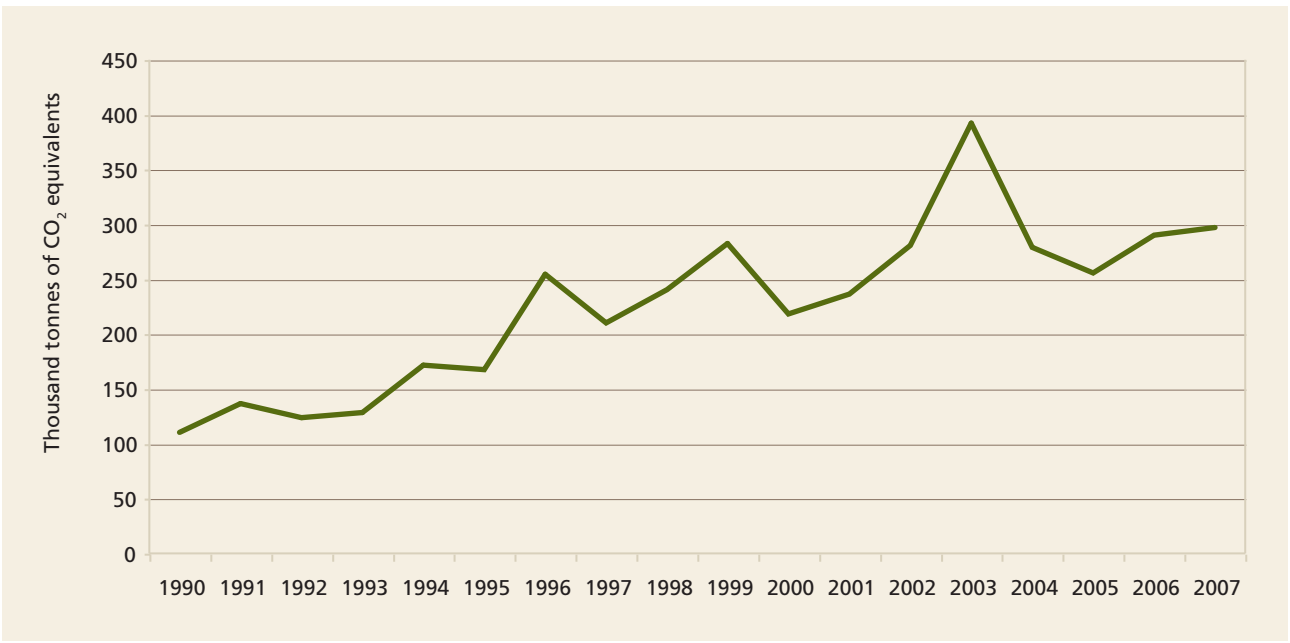
Figure 6.5 District heating consumption 1998–2008



Source: Statistics Norway

296) Proposition No 1 to the Storting (2002–2003) *The Ministry of Petroleum and Energy*.

Figure 6.6 Emissions from district heating production 1990–2007



Source: Statistics Norway and the Norwegian Pollution Control Authority

production. Funding from Enova is also a prerequisite for establishing the financial framework for development.

Both the Ministry of Petroleum and Energy and the Norwegian Directorate of Water Resources and Energy point out that historically, Norway has had a good supply of cheap electricity, while there has been limited development of district heating systems and internal water-borne heating in buildings. The development of an infrastructure for district heating is a costly and a very long-term project. District heating requires internal water-borne heating to be installed in buildings. Water-borne heating will normally only be an option for new constructions or major modifications.

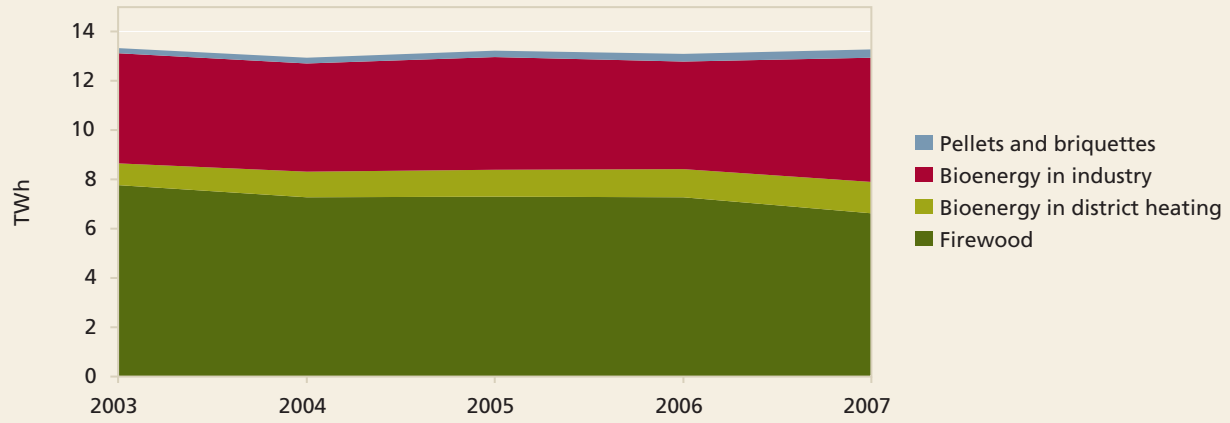
According to the Ministry of Petroleum and Energy, district heating may in many cases be considered an energy efficiency measure in the broad sense, since it enables effective use of energy that would otherwise have been wasted. This particularly applies to waste incineration plants and plants that utilise waste heat from industry.

Figures from Statistics Norway show that waste is the greatest energy source for district heating systems, and accounted for 44 per cent in 2008. Wood chips and bark accounted for 14 per cent. Bioenergy is not suitable as a peak load fuel, and oil, electricity and gas are used as peak load fuels in district heating. Statistics show that about 28 per cent of the district heating energy supplied in the years 1998–2008 came from oil, gas and electricity. District heating may generate more emissions than some other renewable sources. The figures show that consumption from oil boilers has decreased proportionately, while consumption from electric and gas boilers and gas has increased.[297] These energy sources are also used as reserve load to guarantee supply. The Norwegian Directorate of Water Resources and Energy states that even more oil is used when new heating plants are established. The Directorate points out that district heating will not automatically reduce greenhouse gas emissions, but will have an effect if a large number of plants are established. The Directorate is of the opinion that reducing the use of oil as a peak load fuel and replacing it with renewable power will improve the climatic effect. Moreover, expanding existing plants will be better than establishing new district heating plants.

Figure 6.6 shows the trend in greenhouse gas emissions from district heating during the period 1990–2007. Emissions from district heating increased over a period, peaking in 2003, and then started to increase again from 2006. This could be due to an increased development of district heating. Although total emissions have increased, the statistics show that emissions per produced unit have fallen.

297) The main trend for electricity is an increase, but there was a reduction of the proportion in 2008.

Figure 6.7 The use of bioenergy in Norway 2003–2007



Source: Statistics Norway

c) Results for bioenergy

Bioenergy is used as a collective term for energy recovered from biological material (biomass) including biological waste, wood, various agricultural plants and biogas. Figure 6.7 shows the use of bioenergy for district heating production and for industrial consumption as well as wood-burning during the period 2003–2007. Total consumption during this period was about 13 TWh. Bioenergy consumption in industry accounted for approx. 4.5 TWh in the period from 1998 to 2003. The energy consumption from wood-burning during the period between 1998 and 2007 varied between just under 6.5 TWh in 1998, almost 8 TWh in 2003, and just over 7 TWh in 2007.

Sales of wood pellets and wood briquettes have almost doubled from 2003 to 2007, but remains low compared with sales of traditional firewood. A total of 43,000 tonnes of pellets and briquettes was sold in 2003, while in 2007, nearly 75,000 tonnes were sold.

The Ministry of Petroleum and Energy has responsibility for the consumption side of the bioenergy effort, both for guaranteeing the availability of bioenergy and for creating a demand for bioenergy in the market. According to the Ministry, grants through Enova constitute the most important policy instrument. It is also emphasised that bioenergy consumption is influenced by energy prices, taxes and other policy instruments. The Ministry of Petroleum and Energy's strategy for increased bioenergy development signals an escalation of its contribution to research on renewable energy, including bioenergy. The Ministry states that an insufficiently developed infrastructure for heat distribution is a considerable obstacle to being able to use and switch between environmentally friendly energy sources in the energy supply.[298] According to the Ministry, the target figure of 14 TWh of bioenergy is perceived as unclear, since it is not made clear whether the target applies to consumption or outtake of fuels for bioenergy.

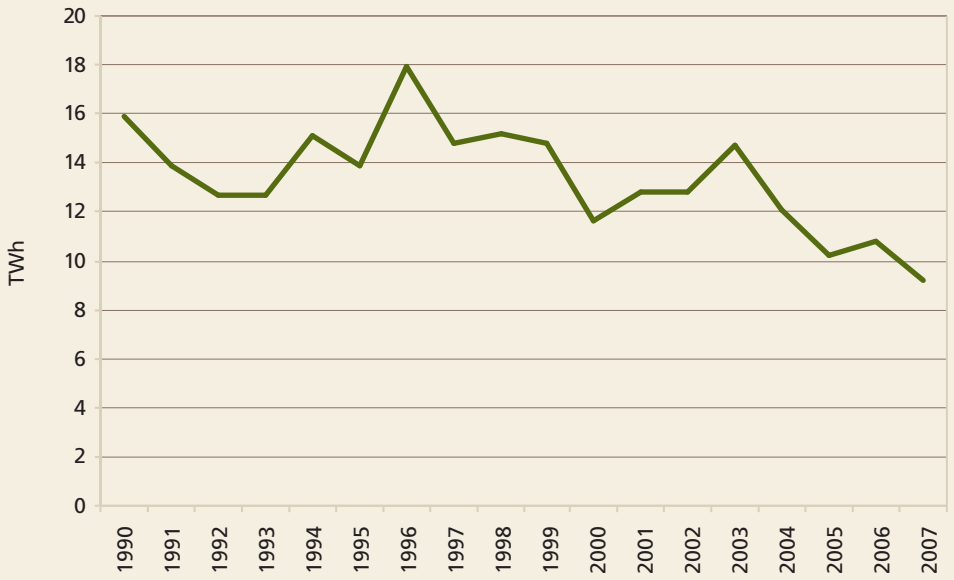
The use of policy instruments and results for the reduced use of oil-fired boilers for heating

The Ministry of Petroleum and Energy stated in an interview that it aims to encourage the use of other energy carriers than electricity and oil for heating. In the Ministry's agreement with Enova, operationalisation of the target of reducing the use of oil-fired boilers specifies that it shall not be implemented as a transition from oil to electricity. According to the Ministry, Enova shall in this way contribute to oil heating being phased out, and this reduction will have a direct effect on greenhouse gas emissions in Norway.

The Ministry of Local Government and Regional Development is responsible for following up the ban on oil-fired boilers in new buildings as well as for considering phasing out oil-fired boilers as a heating solution in connection with major rehabilitation projects.[299] According to the Ministry of Petroleum and Energy, there has been close collaboration on the design of regulation of the construction aspects.

298) Report No 18 to the Storting (2003–2004) *Om forsyningssikkerheten for strøm mv. (On security of supply for electricity etc.).*
299) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*

Figure 6.8 Domestic stationary consumption of fuel oil 1990–2007[300]



Source: Statistics Norway

Figure 6.8 shows that household consumption of oil for heating more than halved in the period from 1990 to 2007. The consumption of fuel oil increased in 2003 and 2004, which could be a result of the dry year in 2003, when the water levels in reservoirs for electricity production were low.

The Ministry of Petroleum and Energy states that the target of a 25 per cent reduction in oil-fired heating in the period 2008–2012 compared with the average for the period 1996–2000 has been reached. The estimated average consumption of fuel oil in the period 1996–2000 based on the figures from figure 6.8 is 14.9 TWh, and consumption in 2007 was approx. 38 per cent lower than this estimate. The Ministry of Petroleum and Energy refers to Enova's performance reports, which provide an account of energy performance as specified in the agreement with the Ministry.

The Ministry points out that it indirectly supported the phasing out of oil heating by means of policy instruments aimed at introducing heating solutions based on other energy carriers than electricity and oil. In the Ministry of Petroleum and Energy's view, the tax on fuel oil has also made it less profitable to use oil heating.

300) Covers stationary domestic consumption of heavy fuel oil, fuel oil, kerosene, heavy distillates (marine gas oil, petrol, autodiesel) for households, service providers, industry, public and other consumption.

The use of policy instruments and results for energy efficiency and reduced energy consumption

The Ministry of Petroleum and Energy states in an interview that the target of reducing energy consumption has been operationalised in the agreement with Enova. Enova has a quantified target of triggering projects that will result in new environmentally friendly energy production and energy saving corresponding to 18 TWh/year by the end of 2011. The baseline year is 2001. By the end of 2010, these projects shall have contributed to making available at least 4 TWh/year of water-borne heat based on new renewable energy sources, waste heat and heat pumps, and a minimum of 3 TWh/year must be increased wind power production. Reaching the total target of 18 TWh per year requires Enova to trigger a number of projects with an impact in the areas of energy efficiency and reducing energy consumption.

The Norwegian Water Resources and Energy Directorate stated in an interview that the Directorate administers policy instruments that can help to reduce energy consumption directly as well as indirectly. The Directorate administers the EU directives intended to contribute to the restructuring and reduction of energy consumption, and can also make use of campaigns that contribute indirectly to restructuring of energy use by consumers.

As regards the impact of the use of policy instruments, the Ministry of Petroleum and Energy points out that the goal is to limit energy use more than would have been the case had developments been allowed to continue unchecked. The Ministry uses no performance indicators in this field, but states that it keeps an eye on consumption trends and carries out analyses of e.g. energy intensity and development trends.

In the Ministry of Petroleum and Energy's opinion, energy consumption level is influenced by many factors simultaneously. Technology development and financial growth are among the factors that may impact energy consumption. The Ministry has not published indicators of the effect of each policy instrument. In the case of Enova's activities, expected energy results are registered for projects that receive funding.

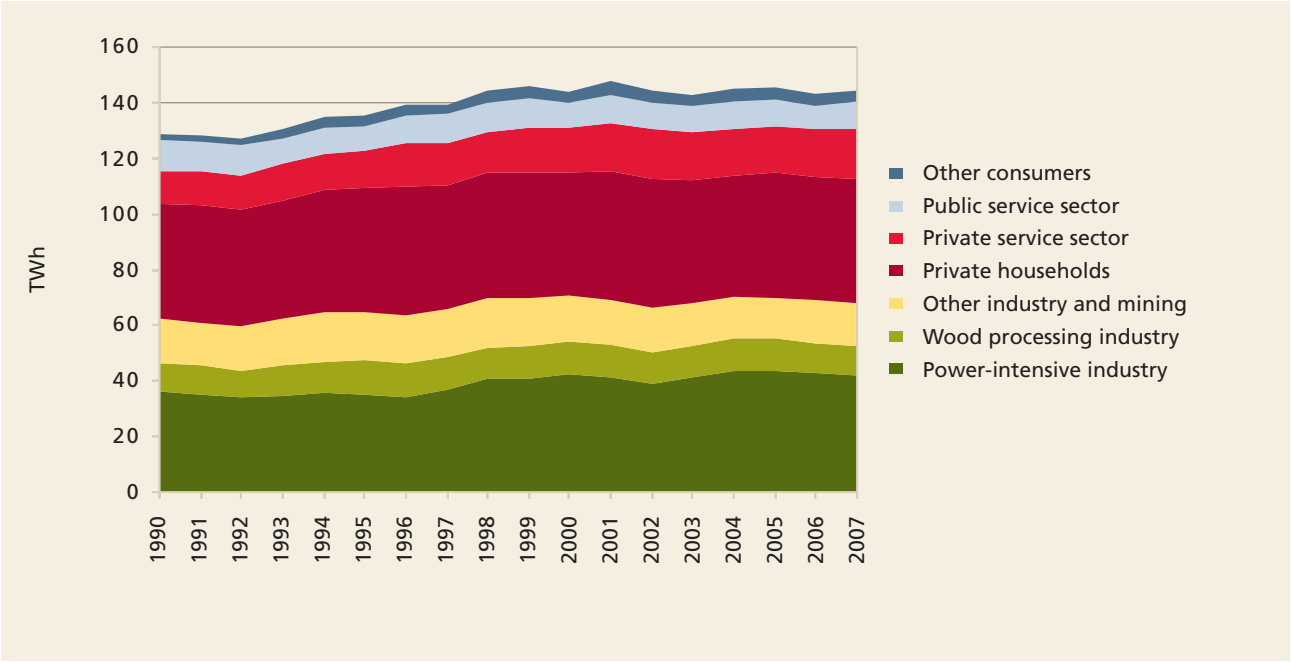
It is the Norwegian Water Resources and Energy Directorate's opinion that it is difficult to assess the effect of these policy instruments. According to the Directorate, it can be estimated in retrospect, but it will be more complicated to break down the overall effect of policy instruments by individual instruments.

The Norwegian Water Resources and Energy Directorate also notes that information campaigns are effective, and states that the 2003 electricity saving campaign, together with increased prices etc., helped to reduce consumption by 5–7 per cent.

According to Statistics Norway, the use of energy for energy purposes (final energy consumption excluding transport) increased by 17 per cent from 1990 to 2008, based on preliminary figures for 2008. Figure 6.9 shows the development until 2007, and the sector-by-sector distribution shows that private households and power-intensive industry account for the largest share of stationary consumption for energy purposes. Final consumption by private households has increased by 8 per cent, from 41 TWh to 45 TWh, while consumption for power-intensive industry increased from 36 to 41 TWh, which is a 15 per cent increase for this sector. The total final consumption of energy in the period 1990–2007 increased from 128 TWh to 145 TWh. The figure shows that energy consumption peaked in 2001 at 147.5 TWh, and has remained relatively stable since then.

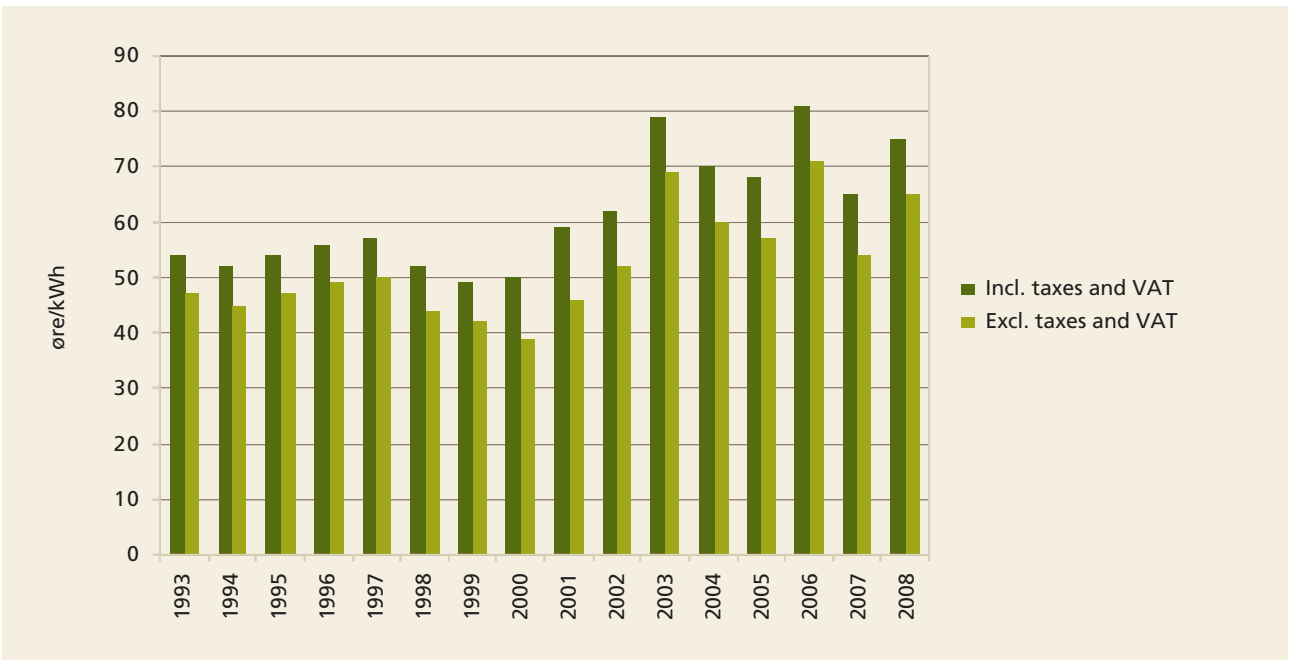
The Ministry of Petroleum and Energy stated in its letter of 7 December 2009 that the increase in the past ten years has been modest, despite strong financial growth. According to the Ministry, this means that energy efficiency has improved substantially. The Ministry deems this to be the result of measures to limit consumption combined with high energy prices, and points out that energy use adjusted for mainland gross domestic product (GDP) has practically plateaued out.

Figure 6.9 Stationary use for energy purposes by sector 1990–2007



Source: Statistics Norway

Figure 6.10 Household electricity prices 1993–2008 including and excluding the consumer tax in 2009 NOK



Source: Statistics Norway

The Ministry of Petroleum and Energy points out that the price of energy will influence consumption.[301] Figure 6.10 shows the trend in the price of household electricity from 1993 to 2008, according to actual price increase. The figure shows that the price, including consumer tax, rose from NOK 0.62 per KWh to NOK 0.79 per KWh from 2002 to 2003, and the strong price increase of 17 øre correlates with a reduction in consumption by households of more than 2 TWh from 2002 to 2003 in figure 6.9. For this sector and in this time series, this was the greatest reduction from one year to the next.

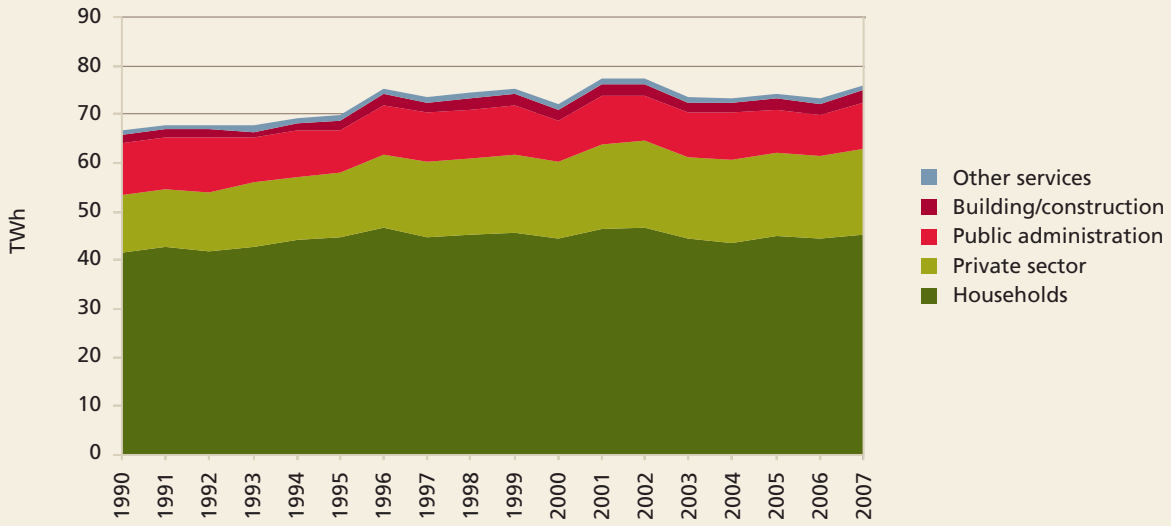
According to the Ministry of Petroleum and Energy, Enova is working to improve energy efficiency, but its energy-efficiency target has only been indirectly quantified as part of the total performance target of 18 TWh.[302] The Ministry states in an interview that there are several parties responsible for policy instruments that can help to improve energy efficiency, including the Ministry of Local Government and Regional Development, which is responsible for the building regulations and for the State Housing Bank's schemes for buildings. The Norwegian Pollution Control Authority can stipulate energy requirements for industry through the Pollution Control Act. The Ministry of Government Administration and Reform is responsible for the Directorate of Public Construction and Property (Statsbygg) and the Government Procurement Regulations. The state-owned enterprise Enova measures energy efficiency performance in projects to which it has given grants. Much of the energy efficiency is promoted through other players or other measures. Enova measures energy performance in its concrete projects, but this is not done by other parties responsible for energy efficiency.

The Norwegian Water Resources and Energy Directorate draws attention to the energy labelling directives for white goods and buildings, adopted by the EU and implemented as part of the EEA Agreement as key policy instruments in relation to achieving energy efficiency.[303]

The Norwegian Water Resources and Energy Directorate stated in an interview that the implementation of the Energy Performance of Buildings Directive[304] means that from 2010, all buildings sold must have an energy performance certificate describing the building's energy status based on its technical standard. The purpose of the directive is to make buildings with good energy performance more attractive in the property market than those with poorer performance. The certificate must include a rating of the build-

301) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.
302) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.
303) Framework Directive on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances (1992/75/EC) and Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
304) Directive 2002/91/EC.

Figure 6.11 Energy use in buildings by sector 1990–2007



Source: Statistics Norway

ing's heating system. The rating will be positive one if the heating system uses renewable energy sources or is capable of using such sources. This is not directly related to climate targets; the aim is to ensure that new buildings are constructed to be energy-efficient, thereby contributing to a reduction in energy consumption.

According to the Norwegian Water Resources and Energy Directorate's definition, energy use in buildings includes energy used for heating and other electricity consumption. Figure 6.11 shows that the energy consumption in buildings rose from 66 TWh to 76 TWh in the period 1990–2007, peaking in 2001 at 77 TWh. There was a slight increase in consumption in 2007 and 2008.[305]

Figure 6.11 shows that household consumption accounts for more than half of total consumption, corresponding to an average of 45 TWh. There has been no significant reduction of consumption in this sector. The high level of energy consumption in households can be explained by the long-term changes in the structure of households in society. The demand for energy has increased because people live in bigger homes, and there are also more small households.[306] Population growth will also mean increased consumption.[307] The basis data for the household sector show that electricity accounts for between 70 and 80 per cent of energy consumption in buildings. About one third of the electricity consumption is used for heating, 18 per cent for heating water, and 12 per cent for lighting.[308]

The Norwegian Water Resources and Energy Directorate states that it has been responsible for a programme for wood processing enterprises with 13–14 participants. These enterprises have their electricity tax reduced in return for introducing energy management and establishing a list of energy efficiency measures that they undertake to implement during the course of a five-year period. The first five-year period ended in summer 2009, when the enterprises were to report on their performances. The performance indicator is kilowatt hours saved. The programme is scheduled to continue for a new five-year period. The Norwegian Water Resources and Energy Directorate state that no performance report is available yet because not all enterprises have reported to the Directorate.

In Proposition No 62 to the Odelsting (2008–2009) *Om lov om endringer i energiloven ('On the Act relating to amendment of the Energy Act')* the Ministry explains that it will not be possible to achieve the first part of section 5.6 of the

305) Cf. an increase in total consumption of 0.1 per cent in 2008. Energy balance and energy accounts 2007 and 2008. Statistics Norway 1 December 2009.

306) *Energiloven og energieffektivisering ('The Energy Act and energy efficiency').* Econ Pöyry report no 2007-077.

307) Report No 9 to the Storting (2008–2009) *Long-term Perspectives for the Norwegian Economy.*

308) Distribution by purpose based on an average of figures from Statistics Norway.

Climate Settlement relating to increasing energy efficiency in the grid and power production by 20 per cent by 2020. It cites financial, technological and environmental factors as the reasons for this. The majority of the Standing Committee on Energy and the Environment agrees with this assessment, cf. Recommendation No 104 to the Odelsting (2008–2009). However, the Ministry stated in an interview that there are several factors that will help to reduce losses in the transmission grid in the years ahead, including considerable reinvestment and new investments at all levels of the grid, a gradual transition to higher transfer voltage and the introduction of advanced metering systems.

According to the Ministry of Petroleum and Energy, increased power production efficiency is largely linked to the modernisation of hydroelectric power plants, possibly in combination with extensions. Work is ongoing to facilitate modernisation and extension to enable more efficient exploitation of the existing hydropower structure.

In Proposition No 62 to the Odelsting (2008–2009) the Ministry also proposed to make it obligatory for grid companies to connect power producers if the total production and grid investment is socially rational. The Standing Committee on Energy and the Environment has supported the draft legislation,[309] and the change will come into force from January 2010. In the Ministry of Petroleum and Energy's view, this amendment means that the second part of section 5.6 of the Climate Settlement, relating to giving small power plants easier access to the grid, will have been fulfilled.

6.3.5 Evaluations

Through the effort to restructure energy production and consumption and the work to ensure security of supply, targets have been set over the past 10 years to increase the renewable heat percentage, to increase wind power production, to improve energy efficiency and limit the use of energy, as well as to reduce the use of fossil fuels. More renewable energy and less total use of energy have indirect effects on the reduction of greenhouse gas emissions. The Norwegian energy supply is based on renewable energy and makes only a small direct contribution to greenhouse gas emissions. Fifty per cent of Norwegian final consumption of energy is covered by electricity, and hydroelectric power accounts for 98–99 per cent of Norwegian electricity production. The power balance is consequently dependent on the availability of water. At the same time, total energy consumption, including transport and energy production, is increasing, and this augments the risk of increased use of non-renewable energy sources, which could in turn mean increased greenhouse gas emissions. The reduced use of fossil fuels for heating will contribute directly to reducing emissions.

Figures show that the wind power production is increasing, but that the 2009 production level was less than half of what is needed to meet the target of 3 TWh more per year by 2010. The use of renewable energy heating solutions is also increasing. District heating production increased by about 1.5 TWh from 1998 to 2008, while the target is to increase the use of renewable heating solutions by 4 TWh per year by 2010.

The investigation shows that the wind power target will not be achieved. There is also a significant risk that the target for increased use of heating using renewable energy will not be achieved by 2010 either. The energy authorities have signalled that economic policy instruments is intended to help to reach the targets, but the investigations shows that high investment costs and insufficient profitability have provided poor conditions for increased development and production of wind power and district heating. In addition, two adopted support schemes have not been implemented, with the result that renewable energy developments have been postponed or not realised. The price of electricity has been low, and consumers have lacked the incentive to start using renewable energy for e.g. heating purposes.

Licence processing is a demanding task for the Norwegian Water Resources and Energy Directorate because many projects are complex and face strong opposition. Also, the licence processing capacity in recent years has not been sufficient to handle the increasing number of licence applications, despite the fact that the number of executive officers has increased. The investment in wind power and district heating requires changes in infrastructure,and it therefore takes time for projects to be completed.

The strategic target for bioenergy is to increase the development of bioenergy by up to 14 TWh by 2020. The consumption of bioenergy has been stable at 13 TWh since 1998. It is not clear to the parties exercising authority what the target of

309) Recommendation No 104 to the Odelsting (2008–2009).

Photo: Petter Abrahamsen

14 TWh more bioenergy by 2020 entails. This could hinder achievement of the target.

A target has been set to reduce the use of fuel oil by 25 per cent in the period 2008–2012 compared with the period 1996–2000. There has been a significant reduction in the use of fuel oil, and this target will probably be achieved. At the same time, the use of oil as a peak load fuel has contributed to increased emissions from district heating. The use of oil as a peak load fuel in district heating thus lessens the reduction in greenhouse gas emissions achieved through the transfer from oil-fired boilers.

The fact that realising the various targets in one area depends on targets being reached in other areas constitutes a risk to overall target achievement. A number of the renewable energy targets are interconnected. The development of district heating, for example, is a precondition for realising the bioenergy target, and the bioenergy target in turn is a precondition for achieving the target of reducing and phasing out the use of oil-fired heating. And for district heating to actually be a climate measure, bioenergy must be available.

The energy authorities do not use performance indicators to measure the effect of the policy instruments employed to promote energy efficiency and reduce energy use, but refers to operationalisation of the target through Enova's total energy target, of which energy efficiency is part. This makes it difficult to evaluate achievement of the energy consumption reduction target.

Insufficient achievement of energy targets can pose a risk of increased greenhouse gas emissions.

6.4 How do the policy instruments in the forestry sector help to achieve climate targets?

6.4.1 The sector's targets for climate mitigation

Forestry can help to achieve climate policy targets in more than one way. Firstly, 90 per cent of the raw materials for bioenergy production come from the forest.[310] Secondly, the forest captures and stores carbon, thus helping to keep the CO_2 content of the atmosphere lower than it would otherwise have been. In addition, wooden products can act as a carbon store.

The main goals of the forest policy are to increase value creation from the forest-based industries while also attending to important environmental tasks. Report No 17 to the Storting (1998–99) *Verdiskaping og miljø – muligheter i skogsektoren ('Value creation and environment – opportunities in the forest sector')* proposed

310) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*

increased felling, provided that it takes place within the framework of sustainable resource management.

The document review shows that no quantitative targets have been set for CO_2 removals and carbon storage in forest.[311] On the other hand, a number of qualitative targets have been formulated:

- Report No 17 to the Storting (1998–99) *Verdiskaping og miljø – muligheter i skogsektoren ('Value creation and environment – opportunities in the forest sector')* signals that carbon binding must be maintained and increased by means of afforestation and increased use of wood, among other things. It also considers climate-motivated grant schemes, provided that they promote cost-effective measures that do not conflict with other environmental interests.
- The Emissions Trading Report[312] of 2001 emphasises that the annual net carbon removals are to be increased by measures in forestry and elsewhere, provided that the measures do not have an adverse impact on the environment, and by preventing the release of greenhouse gases from large carbon stores in the forests and elsewhere.
- Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution* emphasises that increased felling and afforestation will provide long-term climate gains by increasing CO_2 removals and the use of wood for bioenergy purposes and as a raw material for construction.

The Norwegian Pollution Control Authority states in an interview that its mitigation analyses have focused on the measures that would produce credits under the current Kyoto Protocol regulations, and that the Protocol provides little incentive to implement new climate-motivated forest measures. The Ministry of Agriculture and Food states in an interview that the current international regulations provide limited incentives for measures relating to CO_2 removals in forest.

The Norwegian Agricultural Authority states in an interview that none of its forest-related tasks address climate issues directly, but that other forest management targets may be indirectly relevant to the climate policy targets.

All climate policy reports have emphasised increased use of bioenergy as a means of achieving climate policy goals.[313] The climate report[314] set a target for expanding bioenergy by up to 14 TWh by 2020. It did not set specific targets for its production and use. According to the Ministry of Agriculture and Food, a 14-TWh increase in bioenergy can reduce emissions by 4.8 million tonnes of CO_2 equivalents, provided that it replaces more polluting forms of energy such as oil-fired heating.

The Ministry of Agriculture and Food also has a goal of developing bioenergy concepts in which agriculture is not only a supplier of raw materials, but also participates as far along the value chain as possible.[315] The bioenergy investment shall also support the government's climate policy objectives and help to develop sustainable solutions for removal of biomass from forest. Report No 26 to the Storting (2006–2007) *On the Government's Environmental Policy and the State of the Environment in Norway* makes it clear that the building of forest roads and the ensuing felling must not destroy habitats of importance to biodiversity.

One of the preconditions for the bioenergy effort is that it must not have an adverse impact on biodiversity. At the same time, the Norwegian Forest and Landscape Institute states in an interview that increased bioenergy efforts cannot have a positive effect on biodiversity in the forest. According to the Norwegian Forest and Landscape Institute there are between 5,000 and 6,000 species that feed on dead trees. Increased removal of wood, including branches and tops could mean that less dead mass will remain in the forest. The Ministry of Agriculture and Food assumes that all production and removal of biomass for energy purposes will be done in a sustainable manner in accordance with the applicable regulations and guidelines of the Living Forest standard.[316]

According to the Ministry of the Environment, conflicts of goals may nonetheless arise, and the Ministry cites as an example that increased outtake of biomass from forest necessitates the construction of forest truck roads and forestry

311) The Ministry of the Environment stated in a letter that the national target of reducing emissions in Norway by 15–17 million tonnes until 2020 includes 3 million tonnes of CO_2 equivalents from forest not included in the sector goal for primary industries and the waste sector. This figure is based on estimates of what Norway will be able to report to a post-Kyoto Protocol. For the period 2008–2012, this figure is 1.5 million CO_2 equivalents, in accordance with article 3.4 of the Kyoto Protocol.

312) Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy.*

313) See section 6.3 for a review of targets relating to bioenergy and energy restructuring.

314) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*

315) Proposition No 1 to the Storting (2003–2004) *The Ministry of Agriculture and Food*.

316) Living Forest is a co-operative project between foresters, the forest industry, the labour movement, outdoor recreation organizations and environmental organizations to promote sustainable forestry with a good balance between the three aspects: wood production, environmental protection and social interests.

work in areas with rich biodiversity.[317] The Ministry of the Environment points to encroachment on land areas as the most important threat to the habitats of endangered species in the forest. The Ministry also states that a conflict of goals may arise if large new areas are used to plant high-energy forest for biomass production.

6.4.2 Status for removals and storage and for bioenergy production

According to Statistics Norway, Norwegian forests absorbed about 26 million tonnes of CO_2 in 2007. This corresponds to nearly half of Norway's total greenhouse gas emissions. The forests' annual carbon removals increased in the period 1998–2007. The increase was particularly strong from 1999 to 2004, from about 10 million tonnes to about 25 million tonnes per year. The main reason for this increase is that the new forest growth exceeds felling. In total, forests in Norway store about 1.5 billion tonnes of CO_2.[318]

Statistics Norway estimates bioenergy production based on consumption statistics adjusted for the import and export of firewood, and points out that there is some uncertainty relating to the import and export of biofuels. Bioenergy consumption remained stable at about 13 TWh in the period 1998–2007. Statistics Norway states that Norway has been a net importer of firewood since 1998, but that the amount imported is nonetheless rather small in relation to the country's total bioenergy consumption.

6.4.3 Projections and potential for reduction

The costs of four measures in the forest sector are assessed in Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution*. In all four cases, the costs of the measures will be less than NOK 150 per tonne of CO_2. Climate measures in forestry can be considered cost-effective measures in relation to the level of the carbon tax (see section 4.3).

In Report No 39 to the Storting (2008–2009), the Ministry of Agriculture and Food presents four scenarios for carbon removals and storage in productive forest.[319] All four scenarios show that total carbon stores will continue to increase for the next 100 years, and that annual removals will peak in 25 years' time and then decrease somewhat.[320]

Photo: Birger Areklett / NN / Samfoto

Two of the scenarios postulate increased felling along with more intense silviculture. These two scenarios give the lowest long-term total carbon storage. In the short term, they will also give a lower annual removals of CO_2. However, the Ministry of Agriculture and Food also points out that increased felling in combination with more intense silviculture could have a positive long-term effect on the climate.[321] Firstly, increased felling will enable the establishment of regenerated forests with a greater capacity for CO_2 removals. Secondly, the use of wood for bioenergy and building material will reduce greenhouse gas emissions.

6.4.4 What climate-related policy instruments have been developed in the forest sector?

The key policy instruments in forestry are the Forest Trust Fund scheme, a mandatory provision intended to make it easier for forest owners to finance measures for sustainable development of forest resources, and the grants given for industrial

317) Letter of 17 June 2009 from the Ministry of the Environment.
318) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*
319) See section 6.7 in Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution* for a more detailed description of these scenarios.
320) The annual removal in 25 years varies between 15 million and nearly 30 million tonnes of CO_2 in the various scenarios. All four show that in 100 years, the removals will have dropped to between 10 and 15 million tonnes of CO_2.
321) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*

and environmental measures. The Ministry of Agriculture and Food states in an interview that the most important measures for promoting increased felling are grants for forest road construction, grants for industrial and environmental measures in forestry, and research and development to make better wood products. According to the Ministry, increased afforestation will be promoted through grants and the mandatory appropriations to the Forest Trust Fund scheme. As regards bioenergy production, the Ministry states that the bioenergy programme is important, as are the Forest Trust Fund scheme and the special tax allowance for agriculture.[322] According to the Ministry of Agriculture and Food, the Ministry of Petroleum and Energy possesses the most important bioenergy policy instruments.[323] The Ministry of Agriculture and Food also states that it has been providing investment support and funding to bioenergy expertise since 1998.

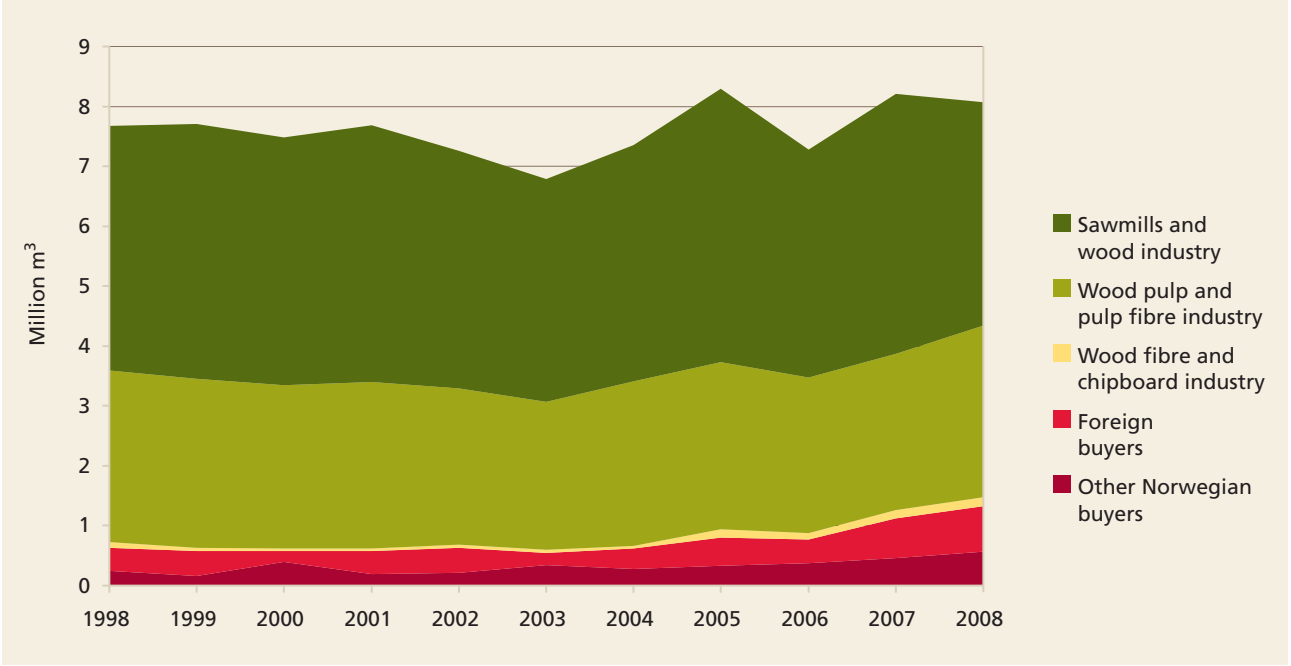
The Forest Trust Fund scheme is regulated by the Forestry Act.[324] Forest Trust Funds can be used for a number of purposes.[325] The following are the most important climate-related purposes:

- regeneration and establishment of forest
- investments in bioenergy measures
- construction and rebuilding of forest roads and areas for short-term timber storage
- measures to promote quality and production
- forestry planning with environmental recording
- competence-raising measures

Grants for business and environmental measures in forestry shall encourage increased commercial activity while safeguarding environmental values. A total of NOK 563 million was spent on commercial and environmental measures in forestry in the period 2004–2008.[326] Grants are available for silviculture, environmental measures, forest roads, thinning, forestry in difficult terrain, and increased activity and improved resource utilisation. According to the Norwegian Agricultural Authority, the prioritised environmental values are biodiversity, landscape, outdoor pursuits and cultural heritage. Before 2007 more than 80 per cent of the grants went to forest truck roads and silviculture, and about 15 percent to other measures, including environmental measures.

The bioenergy programme was established in 2003 and is intended to encourage increased production, use and delivery of bioenergy in the form of fuel or heat. In 2006, the programme was extended to include support for bioheat systems

Figure 6.12 Total amount of wood for industrial purposes felled for sale 1998–2008



Source: Statistics Norway

322) The special tax allowance for agriculture gives tax deductions for income from bioenergy.
323) See section 6.3.
324) Act No 31 of 27 May 2005 relating to Forestry.
325) Regulations relation to Forest Trust Fund, Regulations No 881 of 3 July 2006. See chapter 3 in particular.
326) The Norwegian Agricultural Authority, *Evaluering av SMIL – spesielle miljøtiltak i jordbruket ('Evaluation of SMIL – special environmental measures in agriculture')*. Report no 5/2009.

on farms and conversion to bioenergy for greenhouses. Wood chip production became a new priority area from 2009. Allocations for the bioenergy programme have been augmented. The programme was allocated NOK 18 million in 2003 and a total of NOK 90 million in 2009.

6.4.5 To what extent does the use of policy instruments in forestry help to achieve climate policy targets?

Felling

Figure 6.12 shows that the total felling of wood for industrial purposes (excl. wood for firewood) remained relatively stable in the period 1998–2007. The amount of wood felled was lowest in 2003, at less than 7 million m^3, and greatest in 2005 at nearly 8.3 million m^3. In 2008, 8.1 million m^3 were felled. Preliminary figures for 2009 show that felling for sale was 6.7 million m^3, which is the lowest figure since the mid-1970s.[327]

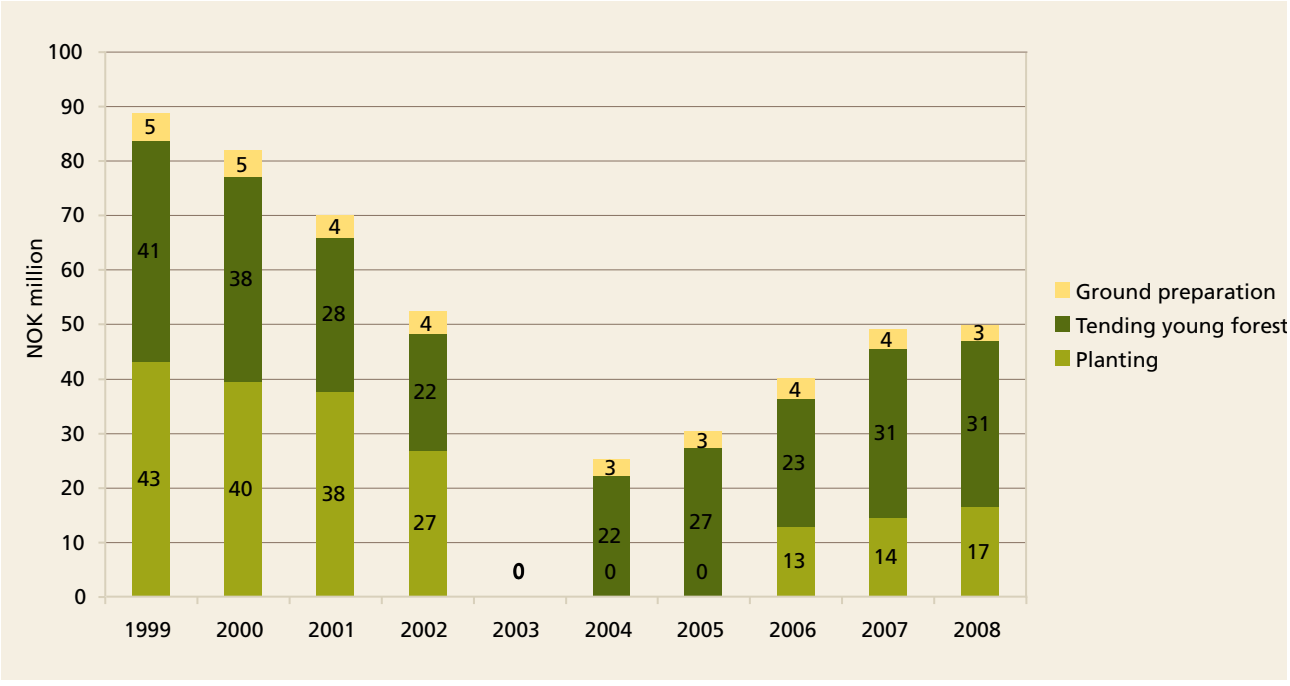
The Ministry of Agriculture and Food, the Norwegian Agricultural Authority and the Norwegian Forest and Landscape Institute all state in interviews that the amount of wood produced is suboptimal. According to the Norwegian Forest and Landscape Institute the most important reasons for the low level of felling are profitability, ownership structure and environmental restrictions on forestry. The Norwegian Forest and Landscape Institute states in an interview that the current felling level corresponds to about one third of the growth potential. In the Institute's opinion, felling can be increased by 40 per cent on the current level, even taking account of environmental considerations.

The timber prices are an important reason for the suboptimal felling level, and this is confirmed in interviews with the Ministry of Agriculture and Food, the Norwegian Agricultural Authority and the Norwegian Forest and Landscape Institute. There has been a small nominal increase in the price of timber over the last 30 years, but if the price is adjusted for developments in the NOK exchange rate, we find that the timber price has been almost halved.[328]

Silviculture

Until 2003, silviculture grants were appropriated directly as a separate item in the national budget. This direct allocation was discontinued and replaced by an enhancement of the forest fee scheme (the Forest Trust Fund scheme from 2006). This entailed increasing the tax benefit rate on investments of forest fees from 35 to 60 per cent regardless of the level of investment.[329]

Figure 6.13 Silviculture grants 1999–2008



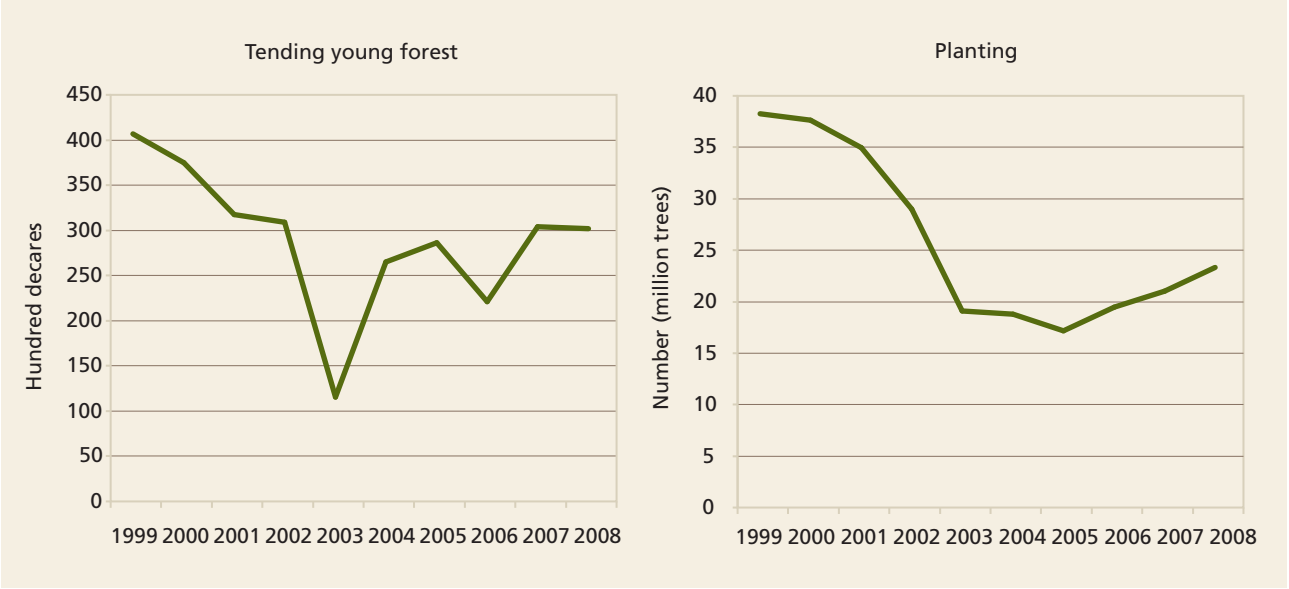
Source: The Norwegian Agricultural Authority

327) Statistics Norway (2009), *Lowest quantity cut in 34 years*, 2010 (download date: 22 January 2010).

328) Statistics Norway, *Noe mindre hogst og fallende tømmerpriser ('Somewhat reduced felling and falling timber prices')*, 2009 (download date: 8 October 2009).

329) This means that for every NOK invested, 40 øre will be taxed while 60 øre will not be taxed.

Figure 6.14 Tending young forest and planting 1999–2008



Source: Statistics Norway

Figure 6.13 shows that grants for silviculture were nearly halved in the period 1999–2008. Ground preparation grants remained relatively stable. Grants for afforestation and tending young forest fell steeply, particularly between 1999 and 2003. These grants have increased steadily from 2004, but the level remains lower than in 2002.

The Norwegian Forest and Landscape Institute states in an interview that the change in the Forest Trust Fund scheme since 2003 has had some positive effect, but not as much as wished for. The Norwegian Forest and Landscape Institute also confirms that the transition from direct to indirect grants has reduced afforestation. This is confirmed by figure 6.14, which shows that activity levels for both planting and tending young forest were lower in 2008 than in 1999. The tending of young forest hit a valley in 2003, at just over 25,000 acres. The reduction for the period as a whole was from 100,000 to 75,000 acres. As far as planting is concerned, the number of trees planted halved from 1999 to 2005. The number has increased somewhat since then, to about 23 million trees in 2008.

In interviews, the Ministry of Agriculture and Food, the Norwegian Agricultural Authority and the Norwegian Forest and Landscape Institute all emphasise that forest roads are a prerequisite for increased felling and extracting more biomass for energy purposes. In Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution* the Ministry of Agriculture and Food estimates that increased road building can increase the potential for mass for bioenergy from forest by 10 TWh. There has been a general decrease in forest road building since 1998. According to the Ministry of Agriculture and Food, this is partly due to the fact that the road systems in some areas are quite well-developed, but for large parts of the forest area the drawn-out economic slowdown in the forest sector is a major reason.

Bioenergy

The Ministry of Agriculture and Food states in an interview that there are few bioenergy production plants, and that the plants established so far have had a relatively limited impact on total green-house gas emissions. This is confirmed by table 6.2, which shows energy production from plants that are part of Innovation Norway's bioenergy programme. Projects with a total energy output of just over 0.02 TWh have already been initiated, while projects corresponding to an additional 0.07 TWh have had their grant applications accepted.

The Norwegian Forest and Landscape Institute stated in an interview that one of the main challenges in the bioenergy effort is that the policy instruments do not address achievement of the targets. The Forest Trust Fund is aimed at compliance with the regeneration obligation, which means there is no direct link between the Forest Trust Fund and bioenergy. The grants scheme for commercial and environmental meas-

Table 6.2 Energy output from farm heating systems, heating plants and greenhouses 2005–2007 (TWh)

		2005	2006	2007	Total
Farm heating systems	Granted[331]	0.0011	0.0155	0.0271	
	In operation[332]	0.0002	0.0013	0.0065	0.0080
Heating plants	Granted	0.0085	0.0194	0.0314	
	In operation	0.0006	0.0051	0.0034	0.0091
Greenhouses	Granted	0.0020	0.0084	0.0118	
	In operation	0	0.0012	0.0062	0.0074
Total	**Granted**	**0.0116**	**0.0433**	**0.0703**	
	In operation	**0.0008**	**0.0075**	**0.0161**	**0.0245**

Source: Statistics Norway

ures only directly targets bioenergy to a small extent. However, according to the Norwegian Forest and Landscape Institute, the grants scheme does contain a few silviculture measures that may have an indirect effect on bioenergy.

The Ministry of Agriculture and Food points out that there is little profit in utilising branches and tops, thinning wood and low-quality timber.[332] If more of the waste wood is to be utilised, raw material prices will have to at least cover the processing and transport costs. According to Norwegian Forest and Landscape Institute, either bioenergy must be given special advantages, or energy prices must rise. The Ministry of Agriculture and Food identifies small-scale agriculture as a challenge for the bioenergy effort. Other challenges relate to distribution and market access.

6.4.6 Evaluations

There are two primary ways in which forestry helps to achieve climate policy targets. Firstly, the forest is the main source of raw material for the production of bioenergy, which could replace fossil fuels. Secondly, the forest absorbs and stores carbon, helping to keep the CO_2 content of the atmosphere lower than it would otherwise have been. The forest absorbs about 25 million tonnes of CO_2 equivalents per year.

The aim is to have a policy that will promote increased felling while also taking account of biodiversity and other environmental values. An increase in bioenergy production requires the felling of more trees. There has been a low level of activity in forestry due to low timber prices, and felling has remained relatively stable. The restructuring of the use of policy instruments has caused a reduction in silviculture activities, particularly planting. This entails a risk that value creation potential and climate values will not be utilised.

The investigation reveals that measures that could give emissions reductions under the Kyoto Protocol have been emphasised. The longer-term possibilities relating to climate measures in forestry in light of the general commitments under the United Nations Framework Convention on Climate Change have not been given the same priority.

Over the past ten years, increased bioenergy production has been a goal. The investigation reveals that the financial policy instruments intended to promote bioenergy production have made only a limited contribution to increasing profitability. Grants via the Forest Trust Fund, for example, do not target bioenergy production to any significant extent. The Ministry of Agriculture and Food provides funding for bioenergy production via the bioenergy programme, but the plants that have become operational so far have had a limited effect. There is a considerable risk that the long-term bioenergy targets will not be attained. If the target of increasing bioenergy production by up to 14 TWh is to be achieved, the current production level – which has remained stable at about 13 TWh for a long time – will have to be more than doubled.

330) The 'granted' figures represent applications accepted by Innovation Norway's bioenergy programme. The figures are cumulative.
331) The 'granted' figures represent applications accepted by Innovation Norway's bioenergy programme. The figures are cumulative.
332) In addition, 0.0036 TWh from farm heating systems, 0.0026 TWh from heating systems and 0,0010 TWh from greenhouses have been put into operation without Innovation Norway knowing the year in which it was initiated.

6.5 How do the policy instruments in the agricultural sector help to achieve climate targets?

6.5.1 The sector's targets for climate mitigation

A review of the budget propositions of the Ministry of Agriculture and Food for the period from 1998 to 2006 shows that no specific climate targets were drawn up for the agricultural sector during this period.[333] The Ministry of Agriculture and Food stated in an interview that the Ministry's role in work to reduce Norwegian emissions was not given much attention until Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

The Climate Report established sector targets and a climate action plan for agriculture.[334] In primary industries and waste, a total reduction of 1–1.5 million tonnes of CO_2 equivalents is to be triggered compared with the baseline scenario on which the Norwegian Pollution Control Authority's mitigation analyses is based. Responsibility for following up this target is divided between the Ministry of Agriculture and Food (agriculture), the Ministry of Fisheries and Coastal Affairs (fishery) and the Ministry of the Environment (waste). According to the Ministry of Agriculture and Food, there has been no internal division between the ministries to determine what proportion of the reduction each ministry shall be responsible for.[335]

The Ministry of Agriculture and Food states in an interview that it considers the fact that there is one joint target for primary industries and waste to pose somewhat of a challenge to the individual sectors At the same time, the Ministry considers that the primary industries and waste sector need to find joint solutions to the challenges and possibilities relating to organic waste.

The most important agricultural policy instruments are determined in the National Agricultural Agreement as a result of negotiations between the Ministry of Agriculture and Food and the agriculture organisations.[336] The 2008 National Agricultural Agreement stipulated targets for climate work. The three main targets are:

- Ordinary autumn ploughing is to be reduced significantly by 2020
- All manure is to be utilised in a significantly better manner by 2020
- Methane emissions from ruminant livestock shall be reduced in combination with increased CO_2 binding by means of carbon storage in soil

The Ministry of Agriculture and Food states in an interview that it sees a conflict between climate considerations on the one hand and productivity targets and the maintenance of scattered settlement patterns on the other. According to Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution*, greenhouse gas emissions from agriculture and food production must be limited, but food production has to increase at the same time. Increased food production requires more use of fertilisers, more fuel for agricultural machinery and possibly cultivating new land. All these factors can result in increased greenhouse gas emissions. The Ministry of Agriculture and Food states in an interview that Norwegian agricultural policy stimulates food production, and thereby also greenhouse gas emissions.

6.5.2 Emission and emissions development status

According to data from Statistics Norway and the Norwegian Pollution Control Authority, the official emission figure for agriculture in 2007 was 4.3 million tonnes of CO_2 equivalents. This accounts for about 9 per cent of the total Norwegian greenhouse gas emissions. Most of these emissions stem from three sources: farm animal flatus, manure and mineral fertilisers.

Other emissions from the agricultural sector include nitrous oxide emissions from cultivated marshland and the use of fossil fuels, mainly to power machines. Most agricultural production is part of the natural carbon cycle and therefore not a large net contributor to carbon emissions.[337] The agricultural emissions take the form of methane (CH_4) and nitrous oxide (N_2O). As shown in table 6.3, methane emissions in 2007 convert into nearly 2.2 million tonnes of CO_2 equivalents,

333) Proposition No 1 to the Storting (2003–2004) *The Ministry for Agriculture and Food* states that sustainable food production that helps to solve important environmental tasks – climate being one of these tasks – is one of the main priorities. In the rest of the document, however, climate is primarily associated with forestry rather than agriculture.
334) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
335) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution* states that in 2006, agriculture accounted for a good 60 per cent of the emissions covered by this target, waste accounted for 21 per cent and fisheries for 18 per cent.
336) *Hovedavtalen for jordbruket. Mellom Staten på den ene siden og Norges Bondelag og Norsk Bonde- og Småbrukarlag (Organisasjonene) på den andre. ('The National Agricultural Agreement. Between the Norwegian state on the one hand and the Norwegian Farmers' Union and the Norwegian Farmers and Smallholders Union (the Organisations) on the other').* 17 February 1992.
337) See Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*

Table 6.3 Greenhouse gas emissions from agriculture in 2007 (in million tonnes of CO_2 equivalents). – Percentage of total official figures for agricultural emissions in brackets

	Total	CO_2	N_2O (nitrous oxide)	CH_4 (methane)
Livestock	1.87 (43 %)			1.87
Manure	0.88 (20 %)		0.56	0.32
Mineral fertiliser (nitrogen fertiliser)	0.65 (15 %)		0.65	
Other*	0.90 (21 %)		0.90	
Total official emissions	**4.30 (100 %)**		**2.1**	**2.2**
Combustion of fossil fuels	0.53 (12 %)	0.53		
Cultivated marshland	1.90 (44 %)	1.90		
Total emissions from agriculture	**6.73 (157 %)**	**2.43**		

* Other emissions include run-off and nitrous oxide emissions from cultivated marshland etc.

Source: Statistics Norway, the Norwegian Pollution Control Authority and Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution*

while nitrous oxide emissions totalled just over 2.1 million tonnes.

Emissions of methane and nitrous oxide from agriculture account for 49 and 45 per cent respectively of total Norwegian emissions of these two gases. Methane emissions come from air exhaled by ruminants (85 per cent) and manure (15 per cent). Nitrous gas comes from a number of sources, including from the use of mineral fertilisers and manure.

According to the regulations, CO_2 released from cultivated marshland is not included in Norway's commitments under the Kyoto Protocol,[338] but it is included in reporting to the United Nations Framework Convention on Climate Change.[339] If the emissions from marshland were included in the official emissions figure, there would be a 40 per cent increase to 6.7 million tonnes.[340] As shown in figure 6.15, the total official emissions from Norwegian agriculture have remained relatively stable during the period 1990–2007. Emissions decreased somewhat from the peak year 1998, when nearly 4.6 million tonnes of CO_2 equivalents were emitted, to 2006, when emissions were just over 4.2 million CO_2 equivalents. Emissions rose somewhat from 2006 to 2007.

The use of fertilisers and animal husbandry are two key factors influencing greenhouse gas emissions from agriculture (see figure 6.15). The consumption of nitrogen in mineral fertilisers per acre remained stable during the period from 1989 to 2005.[341] The number of livestock (cattle, winter-feed sheep and finishing pigs) has also remained relatively stable.[342]

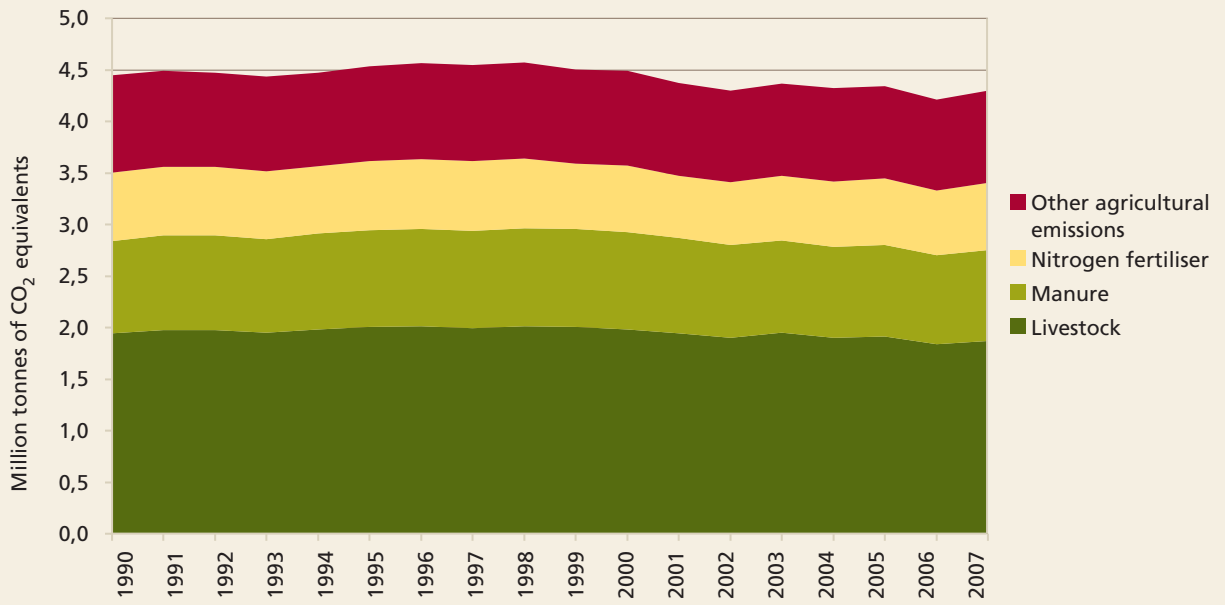
The Ministry of Agriculture and Food states in an interview that it is difficult to use projections from the Norwegian Pollution Control Authority as management information, as these projections do not take national and international food policies into consideration. The Ministry is working to improve its knowledge about the emissions and the data on which the projections are based. The growing population and increased food production are key impact factors in this work, as is the food policy.

6.5.3 The authorities' studies of measures

Agriculture was not included in the Norwegian Pollution Control Authority's first mitigation analysis.[343] In its second mitigation analysis, three measures were identified.[344] These measures had a total reduction potential of just over 0.3 million tonnes of CO_2 equivalents in 2010 and about 0.6 million tonnes of CO_2 equivalents in 2020.

338) UNFCCC, Kyoto Protocol Reference Manual, 2008.
339) UNFCCC, Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (following incorporation of the provisions of decision 13/CP.9), 2004.
340) When marshland is cultivated, water is drained away and replaced by oxygen. This causes organic materials to decompose, and CO_2 is released. The cultivation of marshland is discussed in more detail in the sub-chapter on the use and effects of policy instruments. Due to great uncertainty about emissions from cultivated marshland, Norway reports a set figure to the Climate Convention both for nitrous oxide emissions and CO_2 from cultivation of marshes.
341) Geir Inge Gundersen et. al., *Jordbruk og miljø: Resultatkontroll 2007 ('Agriculture and environment: Performance control 2007')*, Statistics Norway report 2008/1.
342) All figures from Statistics Norway (livestock husbandry).
343) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2000')* Norwegian Pollution Control Authority. Report 1708:2000. See section 6.2 for an overall description of the Norwegian Pollution Control Authority's mitigation analysis.
344) These three measures correspond to the top three measures in table 6.4. See also *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2010 og 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2010 and 2020')* Norwegian Pollution Control Authority, TA-2121/2005.

Figure 6.15 Greenhouse gas emissions from agriculture 1990–2007



Source: Statistics Norway and the Norwegian Pollution Control Authority

The Norwegian Pollution Control Authority's third mitigation analysis for 2020 identifies a total of six measures with a total reduction potential of 1.1 million tonnes of CO_2 equivalents.[345] This figure is also used as basis in Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*. Table 6.4 shows that the measures relating to feeding, reduced nitrogen fertilisation and biogas production are estimated to cost less than NOK 200 per tonne of CO_2 equivalents. The other three measures are estimated to cost between NOK 200 and NOK 600 per tonne of CO_2 equivalents. This gives a total reduction potential of just over 0.6 million tonnes of CO_2 equivalents at a cost of less than NOK 200 per tonne, and about 0.5 million tonnes of CO_2 equivalents at a price of between NOK 200 and NOK 600 per tonne. The table also shows that the

Table 6.4 The Norwegian Pollution Control Authority's analysis of the agricultural reduction potential (in million tonnes of CO_2 equivalents)

Description	Reduction potential	Cost	Overall assessment
Lower nitrogen content in feed and improved feeding for all livestock	0.09	Less than 200 NOK/tonne	Medium possibility of implementation
Reduced nitrogen fertilisation of agricultural land	0.17	Less than 200 NOK/tonne	Good possibility of implementation
Biogas production from anaerobic decomposition of manure and waste	0.36	Less than 200 NOK/tonne	Medium possibility of implementation
Collecting methane gas from livestock quarters and manure cellars	0.27	Between 200 and 600 NOK/tonne	Good possibility of implementation
Alternative processing of plant residue	0.14	Between 200 and 600 NOK/tonne	Medium possibility of implementation
Reduced cultivation of organic soil (peat marsh)	0.06	Between 200 and 600 NOK/tonne	Medium possibility of implementation
Total	**1.09**		

Source: The Norwegian Pollution Control Authority's mitigation analysis for 2020 from 2007

345) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2254/2007.

Norwegian Pollution Control Authority considers measures corresponding to a reduction potential of more than 0.4 million tonnes of CO_2 equivalents to have a good chance of being implemented. According to the Norwegian Pollution Control Authority's definition, this means that there are no major technological or policy instrument barriers to the implementation of these measures.

The Ministry of Agriculture and Food points out that in its mitigation analysis from 2007, the Norwegian Pollution Control Authority assesses measures, but not policy instruments.[346] The Norwegian Pollution Control Authority's analysis shows that the measures are technologically feasible, but fails to consider what policy instruments would be required to trigger the measures.

Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution* also presents measures with a total reduction potential of just over 1.1 million tonnes of CO_2 equivalents. One measure, the collection of methane from livestock quarters, has been removed, while the reduction potential for biogas and improved feeding of cattle has been adjusted upwards. The emission reduction and costs relating to the various measures are presented in table 6.5 to the extent to which they have been assessed.

The Ministry of Agriculture and Food states in an interview that two of the measures identified in the Norwegian Pollution Control Authority's mitigation analysis are not considered real possibilities: reducing the amount of nitrogen in feed, because this could damage agricultural production, and collecting methane from livestock quarters, because the costs are too great and because it is technologically much more difficult than assumed.[347] Increasing efficiency in the production of milk and beef must, according to the Ministry of Agriculture and Food, be considered in more detail in relation to the actual climatic and environmental gains of such a measure.[348]

It emerges from interviews with the Ministry of Agriculture and Food and the Norwegian Agricultural Authority that insufficient knowledge hinders the identification and implementation of measures. The Norwegian Agricultural Authority points out that knowledge is limited and data uncertain with regard to the scale of methane and nitrous oxide emissions.

The Norwegian Pollution Control Authority points out in an interview that uncertainty levels are different for methane and nitrous oxide. The agency is of the opinion that there is relatively less uncertainty about methane than many other sources, and that the uncertainty argument can primarily be applied to nitrous oxide from farmland, where emissions could be twice or half the stated amount. However, the Norwegian Pollution Control Authority is of the opinion that the existing methods of estimating nitrous oxide emissions from agriculture, recommended by the UN Intergovernmental Panel on Climate Change, are adequate as a basis for measures.

6.5.4 What has been done to improve the knowledge base?

A review of the Ministry of Agriculture and Food's Proposition No 1 to the Storting from 1997 to 2007 shows that research priorities have

Table 6.5 The Ministry of Agriculture and Food's analysis of the potential for climate measures in agriculture (in million tonnes of CO_2 equivalents)

Description	Emission reduction	Cost
Biogas – the use of manure and food waste	0.50	Socio-economically profitable
Improved efficiency in milk and beef production	0.25	Profitable for the enterprises
Improved efficiency in sheep husbandry	0.04	Profitable for the enterprises
Reduced number of reindeer	0.01	Not assessed
A 10-per cent reduction in the use of nitrogen fertiliser for grain, grass and grazing land	0.17	
Energy and reduced nitrous oxide from plant residues in agriculture	0.14	
Total	**1.11**	

Source: Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution*

346) Letter of 30 November 2009 from the Ministry of Agriculture and Food.

347) Letter of 30 November 2009 from the Ministry of Agriculture and Food.

348) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*

only focused to a small extent on improving the knowledge base required to reduce greenhouse gas emissions. The availability of Norwegian funding for research into greenhouse gas emissions in agriculture has been very limited.[349] The Ministry of Agriculture and Food states in an interview that although climate has not always headed the list of prioritised research areas, good agricultural practice has been a priority. This has also had positive consequences for the climate aspect.

The Ministry of Agriculture and Food and the Norwegian Agricultural Authority point out that it is a challenge for Norwegian research to absorb the research funding that has become available since the Climate Settlement, also considering that this has not previously been a priority area. The Ministry also stresses that a number of long-term research programmes have been established.

A five-year national development programme for climate measures in agriculture was established in connection with the National Agricultural Agreement for 2007.[350] This programme aims to increase expertise on greenhouse gas emissions from agriculture and the effect of the agricultural policy on emissions. For 2009, NOK 6 million were allocated to this programme.[351] The following are some of the areas to which the development programme shall contribute:

- improving knowledge of the planning and operation of biogas plants through a few pilot plants
- raising competence in agriculture as a recipient of food waste and bioresidue
- improving knowledge about the possibility of purifying methane from livestock quarters
- improving operational knowledge about new manuring techniques in agriculture
- improving knowledge with a view to reducing the agricultural sector's need for and use of fossil energy sources[352]

In the allocation letter from the Ministry of Agriculture and Food for 2009, the Norwegian Agricultural Authority has been assigned the task of working to improve expertise in the climate area. In the allocation letter for 2008, the Norwegian Agricultural Authority was made the secretariat of the development programme for environmental measures in agriculture, with responsibility for day-to-day coordination and follow-up as well as reporting. The Norwegian Agricultural Authority states in an interview that there was little mention of climate-related tasks in previous allocation letters.

6.5.5 What climate-related policy instruments have been developed in the agricultural sector?

Policy instruments in the agricultural sector are often divided between municipal, regional and national levels. This also applies to climate-related policy instruments. According to the Ministry of Agriculture and Food, the most important policy instruments in reducing greenhouse gas emissions from agriculture are found in the National Agricultural Agreement. Among other things, the National Agricultural Agreement has allocated money for a pilot project for environmentally friendly manuring (started 2008). For 2010 NOK 11 million was allocated for grants to promote environmentally friendly spreading of fertilisers.[353] Grants are also available for changing tillage, for example reducing autumn ploughing, but these are primarily motivated by a desire to reduce run-off into water.

There are a number of agricultural grant schemes aimed at promoting environmentally friendly farming systems. According to the Norwegian Pollution Control Authority, these schemes may have a positive effect even though they are not specifically aimed at reducing greenhouse gas emissions.[354] Examples include appropriations to the Agricultural Development Fund and the environmental programmes.

The Norwegian Agricultural Authority states in an interview that the national agri-environmental programme[355] and the regional agri-environmental

349) Erik Trømborg et. al., *Klimagasser og bioenergi fra landbruket ('Greenhouse gases and bioenergy from agriculture')*, INA specialist report 11, 2007.

350) Proposition No 77 to the Storting (2006–2007) *Om jordbruksoppgjøret 2007 – endringer i statsbudsjettet for 2007 m.m. ('On the agricultural settlement 2007 – changes in the national budget for 2007 etc.')*

351) Proposition No 69 to the Storting (2006–2007) *Om jordbruksoppgjøret 2008 – endringer i statsbudsjettet for 208 m.m. ('On the agricultural settlement 2008 – changes in the national budget for 2008 etc.')*

352) See *Mandat: Nasjonalt utviklingsprogram for klimatiltak i jordbruket ('Mandate: National development programme for climate measures in agriculture')*. Adopted by the Ministry of Agriculture and Food, the Norwegian Farmers' Union and the Norwegian Farmers and Smallholders Union on 4 January 2008

353) These funds are allocated through the regional agri-environmental programmes.

354) This emerges from the Norwegian Pollution Control Authority's *Gjennomgang av lovverket mht. klimavirkninger ('Review of legislation with regard to climate effects')* (internal working document).

355) A total of about NOK 3.8 billion has been allocated to the national agri-environmental programme in 2010. The most important items are land use and cultural landscape grants (approx. NOK 3.1 billion), grants for grazing animals (approx. NOK 0.6 billion) and grants for organic farming (NOK 0.1 billion). See Proposition No 75 to the Storting *Om jordbruksoppgjøret 2009 – endringer i statsbudsjettet for 2009 m.m. ('On the agricultural settlement 2009 – changes in the national budget for 2009 etc.')*

programmes[356] may prove to be important policy instruments in the reduction of greenhouse gas emissions. The national agri-environmental programme is an overall programme for the preservation of land and cultural landscapes. However, neither the national nor the regional agri-environmental programme is designed with climate in mind. According to the Ministry of Agriculture and Food, this is due to inadequate knowledge of how emissions can be reduced without reducing the amount of food produced. Some regional agri-environmental programmes provide funding for catch crops, i.e. plants coming after the main crop has been harvested. This policy instrument is primarily aimed at preventing erosion and run-off, but may also have a positive effect on the carbon content of the soil.

6.5.6 What effect has the use of policy instruments had?

Reduced consumption of mineral fertiliser

The Ministry of Agriculture and Food has a target of reducing the use of nitrogen fertiliser by 10 per cent by 2020.[357] A report from the Bioforsk research and development institute shows that each year, 20 per cent more fertiliser is used than recommended on the basis of the average yield.[358]

Both the Ministry of Agriculture and Food and the Norwegian Agricultural Authority state in interviews that better fertiliser planning is the most important policy instrument for reducing the consumption of fertiliser. The Norwegian Agricultural Authority states that work on fertilisation norms needs to be continued, and that a fertilisation practice that is more in line with norms and recommendations must be established. Both the Ministry of Agriculture and Food and the Norwegian Agricultural Authority point out that more accurate production estimates are needed to enable more accurate estimation of fertiliser quantities. The Norwegian Agricultural Authority also states that there is a need for more knowledge about nutrients in soil.

There used to be a tax on fertiliser products, but both the Ministry of Agriculture and Food and the Norwegian Agricultural Authority state that this tax had little or no effect. When the tax was discontinued in 2000, the Ministry of Agriculture and Food introduced the Regulations relating to environmental plans.[359] These regulations include mandatory fertilisation planning for all farms. A pilot project has also been initiated relating to a grant scheme for improved techniques and precision in spreading.[360]

Estimates from Statistics Norway show that the amount of nitrogen sold in commercial fertilisers remained stable at between 100,000 and 110,000 tonnes during the period from 1999 to 2007.[361] In 2007/2008 sales increased to 116,400 tonnes of nitrogen.[362] The amount of fertiliser per produced unit, on the other hand, has decreased somewhat.[363]

Biogas production from manure and waste

Financial support for biogas plants is primarily given through Innovation Norway's bioenergy programme. Such projects also form part of the development programme for climate measures in agriculture.

According to the Ministry of Agriculture and Food, there are three small-scale biogas production plants: one is operational, one is under construction and one is being planned. Bioenergy production from farms accounts for a small part of total bioenergy production. The Ministry of Agriculture and Food states in an interview that these small-scale plants are very costly, and the Ministry questions whether this measure is a cost-effective way of helping to reduce greenhouse gas emissions.

According to the Norwegian Agricultural Authority, there are a number of reasons why there are few facilities for collection of methane from manure cellars in Norway. Energy prices do not make it financially profitable. Many small units make it costly to establish plants, and the existing technology has been developed for larger

356) The 2010 allocation for regional agri-environmental programmes is NOK 410 million. The allocation for grants for environmentally friendly spreading of fertilisers comes in addition to this sum. See Proposition No 75 to the Storting *Om jordbruksoppgjøret 2009 – endringer i statsbudsjettet for 2009 m.m. ('On the agricultural settlement 2009 – changes in the national budget for 2009 etc.').*

357) Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*

358) Tormod Briseid, Odd M. Harstad and John Morken, 'Klimagasser fra landbruket: Utslippsreduksjoner, forslag til mål, tiltak og virkemidler' *('Greenhouse gases from agriculture: Emission reductions, proposed targets, measures and policy instruments').* I *Bioforsk Report,* vol 3, no 9, 2008.

359) See Regulation No 54 of 15 January 2003: *forskrift om miljøplan ('Regulations relating to environmental plans').*

360) St.prp. nr. 75 (2008–2009) *Om jordbruksoppgjøret 2009 – endringer i statsbudsjettet for 2009 m.m.('On the agricultural settlement 2009-changes in the national budget for 2009 etc.*'.

361) Geir Inge Gundersen et. al, 'Jordbruk og miljø: Tilstand og utvikling 2009.' *('Agriculture and environment: State and development 2009.').* Statistics Norway report 2009/37.

362) This was a special year for mineral fertiliser sales because prices increased considerably, which resulted in hoarding. Sales figures for 2007/2008 were the highest ever recorded.

363) Statistics Norway (2008): *Jordbruk og miljø: Resultatkontroll jordbruk 2007 ('Agriculture and environment: Performance control for agriculture 2007').* Report 2008/1.

Photo:Birger Areklett / NN / Samfoto

units. It must also be feasible to use the heat from biogas plants, not just the electricity. The Authority also points out that there are major logistics challenges.

Both the Ministry of Agriculture and Food and the Norwegian Agricultural Authority are of the opinion that the solution is to collect waste from agriculture and households in larger units. The Norwegian Agricultural Authority points out in an interview that there is also great potential for improving cooperation between the agriculture and forestry sectors and the waste industry.

Reduced cultivation of marsh and returning cultivated marshland to its natural state

A third measure identified by the authorities is a reduction in the cultivation of marshland.[364] Both the Ministry of Agriculture and Food and the Norwegian Agricultural Authority state in interviews that there are currently no incentives for cultivating marshland. Land reclamation grants were available until about 1990, resulting in considerable cultivation of marshland. However, drained marshes continue to emit CO_2 for decades after they have been cultivated.

Cultivation of marshes is regulated by the Land Act.[365] The Ministry of Agriculture and Food points out in an interview that environmental considerations are an important part of the regulations relating to land reclamation. The Norwegian Agricultural Authority, on the other hand, states that municipalities do not take climate considerations into account when approving plans before land reclamation starts. The Ministry of Agriculture and Food states that cultivation of marshland has been a low-priority area, since it is not covered by Norway's Kyoto commitments.

The Ministry of Agriculture and Food states that there is insufficient knowledge about the potential effects of marsh restoration on greenhouse gas emissions. Marsh restoration involves returning cultivated marshland to its natural state in order to avoid decomposition of organic materials and CO_2 emissions.

6.5.7 Evaluations

No climate-specific goals had been set for the agricultural sector prior to the Climate Report.[366] Total reductions of 1–1.5 million tonnes of CO_2 equivalents compared with the baseline scenario on which the Norwegian Pollution Control Authority's mitigation analyses is based are to be triggered in primary industries and waste. The

364) In Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy* it is stated that 'prevent the release of greenhouse gases from major carbon stores, among other places in […] marshland".

365) See Act No 23 of 12 May 1995 relating to Land.

366) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*

target, as it is formulated in the Climate Report, is divided between several ministries, but nothing is said about the proportion of the reduction for which each ministry shall be responsible.

Agriculture is the primary source of the national emissions of nitrous oxide and methane. Greenhouse gas emissions from the agricultural sector account for about 9 per cent of total Norwegian emissions and have remained stable during the period 1998–2007. Most of the greenhouse gas emissions from the sector are unregulated.

The Ministry of Agriculture and Food has emphasised that uncertainty about agricultural greenhouse gas emissions and the effect of measures is an obstacle to the identification and implementation of measures. The Ministry has not, however, done much to facilitate improvement of the knowledge base in this field. A five-year development programme for environmental measures in agriculture was established in 2007.

The Ministry of Agriculture and Food has policy instruments financed through the National Agricultural Agreement that can contribute to reducing greenhouse gas emissions. These policy instruments include grants via the national and regional agri-environmental programmes. These programmes are, however, aimed at other environmental values than climate.

The use of policy instruments has only had a limited effect on greenhouse gas emissions. Nitrogen emissions from mineral fertiliser have remained relatively stable during the period 1998–2007. There is less reclamation of marshland now than before, but greenhouse gas emissions from cultivated marshes still account for a considerable proportion of the emissions from the agricultural sector.

6.6 How do the policy instruments in the industry sector help to achieve climate targets?

Emissions from industry comprise both emissions from stationary combustion and emissions from processing. Policy instruments relating to the use of energy in industry are discussed in section 6.3. This section focuses on emissions from processing.

6.6.1 The sector's targets for climate mitigation

A review of budget propositions from 1997 until the present shows that no concrete emission targets had been established for industry prior to Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*. The sector target for industry is a reduction in greenhouse gas emissions of between 2 and 4 million tonnes of CO_2 equivalents compared with the baseline scenario in the Norwegian Pollution Control Authority's mitigation analyses, to be triggered by existing and new policy instruments.

The Ministry of Trade and Industry stated in an interview that the Ministry does not consider itself a sector ministry on a par with, for example, the Ministry of Agriculture and Food or the Ministry of Transport and Communications. The Ministry of Trade and Industry states that the Ministry of the Environment and the Ministry of Finance are responsible for the policy instruments that regulate industry, and that the Ministry of Petroleum and Energy operates funding schemes through Enova. The Ministry of Trade and Industry operates support schemes and policy instruments through Innovation Norway, and the Ministry stated in an interview that it considers its role to be to apply positive policy instruments or use research to promote new activity or transition to other activities.

A review of the recent years' budget propositions of the Ministry of Trade and Industry and the Ministry of the Environment shows that neither ministry has concretised working targets for reducing emissions from industry. The Ministry of the Environment stated in an interview that the main policy instruments are wielded by other ministries than the ministry responsible for the industry sector. The Ministry stated in an interview that, through the Pollution Control Act, voluntary agreements and the emissions trading scheme, it manages some of the most important policy instruments capable of regulating emissions from industry. The Ministry also points out that many other ministries control policy instruments in relation to industry.

6.6.2 Emission and emissions development status for the industry sector

Table 6.6 shows greenhouse gas emissions from mainland industry broken down by the most important industries. The table shows that the mainland industry's contribution was about 13.9 million tonnes in 2007, which accounted for 26 per cent of Norway's total greenhouse gas emissions. Greenhouse gas emissions from industry fell from 18.4 million tonnes of CO_2 equivalents in 1990, which means a reduction of about 25 per cent. The table also shows that emission from

Table 6.6 Greenhouse gas emissions from the mainland industry 1990–2007 (in million tonnes of CO_2 equivalents)

	1990	1997	2000	2005	2007
Stationary combustion	3.7	4.9	4.3	4.1	4.1
Industrial processes	14.7	11.6	12.4	10.8	9.8
- Fertiliser production	2.6	2.1	2.1	2.3	1.7
- Iron, steel and ferroalloys	2.8	3.1	3.5	2.7	2.5
- Aluminium	4.8	3.1	3	3	3
- Other metal production	2.3	0.6	1	0.3	0
- Cement production	0.7	1	0.9	0.9	1
- Oil refining	0.8	0.8	1	1	1
- Carbide production	0.4	0.3	0.3	0.1	0.1
- Other	0.4	0.5	0.7	0.6	0.6
Total	**18.4**	**16.5**	**16.8**	**14.9**	**13.9**

Source: Statistics Norway and the Norwegian Pollution Control Authority

processing amounted to 9.8 million tonnes of CO_2 equivalents in 2007, which was about 70 per cent of total emissions from industry. The greatest emissions sources in the process industry are the production of aluminium, ferroalloys and fertiliser. Emissions from these three sources decreased from 1990 to 2007, and the greatest decrease was in emissions from the production of aluminium and fertiliser. Emissions from oil refining and cement production increased compared with the 1990 level.

Some of the reduction in emissions can be explained by the closure of a few emission-intensive enterprises.[367] There has also been a considerable reduction in emissions per produced unit during the period (see figure 6.16). The reduction in emissions per produced unit was greatest for mineral fertilisers and aluminium, for which emissions per produced unit were more than halved. There was a slight decrease in emissions per produced unit for ferroalloys, while emissions from refineries increased. Technological development, both in the form of transition to less polluting production technology and of improved process control, contributed to reducing emissions per produced unit.[368]

Emission projections and reduction potential

According to the Norwegian Pollution Authority's sector projections [369] for 2020, emissions from the industry sector are not expected to change significantly towards 2020 given the present use of policy instruments. Combustion emissions from industry are expected to remain unchanged, while the projection for emissions from processing in 2020 is 10.8 million tonnes, given the current use of policy instruments.[370]

The mitigation analysis estimates that energy and processing measures in industry could reduce emissions by an amount corresponding to 2.3 million tonnes of CO_2 equivalents by 2020. The transitions from oil to biofuels and from fossil coal to charcoal are examples of such measures. Most of these measures are assumed to be highly feasible and cost less than NOK 200 per tonne. For the process industry, it has been estimated that the measure of improved operation of the production facilities could result in a reduction of 225,000 tonnes of CO_2 equivalents.[371]

The mitigation analysis deems carbon capture and storage from existing industry to be one of the measures with the greatest potential for reducing emissions.[372] Measures have been-identified with a total technical reduction potential of just over 5 million tonnes of CO_2

367) Kathrine Loe Hansen, Torstein Bye and Dag Spilde: *Utslipp av klimagasser i Norge – i dag, i går og den nære framtid. ('Greenhouse gas emissions in Norway – today, yesterday and in the near future').* Statistics Norway report 2008/17.

368) Kathrine Loe Hansen, Torstein Bye and Dag Spilde: *Utslipp av klimagasser i Norge – i dag, i går og den nære framtid. ('Greenhouse gas emissions in Norway – today, yesterday and in the near future').* Statistics Norway report 2008/17.

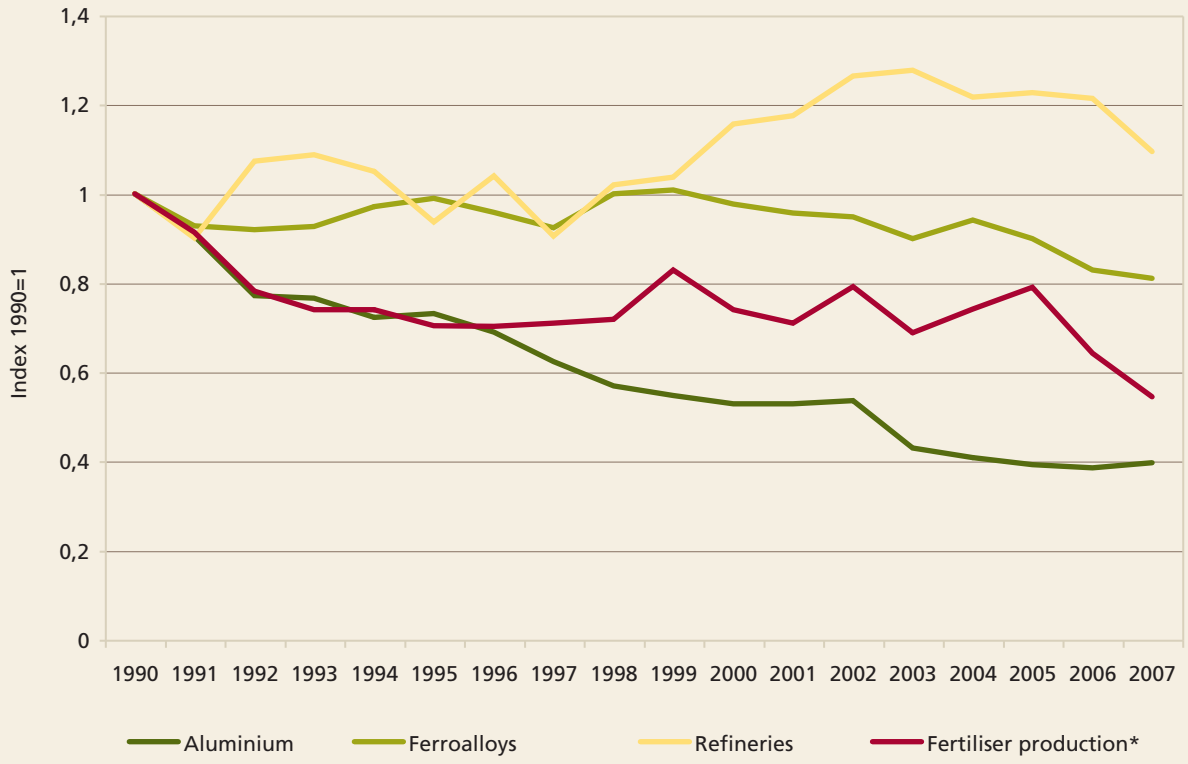
369) Data received from the Norwegian Pollution Control Authority 3 April 2009.

370) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority. Report TA-2254/2007.

371) This concerns improved operation of the aluminium works' prebaking facilities.

372) *Reduksjon av klimagasser i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority, Report TA-2254/2007.

Figure 6.16 Greenhouse gas emissions in industry per produced unit 1990–2008



* The data for fertiliser production (nitric acid) were obtained from the Ministry of the Environment.
Source: Statistics Norway and the Norwegian Pollution Control Authority

equivalents by 2020. It is, however, specified that there is great uncertainty about the cost of carbon capture and storage from existing process industries.

6.6.3 Policy instruments for the process industry

It emerges from the climate policy reports that the main policy instruments for industry are the emissions trading scheme and voluntary agreements. Some industry is currently regulated through the Greenhouse Gas Emission Trading Act, see section 4.4. In spring 2009, ESA approved Norway's inclusion of nitrous oxide from mineral fertiliser production (nitric acid) in the emissions trading scheme.[373] From 2013, most of the process industry will be included if Norway becomes part of the EU emissions trading scheme during the next period.[374]

In September 2007, the Ministry of the Environment appointed an interministerial group that was given the remit to examine policy instruments for the part of Norwegian industry subject neither to the duty to surrender allowances nor to carbon tax. The group concluded its work with a report in December of that year in which it concluded that both taxes and the duty to surrender allowances are good policy instruments that are effective, cost-effective and feasible and help to reduce emissions. The Pollution Control Act is deemed to be an appropriate instrument for generating cost-effective emission reductions and triggering known measures in industry, but it is not normally cost-effective in the cross-enterprise context. Agreements, on the other hand, are not considered cost-effective in the cross-sectoral context or over time unless they contain systems to remedy this.

The Ministry of Trade and Industry stated in an interview that the Ministry's management and industry itself both want voluntary agreements. The Ministry of Finance stated in an interview that allowances and taxes are considered cost-effective policy instruments, and that they should therefore be the preferred instruments. Voluntary agreements are not deemed to be cost-effective.

In 2009, the Ministry of the Environment started negotiations with the Federation of Norwegian

373) News from the Ministry of the Environment, 27 February 2009.
374) Press release from the Ministry of the Environment, 11 September 2009.

Photo: Roger Hardy / Samfoto

Industries about emissions reductions in the part of the industry that is neither subject to carbon tax nor included in the emissions trading scheme. This work resulted in an agreement being entered into in September 2009.[375]

It emerges from interviews with the Confederation of Norwegian Business and Industry and the confederation of Norwegian Industries that industry has called for clear long-term use of policy instruments. Both organisations state that work on establishing industrial policy instruments is too slow, and that the policy instruments are not proportionate to the targets. Inadequate use of policy instruments means that industry will be inadequately prepared for any stronger policy instruments implemented in future. According to the organisations, this could result in higher restructuring costs.

All the climate policy reports emphasise that the Pollution Control Act can be used to regulate greenhouse gas emissions from industry, but only limited use has been made of it in practice, see section 4.5.

The Norwegian Pollution Control Authority stated in an interview that if it finds reason, under the Pollution Control Act, to set carbon capture requirements in a permit for CO_2 emissions that are subject to a duty to surrender allowances and emanate from any other form of industry than a gas-fired power plant, then it will have to take the initiative in relation to the Ministry itself. According to the Norwegian Pollution Control Authority, high costs are the primary obstacle to carbon capture in industry. The Ministry of the Environment states that the industry sector will have to make considerable reductions if the national climate targets are to be achieved, and that the expediency of carbon capture and storage should therefore be studied more closely in this sector too.

375) Press release from from the Ministry of the Environment, 28 August 2009.

Table 6.7 Overview of agreements entered into with industry

Agreement	A. Agreement for reduction of greenhouse gas emissions between the Ministry of the Environment and the aluminium industry	B. Agreement between the Ministry of the Environment and the major importers, manufacturers and users of electrical equipment	C. Understanding between the Ministry of the Environment and the Federation of Norwegian Process Industries (PIL)[376]	D. Agreement between the Ministry of the Environment and the Federation of Norwegian Industries to reduce greenhouse gas emissions in the period 2008-2012 from the part of the process industry that is not subject to a duty to surrender allowances
Entered into	1997	2002	2004	2009
Gases regulated	Perfluorocarbons (PFC) – tetrafluoro-methane (CF_4) and hexafluoroethane (C_2F_6)	Sulphur hexafluoride (SF_6)	CO_2, methane, nitrous oxide, hydrofluorocarbons (HFC), PFC and SF_6	CO_2, methane, nitrous oxide, hydrofluorocarbons (HFC), PFC and SF_6
Target	A 50-per cent reduction in greenhouse gas emissions by 2000 and a 55-per cent reduction by 2005	Emissions shall be reduced by 13 per cent by 2005 and by a total of 30 per cent by 2010 compared with 2000 emissions	An emissions cap of 13.5 million tonnes of CO_2 equivalents for the whole industry covered by this agreement. This corresponds to a 20-per cent reduction compared with 1990	Emissions from the part of the process industry that is not subject to a duty to surrender allowances must not exceed 6.2 million tonnes of CO_2 equivalents per year on average during the period 2008–2012
Agreement expires	2005	2010	2007	2012

6.6.4 The result of the voluntary agreements

Since 1998, the Ministry of the Environment has entered into three voluntary agreements and an understanding with industry to reduce greenhouse gas emissions. The authorities have considered voluntary agreements to be an important supplementary policy instrument in relation to industry not subject to the carbon tax.[377] Through the signing of these voluntary agreements the authorities engage in direct dialogue with the regulated party, and the parties agree on a level of emissions. Most of the voluntary agreements entered into with industry cover other greenhouse gases than CO_2.

A. The agreement with the aluminium industry

The aluminium enterprises Elkem Aluminium, Hydro Aluminium and Sør-Norge Aluminium were parties to this agreement, which covered a total of seven plants. A target was set in the agreement to reduce greenhouse gas emissions by 55 per cent compared with the 1990 level by the end of 2005. Figures received by Statistics Norway show that the aluminium sector had already reduced its emissions by 33 per cent in the period from 1990 to 1996.

Estimates from the Norwegian Pollution Control Authority show that the agreements have been fulfilled, and that emissions are below the agreed target. The Ministry of the Environment stated in an interview that it was the industry itself that saw the potential for emissions reductions, and that some of the reductions probably resulted from technology changes and investments that would have taken place anyway. The agreement is nonetheless perceived as being responsible for considerable reductions. This is confirmed in interviews with the Ministry of Trade and Industry as well as with the business and industry organisations. In the Confederation of Norwegian Business and Industry's opinion, the agreement was ambitious, and the industry made a real effort to reach the targets. It also believes that this has contributed to the introduction of leading-edge technology. According to the Ministry, another beneficial effect is that the negotiation process has led to a better understanding of and greater focus on the issue in the enterprises in question.

B. Agreement on reduction of emissions of SF_6 gas from the electrical industry

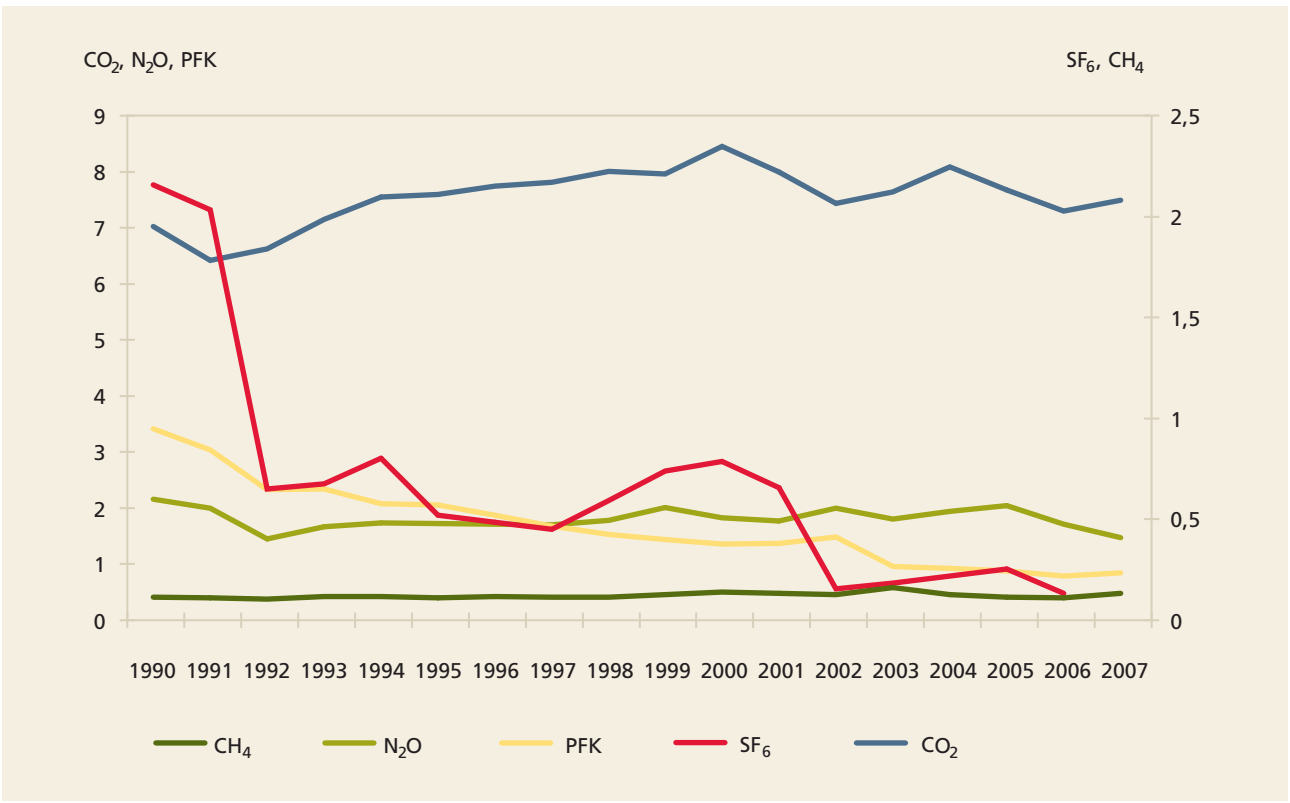
In March 2002, an agreement was signed between the Ministry of the Environment and the major importers, manufacturers and users of electrical equipment containing SF_6.[378]

376) PIL and the Federation of Norwegian Manufacturing Industries (TBL) merged to form the Federation of Norwegian Industries from 1 January 2006. The most important segments and branches of industry in the Norwegian mainland industry are represented in the Federation of Norwegian Industries.

377) Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy.*

378) SF6 is a powerful greenhouse gas that has almost 24,000 times the warming effect of CO_2.

Figure 6.17 Greenhouse gas emissions from industry by type of gas 1990–2007 (in million tonnes of CO_2 equivalents)



Source: Statistics Norway and the Norwegian Pollution Control Authority

The parties undertook to reduce emissions by a total of 30 per cent compared with 2000 emissions by 2010. The obligations are to be met by recycling and establishing procedures to minimise emissions. The Ministry of the Environment stated in an interview that the SF_6 agreement was considered a success. Statistics Norway's emission estimates show that emissions were reduced by more than 50 per cent from 2000 to 1997.

C. Understanding/ agreement between PIL and the Ministry of the Environment

The Federation of Norwegian Process Industries (PIL) took the initiative for signing an agreement that included emissions not covered by carbon tax. Dialogue between the Ministry and the industry produced an understanding between the Ministry of the Environment and the process industry in 2004, but this understanding was never formally signed.[379] The main purpose of the dialogue was to arrive at a common understanding of how the process industry could help to reduce emissions during the period 2005–2007.

The understanding meant that the aluminium, ferroalloy, carbon, mineral fertiliser and carbide industries in Norway undertook to reduce the emissions of all greenhouse gases covered by the Kyoto Protocol. This agreement covered 27 per cent of total Norwegian greenhouse gas emissions.[380] An emissions cap of 13.5 million tonnes was set for the industries as a whole. This entailed a 20-per cent reduction in relation to the 1990 level. The understanding expired in 2007. The Federation of Norwegian Industries stated in an interview that the sector planned to fulfil the agreement by means of extensive measures in one enterprise, Yara (mineral fertiliser production). The measures were funded jointly by the involved industrial enterprises.

Figure 6.17 shows emissions from industry by type of gas. CO_2 emissions were relatively stable, while N_2O emissions were fairly stable until 2005, and have decreased since then. The figure shows that the greatest reductions were in emissions of SF_6 and PFC (both covered by the two voluntary agreements). Emissions of PFC gases from primary aluminium production decreased from 3.4 million tonnes of CO_2 equivalents in 1990 to 0.8 million tonnes in 2007.

379) Proposition No 13 to the Odelting (2004–2005) *Om lov om kvoteplikt og handel med kvoter for utslipp av klimagasser* (klimakvoteloven) ('*On the Act Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances*' *(The Greenhouse Gas Emission Trading Act))*.

380) Recommendation No 33 to the Odelsting (2004–2005).

New technology helped to reduce emissions of nitrous oxide (N_2O) from fertiliser production from 2.0 million tonnes of CO_2 equivalents in 2005 to 1.4 million tonnes in 2007.[381] These emissions were covered by the understanding.

D. Agreement with the process industry on regulation of emissions during the period 2008–2012

To follow up the Climate Settlement,[382] a new agreement with the process industry was entered into in September 2009. In this agreement, the Federation of Norwegian Industries undertakes, among other things, to ensure that emissions from the process industry that are not covered by the emissions trading scheme or for which the producer is not liable to pay carbon tax do not exceed 6.2 million tonnes of CO_2 equivalents per year, calculated as an average for the period 2008–2012. This means that the process industry will have to reduce its emissions by 200,000 tonnes compared with 2007 emissions, which will amount to a reduction of just over 3 per cent.

According to figures received from the Norwegian Pollution Control Authority, emissions in all industries covered by the agreement remained relatively stable or fell slightly from 2007 to 2008. Ferroalloys were an exception; emissions for this industry increased by about 200,000 tonnes from 2007 to 2008. In 2009, the aluminium production plant on Karmøy closed down, and a production line at the Sunndal aluminium works was shut down temporarily due to the market situation. Figures from the Norwegian Pollution Control Authority show that this contributed to a reduction of about 0.8 million tonnes of CO_2 equivalents.[383] There are indications that emissions from ferroalloy production will decrease significantly from 2008 to 2009.[384]

381) *Utslipp av klimagasser i Norge – i dag, i går og den nære framtid. ('Greenhouse gas emissions in Norway – today, yesterday and in the near future')*. Statistics Norway report 2008/17, Kathrine Loe Hansen, Torstein Bye and Dag Spilde.

382) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.

383) According to the Norwegian Pollution Control Authority, emissions from the Karmøy facility amounted to about 0.5 million tonnes of CO_2 equivalents in 2007. Figures from the Norwegian Pollution Control Authority show that emissions from the one production line at Sunndalsøra amounted to more than 330.000 tonnes of CO_2 equivalents in 2007.

384) The consumption of electricity for production of iron, steel and ferroalloys was reduced by 36 per cent in 2009 (up to and including November) compared with the year before, cf. Statistics Norway's electricity balance statistics. This is used as an indication of change in the production of ferroalloys.

6.6.5 Evaluations

The first concrete emission reduction targets for industry were set in Report No 34 to the Storting (2006–2007). The target is for new policy instruments in industry to trigger a reduction of 2 to 4 million tonnes of CO_2 equivalents compared with the baseline scenario in the Norwegian Pollution Control Authority's 2007 mitigation analyses.

Emissions from the sector decreased by about 25 per cent in the period from 1990 to 2007. This was due to the closure of industrial enterprises and to reduced emissions per unit as a result of modernisation, the introduction of new technology and improved process control. Voluntary agreements with industry have been the main policy instruments employed in the sector. The investigation shows that the greatest reduction in greenhouse gas emissions occurred in the industries covered by these agreements.

About half the Norwegian industry's greenhouse gases were not regulated prior to signature of the most recent voluntary agreement. Subsequent to this agreement, the process industry is to reduce emissions by 200,000 tonnes compared with 2007 emissions. When the agreement was signed, an even greater reduction had already taken place as a result of the closure of one facility and the market situation in 2009. It may therefore seem that this new voluntary agreement does not contribute to any actual regulation. Through its interest organisations, industry has called for clear long-term use of policy instruments that are proportionate to the sector's targets in order to enable the industries to make the necessary adjustments. Further policy instruments will be required in order to reach the targets for industry for 2020.

This investigation shows that it is unclear which ministry or ministries is/are responsible for the achievement of the sector target for industry, and that no ministries have concretised working goals for reduction of emissions from industry in their budget propositions. Unclear sector responsibility and disagreement on the use of policy instruments could be a risk factor to the sector's target achievement towards 2020.

6.7 How do the policy instruments in the transport sector help to achieve climate targets?[385]

6.7.1 The sector's targets for climate mitigation

The annual budget propositions from the Ministry of Transport and Communications attach importance to reducing the adverse environmental impacts that transport inflicts on society. A review of the Ministry of Transport and Communications' budget propositions for the period from 1998 to 2006 shows that no concrete greenhouse gas emission targets were set in the transport sector.

The sector targets for greenhouse gas emissions and a climate action plan for the transport sector were established by the Climate Report. The emissions target for the sector is a reduction of 2.5–4 million tonnes of CO_2 equivalents by 2020 compared with the baseline scenario on which the Norwegian Pollution Control Authority based its mitigation analysis. This target also includes shipping and air traffic.

Report No 43 to the Storting (2006–2007) *Norwegian Climate Policy* proposed targets and measures to meet the climate challenges facing the transport sector. The report states that greenhouse gas emissions can only be reduced by[386]

- using less fuel
- using fuel that produces lower CO_2 emissions
- reducing the amount of transport
- switching to more environmentally friendly forms of transport

The Ministry of Transport and Communications refers in an interview to the fact that the environmental action plans, drawn up in 1998[387] and 2006[388]respectively, address climate goals at a general level. It stated that they had not been expressed as concrete performance requirements for individual policy instruments, and that the Ministry had not developed concrete working goals for the climate area.

The Norwegian Public Roads Administration[389] stated in an interview that they have several policy instruments that are relevant to the reduction of greenhouse gas emissions, but few or no concrete climate targets have been set for them. It also stated that the *National Transport Plan* (NTP) also lacks concrete descriptions of what the Norwegian Public Roads Administration's contribution should be. However, the Norwegian Public Roads Administration thinks that the driving force role has become clearer since the agency's instructions were changed in May 2005.[390]

It also emerges that there are a number of concrete targets for the transport sector that may contribute to reducing greenhouse gas emissions, but this is not explicitly given as a reason for the targets in question. This applies to railway development, other public transport and footpaths and cycle paths.[391]

6.7.2 Emission status for the transport sector

In 2007, the transport sector accounted for 30 per cent of total Norwegian greenhouse gas emissions, and road transport alone accounted for 19 per cent. Table 6.8 shows that greenhouse gas emissions from the transport sector had increased from 12.2 million tonnes of CO_2 equivalents in 1990 to 16.6 million in 2007, i.e. an increase of 4.3 million tonnes of CO_2 equivalents. This corresponds to an increase of 35 per cent. Preliminary figures from Statistics Norway indicate that emissions decreased by 1.9 per cent from 2007 to 2008.

The table also shows that the increase in emissions from road transport accounted for about two thirds of the total increase of 2.6 million tonnes of CO_2 equivalents from the transport sector. Both passenger cars and freight transport contributed to the increased emissions. In the passenger traffic area, emissions from passenger cars increased by 0.5 million tonnes of CO_2 equivalents (10%), while freight transport emissions increased by 1.2 million tonnes of CO_2 equivalents (63%). From 2007 to 2008 road traffic increased by 1.5 per cent and emissions increased by 0.4 per cent.[392]

385) This chapter is limited to what Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* refers to as land transport, i.e. railways and road transport including light and heavy vehicles.
386) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*, section 9.2 Climate action plan.
387) Ministry of Transport and Communiations (1998): *Miljøhandlingsplan for samferdselssektoren 1998 ('Environmental action plan for the transport and communications sector 1998').*
388) Report No 34 to the Storting (2006–2007).
389) In this text, the Norwegian Public Roads Administration – Directorate of Public Roads is called the Norwegian Public Roads Administration.
390) Section 1-2 Objectives and responsibility in the instructions for the Norwegian Public Roads Administration, adopted by Royal Degree of 27 May 2005, second paragraph: 'Sector responsibility does not excuse other parties from their responsibilities, but the Norwegian Public Roads Administation shall encourage and support the other parties with primary responsibility to ensure that the sector makes the best possible contribution to society.'
391) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
392) Letter of 2 December 2009 from the Ministry of Transport and Communications.

Table 6.8 Greenhouse gas emissions from the transport sector 1990–2007 (in million tonnes of CO_2 equivalents)

	1990	1998	2000	2005	2007	Increase 1990–2007
Total transport	12.2	14.4	13.9	15.1	16.6	4.4
Total road transport	7.7	8.8	8.6	9.8	10.3	2.6
- Total passenger traffic by road	5.8	6.3	6.2	6.9	7.2	1.4
passenger cars	4.9	4.9	4.7	5.2	5.4	0.5
other light vehicles	0.5	0.8	0.8	0.9	1.0	0.5
buses and coaches	0.4	0.6	0.6	0.6	0.7	0.3
mopeds/ motorcycles	0.05	0.07	0.09	0.1	0.1	0
- Total road freight	1.9	2.5	2.4	2.9	3.1	1.2
light vehicles	0.5	0.8	0.8	0.9	1.0	0.5
heavy vehicles	1.4	1.7	1.6	2.0	2.1	0.7
Air traffic (domestic)	1.0	1.2	1.1	1.0	1.0	0.1
Shipping and mobile oil rigs	2.0	2.6	2.6	2.4	2.7	0.7
Other mobile sources (excl. fisheries)	1.5	1.8	1.6	1.9	2.5	1.0

Source: Statistics Norway and the Norwegian Pollution Control Authority

6.7.3 Emission projections and examination of measures

According to the Institute of Transport Economics, projections for this sector are prepared by both the Norwegian Pollution Control Authorities and the transport and communications authorities using a model from the Institute of Transport Economics, but based on conditions set by the Ministry of Finance. The Norwegian Pollution Control Authority is responsible for the projections for the transport sector that it uses in its own mitigation analyses. However, these projections build on projections presented in the annual national budget and most recently in the report *Long-term Perspectives for the Norwegian Economy*.[393]

The discrepancies between various projections are discussed in Report No 16 to the Storting (2008–2009) *National Transport Plan 2010–2019*. They are explained partly by the use of different modelling tools, and partly by the fact that the projections-making basis has improved since the estimates for the Climate Report were prepared. In addition, the degree to which the projections incorporate the effects of newly adopted emission-reduction policies varies. The discrepancies between different projections are discussed in a letter from the Ministry of Transport and Communications to the Ministry of the Environment dated 5 September 2008 which reads as follows: 'there is significant variation between the estimates for greenhouse gas emissions in the transport sector between projections in the climate action plan'.

The Ministry of Transport and Communications stated in an interview that the Ministry of Finance's general projections are sufficient for setting a national target but somewhat inadequate when it comes to distribution between sectors. The greatest uncertainty factors are found in the back-calculation from gross product to transport work and from that to greenhouse gas emissions.

6.7.4 How are policy instruments used in the transport and communications sector?

According to Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy,* land transport is subject to many policy instruments affecting the amount of transport and the distribution between means of transport, and thus also greenhouse gas emissions. These policy instruments are not, however, primarily aimed at climate:

- The purpose of vehicle taxes is partly to generate revenue for the state, partly to adjust the market for the adverse effects inflicted on society by car traffic which are not necessarily reflected in the cost of using cars (accidents, wear and tear on roads, congestion, pollution and noise)
- The primary goal of grants from central and local authorities for investments in and running of public transport is to guarantee that city areas have an efficient and environmentally friendly transport service, but they are also

393) Letter of 7 December 2009 from the Ministry of the Environment.

intended to provide basic transport services to people who cannot or do not wish to drive
- The extent to which land use policy is used as an instrument to influence the amount of transport, the distribution between means of transport and traffic flows varies
- A main purpose of the development of the network of footpaths and cycle paths has been to ensure that children are safe on their way to and from school, but there are also health-related and environmental reasons for facilitating walking and cycling

The sectoral climate action plan in Report No 34 to the Storting *(2006–2007) Norwegian Climate Policy* pointed to carbon taxes, vehicle taxes, grants for public transport and for footpaths and cycle paths and land use policy as the most important existing policy instruments for the land transport sector. In a short-term perspective, carbon tax on diesel is the policy instrument with the strongest impact on heavy goods transport, while ecodriving training for lorry drivers is expected to contribute to fuel savings of between 10 and 20 per cent.[394]

The Ministry of Transport and Communications stated in an interview that the policy instruments for which the Ministry is responsible have a very limited effect and will not be sufficient to achieve the 2020 targets. To achieve its sector targets, the Ministry of Transport and Communications depends on the policy instruments of other ministries, such as taxes and land use policy. The Ministry of Transport and Communications also states that it sees it as a challenge that it has ownership of the targets with only limited ownership of the policy instruments. This applies to the tax policy as well as to land use planning and biofuel. This is also discussed in Report No 16 to the Storting (2008–2009) *National Transport Plan 2010–2019*, from which the following sentence is quoted: 'It is, however, more important that many highly effective policy instruments are designed in other contexts than the National Transport Plan, for example in taxation policy; or by municipal and regional decision makers, for example in the land use policy'.

The Ministry of Transport and Communications also states that developing new policy instruments is not its primary concern. In the Ministry's opinion, there are enough effective policy instruments available to the sector, but what is lacking is the willingness to use them. One example of this is road pricing, which is cost-effective and has a good climate effect, but must be decided and carried out locally.

In the following, the use of policy instruments is described in relation to the targets in this sector: using less fuel, reducing the amount of traffic and achieving a transition to more environmentally friendly forms of transport (with emphasis on transition from road to rail transport).

Reduction of fuel consumption

Measures that can help to reduce greenhouse gas emissions from individual vehicles include both measures to make conventional vehicles more efficient and the phasing in of alternative fuels and vehicles.[395] According to the Norwegian Public Roads Administration, taxes and information to consumers are the most important policy instruments for reducing emissions from individual vehicles.

Report No 26 to the Storting (2006–2007) establishes that the passenger car population has become more energy-efficient. This report states that both petrol and diesel cars have improved, while the transition to more diesel cars has so far been of minor significance. At the end of 1990 the percentage of diesel-powered passenger cars was three, increasing to 25 per cent in 2008, according to Statistics Norway. The transition from petrol-powered to diesel-powered cars has not resulted in a reduction in total emissions. This is primarily due to an increase in mileage.[396]

Statistics Norway has calculated that better technology has made road traffic more energy-efficient, which means that both energy consumption and emissions are growing less than the total number of passenger-kilometres and tonne-kilometres.[397] Energy efficiency improved by 3–5 per cent for passenger cars and 1–20 per cent for freight [398] in the period 1998–2004.

394) The Norwegian Public Roads Administration stated in an interview that driving instruction is a policy instrument. A new national curriculum has been drawn up for basic driving instruction, which includes training in economical and environmentally friendly driving. The introduction of the directive on the initial qualification and periodic training of lorry and bus drivers (2009) entails further training in environmentally friendly driving for new drivers. The Ministry of Transport and Communications confirmed this in an interview.

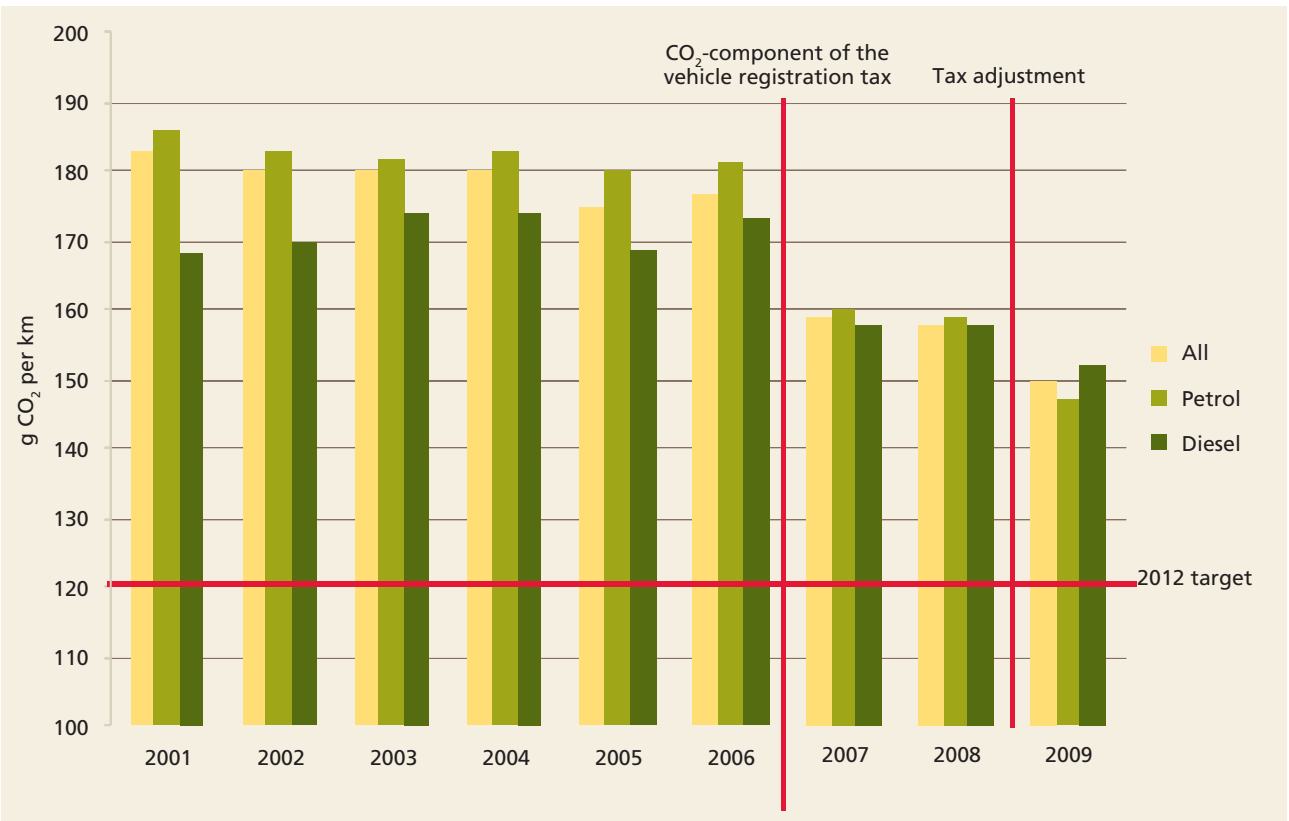
395) Report No 16 to the Storting (2008–2009) *National Transport Plan 2010–2019.*

396) *Energibruk og utslipp til luft fra innenlands transport ('Energy use and emissions to air from domestic transport').* Report 2008/49. Statistics Norway report.

397) *Energibruk og utslipp til luft fra innenlands transport ('Energy use and emissions to air from domestic transport').* Report 2008/49. Statistics Norway report.

398) Depending on the size of the lorry.

Figure 6.18 CO_2 emissions from new cars



Source: Letter of 2 December 2009 from the Ministry of Transport and Communications

Energy efficiency gains have not been as great for other means of transport.

According to the Ministry of Transport and Communications, the registration tax is particularly important and stimulates the purchase of low-emission cars. According to the report *Bilavgifter ('Vehicle taxes')* drawn up by an interministerial working group, the registration tax's primary purpose is to generate revenue for the state, but it is also intended to promote environmental protection and safety.[399]

The most recent major change to the registration tax took effect as from 1 January 2007, when cubic capacity was replaced by CO_2 emission as a tax component.[400] The purpose of this change was to motivate consumers to buy low-emission cars.

In view of the CO_2 emission target of 120 g/km on average in the new car population by 2012, further changes to the CO_2 component were adopted in 2009 to provide a stronger incentive to buy low-emission cars.[401] This meant an increase in registration tax of almost NOK 1,400 for cars with emissions between 140 and 250 g/km and a reduced registration tax for low-emission vehicles. The tax for a car emitting 110 g/km, for example, will be reduced by about NOK 9,700, and for a car emitting 100 g/km the tax cut will be NOK 14,200.[402]

The Ministry of Transport and Communications states that there were a few technical problems relating to the CO_2 metering requirement that came into effect in 2001–2002, which explains why it has taken several years to put this policy instrument in place.

Figure 6.18 shows that average CO_2 emissions from newly registered passenger cars decreased from 2001 to 2007, with the most dramatic reduction between 2006 and 2007, i.e. at the same time as the tax was changed. Between those two years, average emissions from newly registered passenger cars dropped from 177 g to 159 g of CO_2 per kilometre. The figure shows that the

399) *Bilavgifter, rapport fra interdepartemental arbeidsgruppe ('Vehicle taxes, report from an interministerial working group')*, Ministry of Finance, 20 September 2007.
400) Report No 1 to the Storting (2006–2007) *Skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties').*
401) Report No 1 to the Storting (2008–2009) *The National Budget 2009.*
402) Report No 1 to the Storting (2008–2009) *The Ministry of Finance. Skatte-, avgifts- og tollvedtak ('Decisions relating to direct and indirect taxes and customs duties').*

reduction rate levelled out in 2007 and 2008. According to the Information Council for Road Traffic, average emissions from new passenger cars in Norway in 2009 were 151 g/km.

The Norwegian Public Roads Administration stated in an interview that a reduction of 30 g/km in just under three years is a very ambitious target, which will probably be difficult to realise even with major tax changes. The explanation given is that there will be an insufficient supply in the market, especially of larger cars with such low emission levels.

The Ministry of Transport and Communications states that the EU favours a gradual phasing-in of several different measures, including requirements for the rolling resistance of tyres, air conditioning systems, tyre gauges and gearshift indicators, that are intended to reduce greenhouse gas emissions progressively. Today, few types of cars achieve emission levels of 120 g/km or less. According to the Ministry of Finance, the EU has set a target of 30 g/km by 2012, and a further 10-gramme reduction from the other policy instruments.[403]

Heavy goods transport

The Institute of Transport Economics has stated that for heavy goods vehicles, fuel costs account for a large part of the expenditure on the vehicle. The diesel tax is therefore particularly important when it comes to steering behaviour in a climate friendly direction, and it is more important than taxes on the purchase of the vehicle. Fuel costs account for about 50 per cent of all vehicle expenditure in the road haulage industry, while the corresponding figure for passenger cars is about 20 per cent.

The Norwegian Public Roads Administration also states that heavy goods vehicles are more energy-efficient than vehicles used in passenger transport. This is primarily because they use diesel engines which are more energy-efficient that petrol engines. There are therefore fewer measures available for reducing greenhouse gas emissions from heavy goods vehicles. The exception from this rule is buses and vans (local traffic), where introducing alternative technology/fuels is a realistic option. Rationalisation of the transport industry by means of improved logistics could also prove to be an important contribution.

403) Letter of 7 December 2009 from the Ministry of Finance.

Fact box 6.4 Biofuel production

In connection with increased use of biofuels, it is important to take the overall environmental and societal considerations into account. Biofuel production can be a positive contribution to agricultural production in developing countries, but can also have a major adverse impact on food security, food prices and environmental factors such as forest areas, biodiversity and water resources. There is also great variation in the net climate effect of different biofuels, so it is important to evaluate fuels within the framework of a total lifecycle analysis. Norway will cooperate with the EU, international bodies and the fuel industry, among others, to establish schemes to promote the sustainable production and importation of biofuels. Such schemes could involve certification, international mechanisms or similar, and should be based on sustainability criteria and lifecycle analyses of the various effects of the different fuels.

In the EU Renewable Directive, the net climate effect of current biofuels is calculated to be between 16 and 88 per cent, and the effect of future biofuels to be between 70 and 95 per cent. The emissions are not included in the climate accounts.

Source: Report No 34 to the Storting (2006–2007) Norwegian Climate Policy and a letter of 2 December 2009 from the Ministry of Transport and Communications

The Norwegian Public Roads Administration also points out that consideration is being given to allowing long combination vehicles, i.e. longer articulated lorries. This would mean that two such articulated lorries could replace three of the current length. Trial projects with long combination vehicles have been started on some selected stretches of road.[404] A climate calculator for freight transport is also under development by the research project *Green Freight Transport*.

Using fuel that produces less CO_2 emissions

Biofuel is called carbon neutral because the plants used to produce biofuel absorb CO_2 from the atmosphere while they grow. When the biofuel is used, the same amount of CO_2 is returned to the atmosphere. However, the net gain from the use of biofuels depend on the production method, see fact box 6.4.

Biofuel is still more expensive to produce than fossil fuels, but tax exemption has made it cheaper for consumers.[405] Biodiesel has been

404) This trial is to be evaluated by the Institute of Transport Economics and will be completed in 2011.

405) Biofuel fact sheet, Konrad Pütz, The Bellona Foundation, 3 January 2007 (download date: 7 July 2009).

exempt from both fuel tax and carbon tax. There is no carbon tax on bioethanol, but exemption from the fuel tax is only granted if the finished product consists of at least 50 per cent bioethanol. From 2010, biodiesel will be taxed at half the autodiesel rate, cf. Recommendation No 3 to the Storting (2009–2010) *Skatte-, avgifts- og toll-vedtak ('Decisions relating to direct and indirect taxes and customs duties')*.

Increased use of biofuels has been emphasised as a policy instrument in all climate policy reports since 1998.

Section 3.16 of the Product Control Regulations stipulates that a minimum of 2.5 volume per cent of total sales of fuels for road traffic from 1 April 2009 until the end of the year must consist of biofuels. According to the Ministry of Finance, it is primarily this provision that steers the total demand for biofuel in Norway.[406] The regulations also propose increasing the mandatory requirement to 5 volume per cent of total sales from the middle of 2010. Table 6.9 shows that sales of biofuel accounted for 2.7 per cent in 2008.

Table 6.9 Proportion of biofuels (in million litres of pure biocomponent)

	2007	2008
Total sales of diesel and petrol	3 952	3 948
Total sales of bioethanol and biodiesel*	39.8	105.1
Bioethanol and biodiesel's share of total sales	1.0	2.7

* Of which bioethanol (E85) amounted to 0.6 million litres in 2007 and 1.5 million litres in 2008.

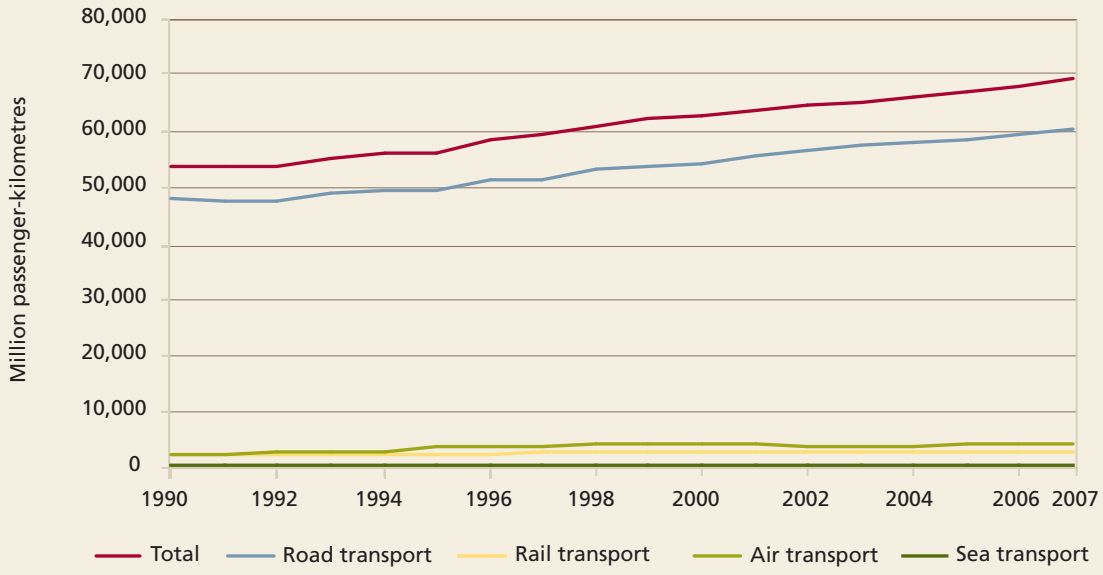
Source: Statistics Norway and Statoil Norge AS

Reducing the amount of traffic

Figure 6.19 shows the passenger transport trend in the period 1990–2007. The figure shows that road transport is the dominant form of passenger transport, and that it has increased by 26 per cent. The growth has been steady throughout the period.

Figure 6.19 also shows that air, sea and rail transport accounts for much smaller proportions of passenger transport work, but that here too there has been a considerable increase. Passenger transport by air increased by 65 per cent from 1990 to 2007, while transport by rail and sea increased by 41 and 23 per cent respectively.

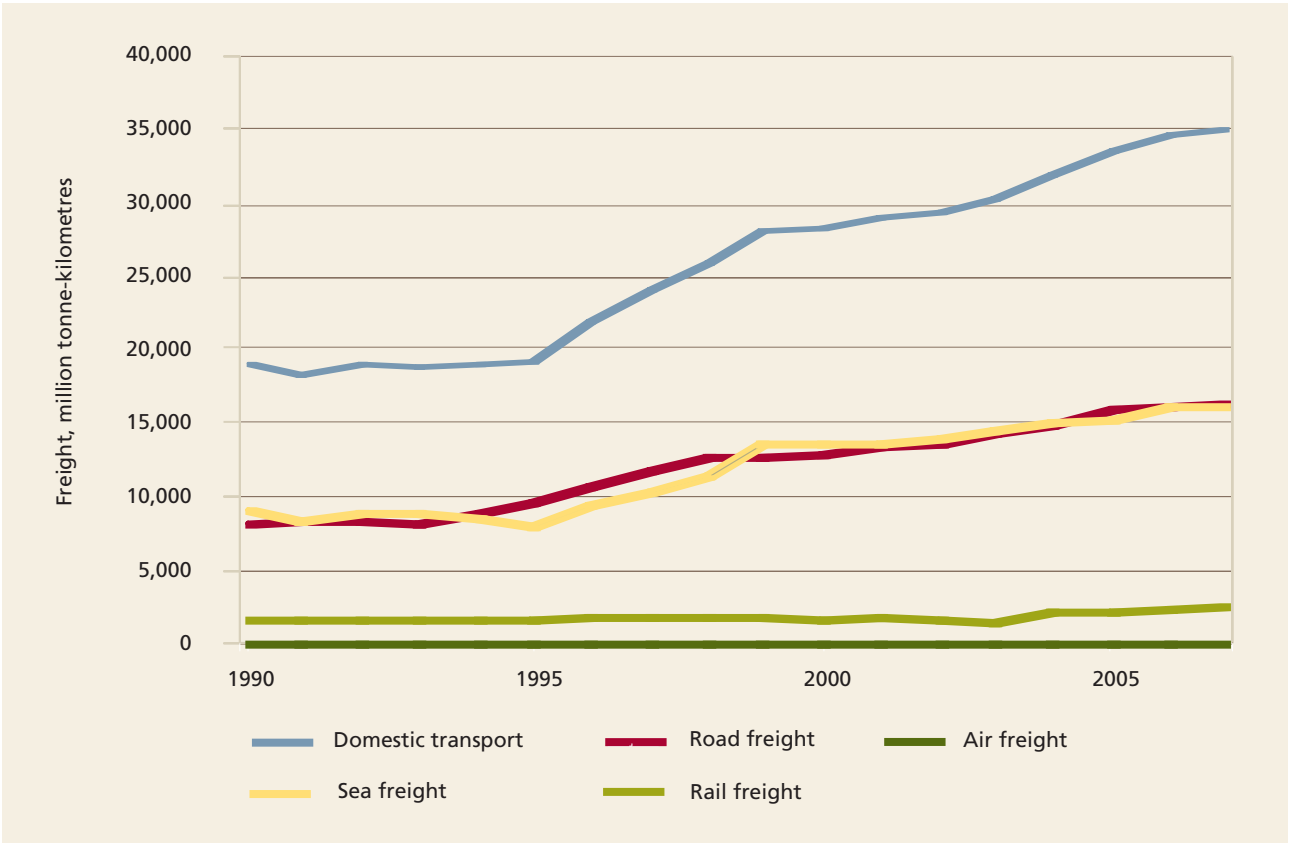
Figure 6.19 Domestic passenger transport 1990–2007



Source: Statistics Norway

406) Letter of 7 December 2009 from the Ministry of Finance.

Figure 6.20 Domestic freight transport 1990–2007



Source: Statistics Norway

Figure 6.20 shows the trend in domestic freight transport in the period 1990–2007. Road freight increased by 98 per cent in the period. Most domestic freight was transported by road and sea, in fairly equal proportions and following a very similar trend after 1990. Rail transport saw some growth after 2003, but it was modest compared with the growth in road and sea transport.

The Institute of Transport Economics has calculated that freight transport will grow faster than passenger transport in the years ahead.[407] The reason given is that financial growth generates more transport of goods. Increasing use of just-in-time strategies means fewer decentralised warehouses and bigger central ones, which also increases the demand for transport. It is also a fact that most imported goods arrive by road, while extensive use is made of other forms of transport, such as sea, when exporting goods. This means that there are many empty lorries driving on Norwegian roads. According to Statistics Norway's lorry survey, the percentage of empty running[408] was 27.7 per cent in the third quarter of 2009.[409]

Reports and propositions to the Storting and statements in interviews identify a number of relevant policy instruments for curbing traffic growth.

The carbon tax

Both the Ministry of Transport and Communications and the Norwegian Public Roads Administration state in interviews that the carbon tax has had no significant traffic-reducing effect. In their opinion, the tax will probably have to be considerably higher if it is to influence consumer behaviour. The Ministry of Finance states that the Norwegian petrol tax level is a high one.[410] This is primarily because the petrol tax is intended to pay for external costs of road traffic other than CO_2 emissions (such as accidents, congestion, noise, air pollution and road damage). These costs are estimated to be considerably higher than

407) *Grunnprognoser for godstransport ('Basic forecasts for Norwegian freight transport') 2006–2040*. Institute of Transport Economics, Report 907/2007.

408) Empty running means all running with the goods code 'empty run', when the vehicle has not been registered as having a load or other assignment for a trip, cf. Institute of Transport Economics report 395/1998.

409) Statistics Norway (2009) *Lastebilundersøkelsen ('The lorry survey')*, 3rd quarter 2009.

410) Letter of 7 December 2009 from the Ministry of Finance.

the costs related to CO_2 emissions. A high fuel tax increases the price and provides a strong incentive to reduce consumption.

Municipal and county policy instruments
One of the aims of the work on the new Planning and Building Act is to make changes that will highlight transport solutions as an element in land use planning. It is proposed, among other things, to allow for making the main cycle path network and bicycle parking separate and specific objectives in land use plans, and for making provisions in municipal master plans that stipulate transport solution requirements in connection with new developments.[411]

Land use planning[412]
Report No 26 to the Storting (2006–2007) *On the Government's Environmental Policy and the State of the Environment in Norway* establishes the following important guidelines for land use policy:

- Both national and local land use policy shall facilitate a reduction in greenhouse gas emissions
- Land use planning shall contribute to reducing the threat posed by climate change to life, health and property, as well as to important societal functions and infrastructure
- Transport policy in urban areas shall help to reduce greenhouse gas emissions, improve the urban environment and health and improve universal accessibility

Objections can be made to land use and transport plans. According to the Institute of Transport Economics, the Norwegian Public Roads Administration plays an important role here. The agency is entitled to object to the establishment of shopping centres that will cause an increase in traffic and greenhouse gas emissions, and currently exercises this right. The Institute of Transport Economics states that the Norwegian Public Roads Administration exercises its right to object more often than the county administrations do.

The Directorate for Nature Management describes the Planning and Building Act as the most important land use management tool for land that is not protected under the Nature Conservation *Act*, i.e. 85–90 per cent of Norway's total land area.[413]

The Norwegian Public Roads Administration stated in an interview that the New Planning and Building Act will provide more policy instruments at the regional management level. More focus on logistics can help to reduce heavy traffic. An active policy for the localisation of terminal areas, better organisation and technological advances in the fields of reloading and coordination and better integration of supply chains can improve utilisation of freight capacity, reduce the number of tonne-kilometres and increase the percentage of rail freight.

The Ministry of Transport and Communications stated in an interview that utilisation of land use planning as a tool varies from municipality to municipality. Municipal authorities are responsible for land use planning and parking policy, while the county authorities are responsible for public transport. In connection with land use planning, the Ministry also mentions that the reward scheme (see below) can encourage cooperation between counties and municipalities, and it has been proposed that this scheme be strengthened through NTP.

Road pricing and parking restrictions
Road pricing (often called congestion charging) means that a rush-hour fee is introduced, i.e. that the road toll rates vary according to when you pass the toll booth. The Ministry of Transport and Communication stated in an interview that road pricing is cost-effective and has a positive effect on climate. However, this policy instrument requires local initiative, and has so far not received the necessary local political support.

It emerges from interviews with both the Ministry of Transport and Communications and the Norwegian Public Roads Administration that there has been little use of parking restrictions despite the fact that the Ministry regards them as an effective means of limiting road traffic.

The Ministry of Transport and Communications also states that it has few policy instruments for curbing traffic growth in rural areas. An overview from Statistics Norway of the traffic work on national and county roads measured in million vehicle kilometres shows that for the ten municipalities with most traffic in 2005, traffic work had

411) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*
412) This investigation has not studied in detail how far land use planning has contributed to reducing greenhouse gas emissions. Reference is made to Document No 3:11 (2006–2007) *The OAG's investigation of sustainable land-use planning and land use.*
413) The Planning and Building Act. The Directorate for Nature Management's website (download date: 14 August 2009).

increased by 38 per cent for short trips and 36 per cent for long trips since 1993. The corresponding average figures for the other municipalities are 25 per cent and 30 per cent for short and long trips respectively.

The reward scheme
Report No 26 to the Storting (2001–2002) *Om bedre kollektivtransport ('Improving public transport')* launched an incentive scheme to reward urban areas implementing concrete public transport measures. This incentive scheme, or reward scheme, was intended to encourage urban areas to invest in public transport. The aim is to improve accessibility, environment and health in urban areas by investing in public transport rather than private motoring. During the first few years, support was given to cities demonstrating a will to invest in public transport by introducing measures to improve public transport services and limit the use of cars. Since 2008, the money has increasingly been awarded on the basis of the traffic trends in applicant cities.[414]

An evaluation of the reward scheme points out that the decision-making process for the awarding of the reward funds seems unpredictable because the award criteria were loosely applied and because money is only awarded for one year at a time. The scheme was changed somewhat in 2009, when it became possible to apply for a four-year agreement, and the guidelines became stricter.[415]

In 2009 the Ministry of Transport and Communications has signed agreements with the Trondheim region[416] and the Kristiansand region[417] granting a total of NOK 655 million for the period from 2009 to 2012 for measures to increase the use of public transport and reduce private motoring. A congestion charge system will be developed as part of the agreement for the Kristiansand region. The new toll booths are scheduled to open in 2010.[418]

Transition to more environmentally friendly forms of transport
The Norwegian Public Roads Administration stated in an interview that the freight transport target is clear – to transfer freight from road to sea and rail – but there are relatively few government policy instruments, and much is left to private initiative. The most recent *National Transport Plan* proposes an investment in the railway sector in order to stem the growth in road-based heavy transport. Both the Ministry of Transport and Communications and the Norwegian Public Roads Administration stated in interviews that rail transport is more effective in reducing emissions from freight transport than from passenger transport. The Ministry of Transport and Communications states that although developing the railways is not primarily a climate measure, an improved railway system combined with measures to restrict the use of cars and intelligent land use policy may have a positive effect on greenhouse gas emissions. The Ministry also stated that developing the railways would only have a limited effect unless measures were taken to restrict car traffic.[419]

Figure 6.20 shows that the trend in domestic freight transport has developed in the opposite direction. Road transport's share of total freight transport has increased, and the railway's share has decreased. However, the railway's share of total freight transport increased somewhat after 2003.

The Norwegian Public Roads Administration stated in an interview that at present, the main obstacle to transferring freight transport from road to rail is inadequate rail capacity. This was confirmed in an interview with the Norwegian National Rail Administration, which confirmed that capacity is currently fully utilised in parts of the rail network. The Ministry of Transport and Communications refers to the fact that a number of measures have been implemented to make the railways more competitive, including exemption from electricity tax and base tax and the building of more terminals and passing tracks.[420]

The Norwegian National Rail Administration states that there are rush-hour bottlenecks in passenger traffic, but that there is often available capacity during the day. Much of the freight transport takes place at night, when there has been sufficient capacity so far, but the limit is being approached. The Norwegian National Rail Administration is of the opinion, therefore, that

414) 'Belønningsordningen for bedre kollektivtrafikk og mindre bilbruk i byene' ('The reward scheme for better public transport and less use of cars in cities'). Article from the website kollektivkampanjen.no. (download date: 15 January 2010).
415) *Evaluering av Belønningsordningen ('Evaluation of the reward scheme')*. Urbanet Analyse and Norconsult. 2007.
416) Sør-Trøndelag County and the City of Trondheim.
417) Vest-Agder County and the City of Kristiansand.
418) The payments are subject to the approval of the Storting, cf. letter of 7 December 2009 from the Ministry of Finance.
419) Letter of 2 December 2009 from the Ministry of Transport and Communications.
420) Letter of 2 December 2009 from the Ministry of Transport and Communications.

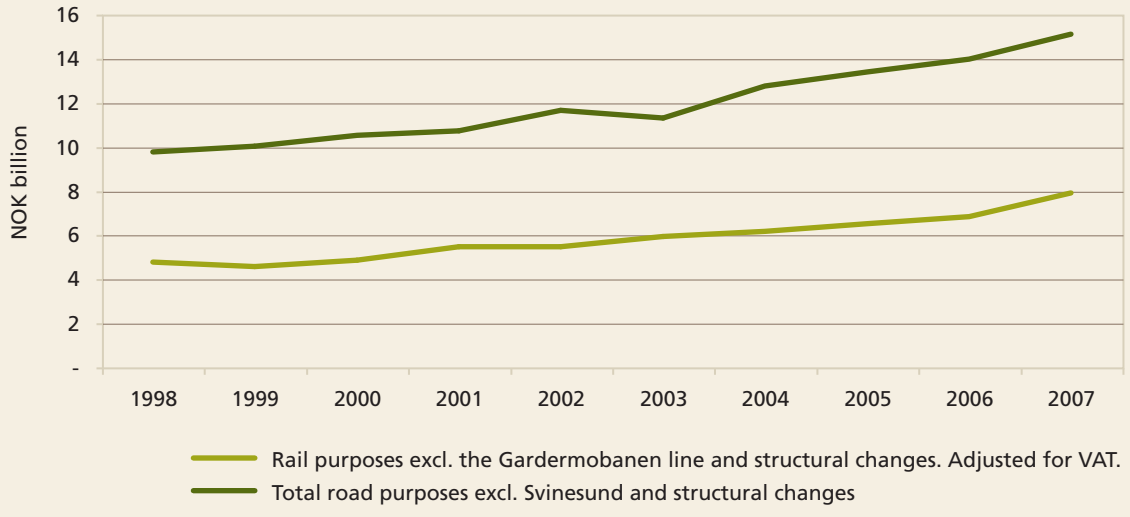
the building of passing tracks is important. Longer passing tracks are also required to enable longer trains to be run. Until now, there has been little activity on the passing-track front, with less than one a year being built or extended. The plan is to increase this activity considerably in the years ahead.[421]

The Norwegian Public Roads Administration stated in an interview that the terminal structure and the location of reloading terminals are important determinants of the amount of heavy road transport – as regards facilitating transfer to rail and sea transport as well as limiting the number of tonne-kilometres in distribution and between terminals. The Norwegian state has direct policy instruments (within the infrastructure) for rail and road transport, but not for harbours. Harbours are normally owned by municipalities, and the Norwegian National Rail Administration owns little land except for the tracks. There are often conflicts of goals when it comes to land use for terminals, for example when it comes to green areas or urban development. The government puts little pressure on municipalities concerning land use (including coordination of reloading terminals). The Norwegian Public Roads Administration also states that there is no clear government or municipal/regional policy in this area to guarantee the land required. The new Planning and Building Act will provide more policy instruments for regional-level management, depending on the local and regional political willingness to use them.

The Norwegian National Rail Administration stated in an interview that the present strategy requires freight transport capacity to be doubled by 2020 and trebled by 2040. The capacity of the Sørlandet line in Southern Norway is to be doubled by 2014. The further development of passing tracks and reloading terminals is a key element in this strategy, which is rooted in the most recent *National Transport Plan*. Three terminals are of particular importance to the implementation of the Norwegian National Rail Administration's strategy, namely the terminals in the cities of Oslo (Alnabru), Bergen and Trondheim. All these projects face challenges relating to clarification with local authorities on the land use within or around the terminal.

The Ministry of Transport and Communications' accounts for the period from 1998 to 2007[422] shows that the difference between allocations for road and rail purposes increased by more than NOK 2 billion in favour of roads during this period, see figure 6.21. In 1998, NOK 5 billion more was allocated to roads than to the railway, and in 2007 this difference had increased to NOK 7.2 billion. The Ministry of Transport and

Figure 6.21 Expenses over the national budget for road and rail purposes in the period 1998–2007



Source: The Ministry of Transport and Communications

421) *National Transport Plan 2010–2019* plans for 45 passing tracks to be built or extended by 2019.

422) E-mail from the Ministry of Transport and Communications, 3 July 2009.

Photo: Espen Bratlie / Samfoto

Communications stresses that the percentage growth for the same period was 66 for rail purposes and 55 for road purposes.

Electric cars
There are a number of financial incentives in place in Norway today to encourage people to choose electric cars. For example, electric cars are exempt from registration tax, are zero-rated for VAT on purchase, pass all Norwegian toll booths free of charge and are allowed to drive in the bus lane. Electric cars can also park in any municipal car park in Norway free of charge.[423]

It emerges from interviews with the Ministry of Transport and Communications and the Institute of Transport Economics that electric cars in Norway have only a small climate effect at present as there are so few of them in relation to the total number of cars. However, the number of electric cars in relation to the size of the population is relatively high in Norway compared with other countries.

Hydrogen cars
Most financial incentives that apply to electric cars have also been applied to hydrogen cars. The drawback of hydrogen cars is the inadequate availability of refuelling facilities. However, the establishment of refuelling stations on the road between the cities of Oslo and Stavanger has been given priority. For hydrogen cars to become competitive, however, considerable investments will have to be made in infrastructure.

6.7.5 Evaluations

The emission target for the transport sector is a reduction of 2.5–4 million tonnes of CO_2 equivalents by 2020 compared with the baseline scenario used in the Norwegian Pollution Control Authority's mitigation analysis. This investigation shows that greenhouse gas emissions from the transport sector increased by 35 per cent from 1990 to 2007. This increase is due to the increasing amount of passenger traffic and freight transport, particularly in the road sector. A certain energy efficiency improvement has taken place in the transport sector so that the cars use less fuel per kilometre, but this has not made up for the growth in the amount of transport. The strong growth in the transport sector poses a risk to the long-term climate targets.

The transfer of as much of the long-distance freight transport as possible from road to rail is a target. The investigation shows an increase in rail capacity and traffic. Nonetheless, road transport's share of total freight transport has increased, while the railway's share has decreased. The difference between the amount of freight transport by road and rail increased during the period 1990–2007. However, rail transport increased moderately after 2003. All in all, the Ministry of Transport and Communications' efforts do not seem to have contributed much to transferring freight transport from road to rail. There has been little concretisation of what the climate-relevant policy instruments are intended to help achieve. The Norwegian Public Roads Administration has a number of policy instruments relevant to the reduction of greenhouse gas emissions, but there are few of no concrete climate targets set for them. The Ministry of Transport and Communications has given few management signals via allocation letters or the *National Transport Plan*.

423) Regulations No 268 of 19 March 2001 relating to the registration tax on motor vehicles, section 4-10. Act No 66 of 19 June 1969 relating to value-added tax, section 16 subsection 14. Regulations No 747 of 21 March 1986 for pedestrian and motor vehicle traffic (Traffic rules), section 5 subsection 2. Regulations No 921 of 1 October 1993 relating to public parking regulation and parking fines, section 8a.

The investigation shows that the carbon tax alone has little traffic-reducing effect because it accounts for a relatively small part of an individual's fuel expenses. However, the carbon tax is part of an overall taxation on fuel.

The Climate Settlement stipulated a target of reducing emissions from individual cars. This target is to be reached by reducing emissions from individual cars and developing alternative fuels. The target is average emissions from new passenger cars of maximum 120 g CO_2/km by 2012. The investigation shows that the restructuring of the registration tax to incorporate a CO_2 component has provided a significant incentive for choosing low-emission cars, but has probably not helped enough for the target to be reached by 2012. One of the reasons for this is that there is not a sufficient supply of larger low-emission cars (e.g. family cars) in the passenger car market.

The Ministry of Transport and Communications has no decision-making authority for the application of several of the possible policy instruments relating to the Ministry's climate policy sector targets. These include taxes, land use planning and biofuels. These policy instruments lie with other ministries. The Ministry of Transport and Communications is of the opinion that parking restrictions and road pricing are cost-effective policy instruments with a positive climate effect, but these policy instruments require local political support and have therefore not been implemented.

7 How will the priority areas contribute to long-term reduction of greenhouse gas emissions?

This chapter discusses three priority areas that are important to the achievement of long-term climate policy targets: research and technology development, carbon capture and storage (CCS) from gas-fired power plants, and the Climate and Forest Initiative. Common to all these three areas is that they are at an early stage, involve considerable funds and are all political priorities.

7.1 In what ways do research and technology development underpin climate policy targets?

All climate policy reports since 1998 have emphasised research and the development and implementation of new technology as an important policy instrument for reducing greenhouse gas emissions. The policy instrument system includes funding for research and development (R&D) and innovation[424] that can contribute to new technology being implemented.[425]

7.1.1 What have been the key research priorities in relation to reducing greenhouse gas emissions?

The research programme KLIMATEK was started in 1997 and targeted the petroleum and process industries in particular.[426] The Ministry of the Environment provided by far the largest share of the funding for the programme in its early years. The Ministry of the Environment states that as more reports were submitted recommending that climate research be strengthened, it gave priority to following up areas of climate research that were receiving little or no financial support from other ministries. This resulted in a gradual increase in the sectoral ministries funding of KLIMATEK, and the relative contribution of the Ministry of the Environment was reduced correspondingly. The Research Council of Norway (hereinafter called the Research Council) stated in an interview that increased investment in the development of gas power resulted in focus on the energy sector and the implementation of the technology development programmes CLIMIT (see section 7.2) and RENERGI from 2004. At that time, the Ministry of Petroleum and Energy took over overall responsibility for the research programmes. The Ministry of the Environment also states that the continuation of the KLIMATEK project's research through the creation of new programmes has led to a somewhat less climate-specific focus in this research.

The main purpose of the research programme RENERGI – *Clean energy for the future* is to develop knowledge and solutions to provide a foundation for an environmentally friendly, financially sound and rational management of Norway's energy resources, high security of supply and an internationally competitive commercial development in the energy sector. The Ministry of Petroleum and Energy stated in an interview that the early research programmes were numerous, small and more technology-specific than the programmes of today. The programmes for basic and applied research have been combined in the RENERGI programme. The Ministry of Petroleum and Energy stated in an interview that this has made it easier to see the development of a technology throughout the innovation chain, from idea and basic research to applied research and pilot projects. The RENERGI programme has also made it easier to link social and technological research.

From 2008, the Research Council set up a support scheme for Centres for Environment-friendly Energy Research (FME) funded over the budget of the Ministry of Petroleum and Energy. According to the Research Council, eight new research centres have been established under this scheme. These centres were established in priority areas of the R&D strategy Energi21.

The Research Council stated in an interview that at present no one has direct responsibility for the development of new technology for the process industry. Interested parties can apply for funding from the User-driven Research-based Innovation (BIA) programme[427], but this programme funds projects in many sectors. Energy efficiency

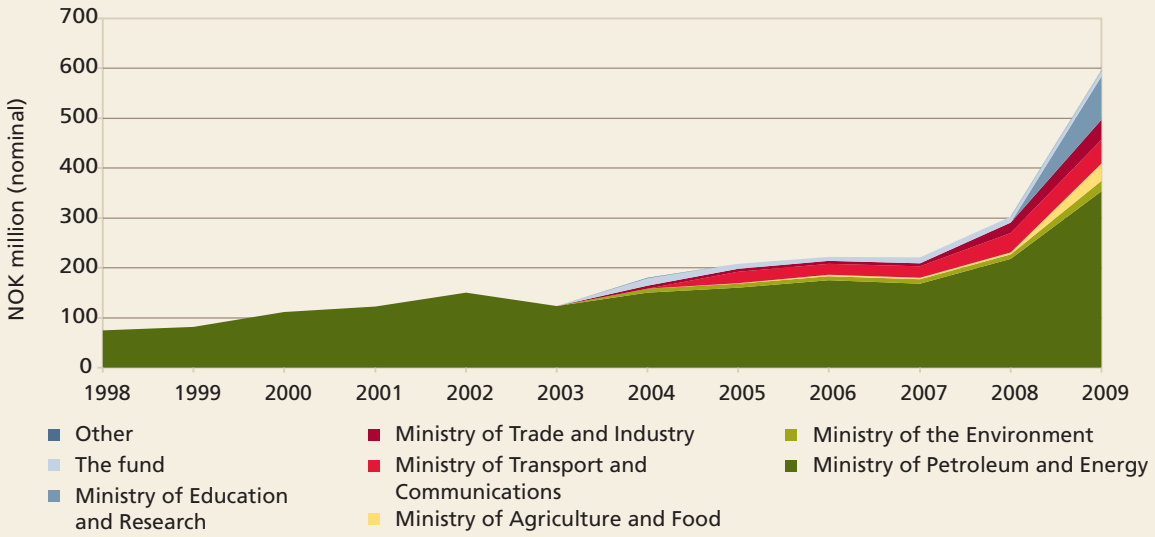
424) Innovation can be described as 'a product, a service, a new production process or form of organisation launched into the market or implemented in production to create economic values', cf. Report No 7 to the Storting (2008–2009) *An Innovative and Sustainable Norway*.

425) Cf. the budget propositions of the Ministry of Trade and Industry.

426) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol').*

427) BIA was established in 2005 to support the best research-based innovation projects with the greatest expected value creation potential. More than NOK 10 million was allocated to renewable energy and energy efficiency over the Ministry of Trade and Industry's budgets in 2008 and 2009.

Figure 7.1. Energy research allocations channelled via the Research Council 1998–2009



Source: The Research Council of Norway. These figures do not include KLIMATEK.

projects in industry can apply for funding under the RENERGI programme. According to the Norwegian Pollution Control Authority, it would be an advantage if issues in this area could also be raised to the research and demonstration project level.[428] The Federation of Norwegian Industries stated in an interview that it had the impression that the process industry's need for solutions had not been addressed with regard to transferring the CCS knowledge base to this branch of industry. The Ministry of Petroleum and Energy states that it has recently been decided to extend CLIMIT's terms of reference to include CO_2 emissions from industry.[429] The ESA will be notified of this.

The Ministry of Trade and Industry stated in an interview that it wishes to facilitate extensive calls for applications in a technology-neutral arena of competition. The Ministry specifies some guidelines, including environmental ones, in its allocation letters. Some funds are earmarked for environmentally friendly technology, including an element for renewable energy and energy efficiency within the framework of the Climate Settlement.

7.1.2 Development trends in research funding

All sectors are responsible for funding research addressing the environmental impact of the activities in their own sector.[430] The Ministry of Trade and Industry stated in an interview that the Ministry has overriding responsibility for funding research intended to promote innovation and restructuring in businesses.

Figure 7.1 shows research allocations for the period 1998–2009. The figure shows that funding for energy-related research was stepped up significantly after 1998. It increased by NOK 520 million from 1998 to 2009, of which almost NOK 300 million was allocated in 2008 and 2009.[431] A further increase of NOK 300 million has been adopted in the 2010 budget. Most of this is funded over the budget of the Ministry of Petroleum and Energy.

The figures show public funding. Support from business and industry comes in addition to this. The Research Council stated in an interview that for RENERGI, funding from industry was more or less equal to the amount provided by the authorities. The Confederation of Norwegian Business and Industry stated in an interview that a lot of technological expertise has been lost over the past decade. Because the research environments in this field have been so dramatically downscaled, it is difficult to rapidly absorb the increase in

428) Letter of 5 December 2008 from the Norwegian Pollution Control Authority to the Ministry of the Environment.
429) Letter of 7 December 2009 from the Ministry of Petroleum and Energy.
430) Letter of 17 June 2009 from the Ministry of the Environment.
431) These figures cover research in programmes with energy research as their primary objective. If we include research funded through other Research Council programmes which may be relevant to the energy sector, the Research Council estimates the figures to be about NOK 400 million in 2008 and NOK 700 million in 2009.

Photo: Øystein Sølbye / NN / Samfoto

research funding and find effective uses for the funds. This also means that it is difficult to find partners in business and industry.

The Research Council stated in an interview that the rapid stepping-up of funding may result in less than optimum utilisation of funds, even given the strong adaptability of research environments. According to the Research Council, long-term and predictable framework conditions are the most important factor for applicants. Major fluctuations in allocations are difficult to handle. This is also a challenge in relation to achieving an adequate degree of business and industry involvement.

The Ministry of Petroleum and Energy stated in an interview that it has been concerned with the need for sufficient capacity in the institute sector to absorb the allocated funding. The Ministry states that the quality of applications for being acknowledged as Centres for Environment-friendly Energy Research has been excellent. This indicates good capacity in the technical industrial institutes.

7.1.3 How are the results from research programmes evaluated?

It emerged from interviews with the Ministry of the Environment, the Ministry of Petroleum and Energy and the Ministry of Trade and Industry that they have not carried out their own evaluations of the research programmes that they have helped to fund. However, the Ministries have a generally positive opinion of the results of the programmes.

The Research Council stated in an interview that they evaluate what constitutes good research according to given criteria, but they do not evaluate whether the research actually results in the implementation of new energy. The Research Council also states that there is agreement between the climate targets and energy targets in the RENERGI programme. The Ministry of Petroleum and Energy focuses primarily on energy policy targets, but there is great synergy potential in the climate targets, as they aim at more renewable energy, reduced consumption and greater flexibility.

7.1.4 Do the policy instruments contribute to the implementation of new technology?

According to the Norwegian Board of Technology it could take 15 years of more from the start-up of the initial development until a product becomes commercially available.[432] The Norwegian Board of Technology has also pointed out that the Kyoto mechanisms make investments in technology with little or no emissions more profitable. However, due to the current low carbon price and short-term framework, the mechanisms make little significant contribution to technological innovation. An expert group appointed by the Norwegian Board of Technology concluded that the public authorities are important in promoting environmental technology, not least because of the obstacles to establishing sufficiently large markets for these innovations.[433]

A report commissioned by the Ministry of Trade and Industry reveals great variations in the extent to which the environmental technology enterprises are familiar with and use the available policy

432) *Fra rådet til tinget,* No 16, November 2007, Information from the Norwegian Board of Technology to the Storting.

433) Bærekraftig innovasjons- og teknologipolitikk *('Sustainable innovation and technology policy')*. Report 2-2205. The Norwegian Board of Technology.

instrument to promote environmental technology.[434] Schemes to support R&D are the most widely used, and most enterprises consider the policy instrument system to be satisfactory in this area. The policy instrument apparatus is deemed particularly inadequate when it comes to commercialisation of technology. Several of the enterprises in the investigation expressed a wish for the apparatus to be more willing to take risks, and for risk loans to be more readily available. The report also concludes that it is important that the authorities' energy technology investment is perceived as sufficiently long-term and that enterprises must be reasonably confident that there will be a demand for the technology in the commercialisation phase.

The Ministry of Petroleum and Energy stated in an interview that one of the most important challenges facing innovation and implementation of climate-friendly technology is to make new technologies competitive in the market so that they are implemented. Although Norwegian environmental technology is also developed and produced by large enterprises, the environmental technology sector is still dominated by small and medium-sized enterprises. The Energi 21 strategy, submitted to the Minister of Petroleum and Energy in 2008, points out that the energy sector is perceived as far less innovative that the oil and gas sector, and contributes less to value creation through technology development and internationalisation.[435]

The Ministry of Petroleum and Energy stated in an interview that the financing of projects for full-scale demonstration and testing of new energy technology is a challenge. Such projects are usually capital-intensive and highly risky, and business and industry are reluctant to initiate projects unless the State helps to finance them.

In late 2008, the Government set up a strategic council for environmental technology comprising representatives from enterprises, competence communities, business and industry organisations and the environmental movement. This council is to provide input to and follow up a national environmental technology strategy.[436] A network of environmental technology enterprises, called *Forum for miljøteknologi*, has also been established.

Innovation Norway

According to the budget propositions from the Ministry of Trade and Industry and the climate policy reports, Innovation Norway[437] is regarded as a policy instrument administrator that can help to reduce greenhouse gas emissions. The Ministry of Trade and Industry stated in an interview that the Research Council has overall responsibility for research relevant to business activities, while Innovation Norway has overriding responsibility for encouraging innovation activity closer to the market. In its allocation letters to Innovation Norway and the Research Council of Norway, the Ministry of Trade and Industry stated that the agencies 'shall contribute to the environment by giving even higher priority to the environmental aspect of certain investment areas and sectors'.[438] Moreover, special resources are currently earmarked for environmental technology, including funds channelled through the Research Council for measures relating to renewable energy and energy efficiency within the framework of the Climate Settlement. In addition, the national budget for 2010 appropriates NOK 140 million to an environmental technology effort, NOK 100 million of which is earmarked for second-generation biofuel.

The Ministry of Trade and Industry also stated that Innovation Norway has a cross-sectoral environmental and energy programme, comprising R&D funds and loans to stimulate research and innovation. Innovation Norway's environmental and energy investment includes energy systems and energy efficiency, climate-friendly energy and CCS.[439] The energy and environmental initiative offers support for networking, marketing/profiling, competence-raising and funding. Innovation Norway reports on the activities that have been initiated/carried out, but not on results in the form of reduced greenhouse gas emissions. The Ministry's opinion is that the results have a concrete impact on innovation and internationalisation of energy and environment enterprises in Norway.

The Ministry of Trade and Industry states that in 2007, the majority of the projects in the energy and environmental sector initiative, a total of 230 projects corresponding to NOK 29.5 million, were related to the bioenergy programme (see

434) Econ Pöyry: *Virkemiddelapparatet og miljøteknologi ('Policy instrument apparatus and environmental technology').* Report 2007-096.
435) Energi21. A collective R&D strategy for the energy sector. Final report. www.energi21.no.
436) Letter of 7 December 2009 from the Ministry of the Environment.
437) On 1 January 2004 Innovation Norway took over the tasks previously carried out by the Norwegian Industrial and Regional Development Fund (SND), the Norwegian Trade Council, the Government Consultative Office for Inventors (SVO) and the Norwegian Tourist Board.
438) Letter of 2 December 2009 from the Ministry of Trade and Industry.
439) Letter of 13 February 2009 from the Ministry of Trade and Industry.

section 6.4).[440] Research and development contracts (OFU/IFU) account for a large part of allocations to programmes in the energy and environment sector initiative.[441] OFU/IFU grants for environmental technology as a branch/business area totalled NOK 14.5 million in 2008, divided between 20 projects. Projects targeting the environment accounted for NOK 107.5 million. According to Innovation Norway's annual report for 2008, grants to projects targeting the environment totalled NOK 327 million; NOK 618 million if you count loans and guarantees (NOK 491 million in 2007).

A previous investigation carried out by the Office of the Auditor General revealed that a limited proportion of the Innovation Norway grants go to innovation, and that many of the projects have a low innovation level.[442] The degree of innovation is lowest in agriculture and the marine sector, and greatest in the industry sector.

Statens miljøfond

Statens miljøfond is a state environment fund established in 1998 as a loan scheme to ensure funding for projects helping to reduce greenhouse gas and other environmentally harmful emissions which would not have received funding from the capital market on the basis of purely financial considerations.[443] The scheme was also intended to stimulate investment in new environmental technology and the further development of existing environmental technology. The Norwegian Industrial and Regional Development Fund was assigned responsibility for managing the fund on behalf of the Ministry of the Environment.[444] The lending ceiling was set at NOK 250 million, and most of this sum was allocated in 2000.

An assessment of *Statens miljøfond* initiated by the Ministry of the Environment concluded that 72 per cent of projects receiving loans had realised their planned environmental gains, and that a resulting greenhouse gas reduction of about 0.5 million tonnes of CO_2 equivalents had been identified.[445] The average cost of emission reductions was estimated to be NOK 866 per tonne of CO_2 equivalents. The evaluation concluded that the fund was a costly way of achieving a reduction in greenhouse gas emissions and that the degree of innovation was low, as the fund primarily approved loans based on current environmental technology.

7.1.5 Evaluations

It has been an objective to focus on environmental technology and strengthen the environmental aspect of the research and development programme.[446] Increased use of environmental technology is crucial if we are to solve key environmental and resource problems and achieve the target of disconnecting financial growth from environmental impact.[447]

The investigation shows that the development of new technology has been considered an important climate policy instrument since the Kyoto Protocol was signed. There have been a number of changes in the organisation of the research programmes in recent years towards broader and more long-term programmes. The investigation shows that research is primarily aimed at energy targets rather than greenhouse gas emissions. Technological research targeting greenhouse gas emissions in the process industry has not been given priority, but from 2010 research into carbon capture from the process industry can be funded under the CLIMIT programme.

The investigation shows that allocations for research that can help to reduce greenhouse gas emissions were stepped up considerably from 1998 to 2009. Half of the increase took place from 2008 to 2009. The stepping up of research investments was late in relation to the climate targets for 2008–2012, but could form an important basis for reaching the more long-term climate targets.

The investigation shows that there are a number of challenges relating to introducing new technologies into the market. One of the reasons for this is that the energy sector has a high

440) Letter of 13 February 2009 from the Ministry of Trade and Industry.

441) Public and industrial research and development contracts (OFU/IFU) involve binding and targeted collaboration between the business and industry community and the public authorities. The scheme is intended to encourage close development collaboration between a demanding customer enterprise/public agency and one or more supplier enterprises.

442) *Riksrevisjonens undersøkelse av Innovasjon Norge som statlig næringsutviklingsaktør. ('The Office of the Auditor General's investigation into Innovation Norway as a government agent for business development.')* Document No 3:4 (2008–2009).

443) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*

444) Report No 36 to the Storting (2000–2001) The Norwegian Industrial and Regional Development Fund (SND): *Ny giv, ny vekst og nytt næringsliv ('New initiative, new growth, new commercial activity).*

445) *En evaluering av Statens miljøfond for Miljøverndepartementet ('An evaluation of Statens miljøfond for the Ministry of the Environment').* Hartmark Consulting AS. December 2003.

446) Recommendation No 150 to the Storting (1997–98), cf. Report No 58 to the Storting (1996–97) *Environmental Protection Policy for a Sustainable Development*.

447) Recommendation No 132 to the Storting (2007–2008), cf. Report No 26 to the Storting (2006–2007) *The Government's Environmental Policy and the State of the Environment in Norway*.

number of small-scale players. At present, the Kyoto mechanisms make only a small contribution to technological innovation, partly as a result of a low carbon price. Most of the innovation policy instruments are general and not aimed at climate technology in particular.

7.2 How do the gas power and carbon capture and storage investments help to achieve climate targets?

7.2.1 Important targets

Natural gas accounts for an increasing proportion of resources on the Norwegian continental shelf. Power balance and security of supply considerations were behind the intention to increase use of natural gas as a domestic energy source, but increased recovery and use of natural gas would entail increased CO_2 emissions.[448] The authorities therefore made it a target to develop climate-friendly gas power technology that would reduce greenhouse gas emissions from the use of natural gas. The majority of the Standing Committee on Energy and the Environment has emphasised that a requirement for carbon capture and storage (CCS) at gas-fired power plants will be a key instrument in efforts to achieve Norwegian targets to reduce greenhouse gas emissions, and that the technology may also make an important contribution in reducing global greenhouse gas emissions. The committee's majority considers that Norway, as a major producer of fossil energy, has a particular responsibility in this field.[449]

Gas-fired power plants with carbon capture and storage were to be realised through financial incentives in the form of government grants for technology and product development. In addition, from 2006, investment support was to be given for full-scale gas-fired power plants with CCS. A condition for granting financial support for implementation of this project was that it would have been commercially profitable without CCS.[450]

The majority of the committee supported the establishment of a financial support scheme for gas power[451] to speed up the development of gas-fired power plants with CCS.[452] The purpose of this was to ensure that once gas-fired power plants with CSS had been realised, the same conditions would be applied to financial support to producers of renewable energy sources. The committee also referred to the Gas Technology Commission's recommendation of a 10–15 year time frame for the realisation of a full-scale gas-fired power plant with CCS. The committee's majority favoured the creation of a national gas technology programme to encourage environmentally friendly use of gas, including CCS. The majority also favoured the creation of a government innovation company to administer state investments in this field.[453]

In 2004, a target was set of pushing the establishment of gas-fired power plants with CCS forward by stepping up the research effort and by reducing the costs by means of pilot and demonstration plants.[454] The CCS investment would contribute to security of supply, while also making it easier to achieve climate targets. The possibility of using CO_2 as pressure support in connection with offshore oil recovery provided a further incentive to invest in technology development in this field.[455]

The Standing Committee on Energy and the Environment supported the proposal to allocate NOK 2 billion to an innovation activities fund from 1 July 2004.[456] The fund was to form a basis for stable public funding of development projects in the field of environmentally friendly gas power technology.[457] The funds were to be allocated via the new government innovation enterprise.[458]

During the processing of the national budgets for 2006 and 2007, the target of establishing a carbon capture facility for the Kårstø gas-fired power plant by 2009 was set.[459] It was stressed that the realisation of carbon capture at Kårstø would be important to Norway's fulfilment of its international climate commitments. In 2006, the Ministry of Petroleum and Energy signed an implementation agreement with Statoil for the establishment of CCS at Mongstad in two stages: first a test centre for carbon capture, then full-scale CCS for the combined heat and power plant

448) Report No 9 to the Storting (2002–2003) *On domestic use of natural gas etc.*
449) Budget Recommendation No 9 to the Storting (2007–2008).
450) Report No 9 to the Storting (2002–2003) *On domestic use of natural gas etc.*
451) Cf. Recommendation No 240 to the Storting (2001–2002).
452) Recommendation No 167 to the Storting (2002–2003).
453) Recommendation No 167 to the Storting (2002–2003).
454) Report No 47 to the Storting (2003–2004) *Om Innovasjonsverksemda for miljøvennlege gasskraftteknologiar mv. (On innovation activities for environmentally friendly gas power technologies etc.).*
455) Report No 47 to the Storting (2003–2004) cf. Report No 38 to the Storting (2003–2004).
456) Recommendation No 250 to the Storting (2003–2004), cf. *The revised National Budget 2007* (Proposition No 63 to the Storting (2003–2004)).
457) Proposition No 63 to the Storting (2003–2004).
458) Report No 47 to the Storting (2003–2004).
459) Budget Recommendation No 9 to the Storting (2005–2006).

Table 7.1 Gas-fired power plants granted licences and emission permits

Facility	Company	Emission permit, million tonnes of CO_2[462]	MW	TWh	Status
Mongstad in Hordaland county	Statoil ASA	1.3	280 electricity and 350 heat	2.2	Under construction. The combined heat and power plant is scheduled to be operational from 2010, the cleaning plant from 2014.
Kårstø in Rogaland county	Naturkraft	1.2	430	3.5	Operational (full-time since February 2009)
Melkøya in Finnmark county	Statoil ASA	0.9	215	1.5–2	Operational
Skogn in Nord-Trøndelag county	Industrikraft Midt-Norge	2.2	800	6.4	To be built[463]

Source: The Norwegian Pollution Control Authority (http://www.sft.no/Tema/Klima-og-ozon/Gasskraft/)

from 2014. Proposition No 49 to the Storting (2006–2007) described the premises for this collaboration. Start-up of the test centre will take place before start-up of the combined heat and power plant, and is scheduled for 2011. Pursuant to the agreement, the Norwegian state would take responsibility for establishing a transport and storage solution for 100,000 tonnes of CO_2 per year from the Mongstad test centre.[460] The full-scale facility is scheduled for start-up in 2014.

7.2.2 Emission permits and emissions

As of today, gas-fired power plants exist at Kårstø and on Melkøya. The existing plants' emission permits were granted without any CCS requirements being stipulated.[461] Proposition No 49 to the Storting (2006–2007) described how new licences granted to gas-fired power plants would be based on carbon capture. Table 7.1 shows the status for gas-fired power plants that have been granted an energy licence and emission permit.

In 2006, the Norwegian Pollution Control Authority granted Statoil an emission permit for the development and operation of the combined heat and power plant at Mongstad on the condition that CCS was established for the facility.[464]

The Ministry of the Environment stipulated the CCS requirement in the permit for CO_2 emissions subject to a duty to surrender allowances, and it has been incorporated into the emission permit.[465] The Ministry of the Environment has followed the recommendations of the Norwegian Pollution Control Authority and made CCS a requirement for the planned gas-fired power plant at Elnesvågen, but the Norwegian Water Resources and Energy Directorate has not yet made its decision on the plant's licence.[466]

Licences and emission permits have also been granted for a mobile reserve combined heat and power plant at Tjeldbergodden and one at Nyhamna. The Norwegian Water Resources and Energy Directorate states in an interview that these mobile reserve power plants shall only be used if the Directorate allows it, following applications for start-up from Statnett, the owner of the plants. This will only happen in extreme supply situations when there is a shortage of power. There are no CCS requirements for these two plants[467], but the Norwegian Pollution Control Authority has set stringent requirements relating to their use.[468]

460) Proposition No 49 to the Storting (2006–2007).
461) The Norwegian Pollution Control Authority stipulated a requirement for carbon capture for the Kårstø power plant in January 1999, but in autumn 2000 the Ministry of the Environment reversed this decision following the Storting's consideration of Report No 29 to the Storting (1998–99), and the facilities were given emission permits without carbon handling requirements.
462) Now regulated by the emissions trading scheme. These figures refer to the original emission permits.
463) The developer has a 2012 start-up deadline, but has asked the Ministry of Petroleum and Energy to extend this deadline to 2016, cf. www.industrikraft.no.
464) *Etableringen av kraftvarmeverk på Mongstad, Statens Forurensningstilsyns anbefaling til Miljøverndepartementet ('Establishment of a combined heat and power plant at Mongstad. The Norwegian Pollution Control Authority's recommendation to the Ministry of the Environment'),* 18 August 2006.
465) *Utslippstillatelser for CO_2 fra kraftvarmeverket på Mongstad ('Emission permit for CO_2 from the combined heat and power plant at Mongstad')* of 12 October 2006 from the Ministry of the Environment.
466) *Krav om CO_2-håndtering til industrikraft ('Carbon capture and storage requirement for industrial power')*, press release dated 16 May 2009, the Ministry of the Environment's website. Cf. the topic pages on gas power on the Norwegian Pollution Control Authority's website. Downloaded in June 2009.
467) *Anbefaler tidsbegrenset tillatelse på Nyhamna ('Recommends time-limited permit for Nyhamna')*. News item from the Norwegian Pollution Control Authority's website dated 14 June 2007. Downloaded in June 2009.
468) *Overview of gas-fired power plants granted a licence*. The Norwegian Pollution Control Authority's website and *Streng utslippstillatelse for reservekraftverk på Tjeldbergodden ('Strict emission permit for reserve power plant at Tjeldbergodden')*, press release of 18 January 2008, the Ministry of the Environment's website (downloaded in June 2009).

At present, gas-fired power plants account for a small percentage of total Norwegian greenhouse gas emissions; about 1 per cent, to be precise. In 2008, only the plant on Melkøya was in ordinary operation, and its operation resulted in the emission of 558,000 tonnes of CO_2. Naturkraft reported on its website that the plant at Kårstø delivered a total of more than 3 TWh of power to the transmission grid in 2009. The plant was operational during large parts of 2009. Naturkraft has not stated the quantity of emissions this corresponds to.

The development and operation of gas-fired power plants without CCS will increase emissions. A comparison between the 2005 and 2007 baseline scenarios for the Norwegian Pollution Control Authority's mitigation analyses indicates that CCS accounts for most of the difference in emissions in 2020. The baseline scenario for 2020 published in 2005 estimated emissions of just under 10 million tonnes of CO_2 from gas-fired power plants without CCS.[469] Considering targets set for CCS, the Norwegian Pollution Control Authority has included gas power with CCS in its baseline scenario for 2020. The implementation of CCS and the length of time the gas-fired plants operate will be deciding factors for actual emissions.

The 2007 baseline scenario assumed the cleaning of 85 per cent of emissions from the gas-fired power plants at Mongstad and Kårstø in 2020. It also assumed that the building of the Mongstad gas-fired power plant would help to reduce emissions from the refinery by 350,000 tonnes of CO_2.[470]

7.2.3 The government's administration the carbon capture and storage efforts

The authorities have allocated funds through the CLIMIT programme for research, development and demonstration of technologies for the capture, transport and storage of carbon from power plants that burn fossil fuels, and granted funds to major innovation projects in this field via Gassnova SF.

Research and development

The CLIMIT programme is a collaboration between Gassnova SF and the Research Council of Norway, initially intended to fund research, development and demonstration of technologies for the capture, transport and storage of carbon from gas-fired power plants. The Research Council of Norway is responsible for research and technology development funding, while Gassnova is responsible for funding for pilot projects and demonstrations of new technology. From 2008 the programme's mandate has been extended to cover CCS from all fossil fuels.

The CLIMIT fund and research programme was a continuation of some elements of the KLIMATEK programme (see section 7.1). The Ministry of Petroleum and Energy finances the research and development part of the programme through appropriations to the Research Council of Norway over the national budget. Appropriations increased from NOK 48.5 million in 2008 to NOK 68.5 million in 2009.[471] Private contributions come in addition to this sum, and, according to the Research Council of Norway, they correspond to half of the public funding. The Research Council of Norway is of the opinion that this is a relatively small private contribution for a programme aimed at innovation, and believes it to be due to the uncertain framework conditions for carbon capture. The yield from the Gas Technology Fund finances the CLIMIT fund, and the money is allocated to pilot and demonstration projects. Allocations to pilot and demonstration projects have remained stable at NOK 81.8 million per year.

According to Gassnova, funding thus far has primarily been given to development projects. However, the project material for scale-up and demonstration has grown, and the proportion of funds committed to this type of project increased in 2008.

The CLIMIT programme plan for the period 2006–2009 was revised in 2008. The revised programme plan places more emphasis on CO_2 transport, environmental aspects (particularly in relation to amine technology) and geological storage. Gassnova states this change is a result of an assessment that investments in these fields have been too small compared with investments in capture.

Gassnova also states that there has been no evaluation of target achievement in the programme. In the case of the pilot and demonstration segments, the number of players in this field is insufficient

469) *Reduksjon av klimagassutslipp i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority, report TA-2254/2007.

470) *Reduksjon av klimagassutslipp i Norge: En tiltaksanalyse for 2020. ('Reduction of greenhouse gases in Norway: A mitigation analysis for 2020')* Norwegian Pollution Control Authority, report TA-2254/2007.

471) R&D figures from the Research Council of Norway, innovation figures, appropriations over the national budget.

and the framework conditions have not been clarified. The industry does not know the costs, the future price of allowances or which public authority will be the regulator, and has therefore adopted a wait-and-see attitude.

Demonstration and implementation of projects
Gassnova was established as an administrative agency in 2005 with responsibility for

- collating and coordinating the various activities of the innovation chain for environmentally friendly gas power technology
- providing partial financing for projects with clear commercial potentials and market-based business plans[472]

This state innovation company was established to manage government administrative tasks relating to the environmentally friendly gas power technology effort. The company would be authorised to enter into binding agreements on funding for relevant projects within agreed limits.

When it was formed, Gassnova's task was to manage grant funds for the development of CCS technology by evaluating project proposals and allocating grants. The state enterprise also acted as an advisor to the government administration in CCS-related matters. Since 2008, Gassnova has also been an operative unit carrying out planning projects in which the government is an investor.

Gassnova states in an interview that it gives priority to technical development issues and evaluates technical and chemical solutions. The enterprise also takes commercial and market-related circumstances into account to assess the potential profitability of a technology.

Regulation of gas-fired power plants
In order to build and operate a gas-fired power plant, the developer must be granted a licence from the Norwegian Directorate of Water Resources and Energy. The Directorate processes the application in accordance with the Energy Act. Carbon storage requires a permit from the Norwegian Pollution Control Authority pursuant to the Pollution Control Act. When processing the applications, the Norwegian Pollution Control Authority will consider, among other things, whether the formation in question is a suitable storage location and stipulate requirements for the composition of the CO_2 flow, monitoring, reporting, plans for remedial measures, financial security etc.

The Ministry of the Environment stated in an interview that the Ministry has responsibility for CCS, both because it is a key climate measure, and because it is important that the measure, carbon storage in particular, is implemented in an environmentally safe manner. To be more precise, the Ministry of the Environment is responsible for CCS through its administration of policy instruments capable of triggering capture projects (the Pollution Control Act and the emissions trading scheme), and through the national and international regulations for safe storage. The Ministry of the Environment states that CCS is not important to the fulfilment of Norwegian commitments in the first commitment period of the Kyoto Protocol, but considers it important as it will help to reduce domestic emissions and contribute to the development of technology.

The Norwegian Pollution Control Authority processes applications for emission permits, and will grant permits for emissions in connection with energy production provided that the licensee meets certain requirements. The Ministry of the Environment also states that it has cooperated closely with the Ministry of Petroleum and Energy when processing applications. There are two application processes, but the Norwegian Directorate of Water Resources and Energy and the Norwegian Pollution Control Authority cooperate to ensure that the processes are coordinated, for example as regards the facts on which decisions are based.

7.2.4 How have the authorities worked to achieve the adopted targets for the implementation of carbon capture and storage at Kårstø and Mongstad?

Kårstø
In 2006, the Norwegian Directorate of Water Resources and Energy was commissioned by the Ministry of Petroleum and Energy to carry out a study of CCS at Kårstø. This study examined possible solutions for carbon capture, transport and storage.[473] The report sheds light on the potential problems and risk factors relating to the implementation of CCS at Naturkraft's gas-fired power plant at Kårstø. It assessed the technology solutions, costs and progress schedule for the establishment of the capture plant, among other things. According to the report, it would not be feasible to establish the capture plant by 2009. It was estimated that 2011/2012 would be an ambitious start-up date. Planning phase costs were estimated to be NOK 330 million, and the invest-

472) Proposition No 47 to the Storting (2003–2004).

473) *Carbon Capture and Storage at Kårstø.* NVE report 13/2006.

ment basis for the capture plant was estimated at NOK 3.46 billion. In addition, an investment basis of NOK 1.56 billion was estimated for the storage and transport solutions. Based on an operating time of 8,000 hours and energy costs, annual operating costs were estimated at NOK 370 million. This corresponds to a measure cost of NOK 700 per tonne of CO_2 for carbon capture and storage at the plant.[474]

According to Gassnova, the most recent public estimate of construction costs is between NOK 5 billion and NOK 10 billion.

The decision basis was scheduled to be presented in September 2009. According to Gassnova, a milestone was reached in 2009, when pre-engineering studies had already been carried out with four participants, and verification studies were underway to demonstrate feasibility. Gassnova states that the construction time for the facility will be about 40 months from the time when the solution is chosen. The authorities were scheduled to start a series of commercial negotiations, but Gassnova states that it recommended that negotiations be postponed.

According to Gassnova, the project was carried out according to plan, but its initiation was postponed, causing a delay in relation to the original target of establishing the capture plant in 2009. Gassco examined the possibility of technical integration between the gas-fired power plant and the Kårstø gas terminal.[475] The power plant's irregular operating pattern was behind the Government's decision to stop the procurement process for construction of a capture plant at Kårstø. The government also wanted to look into a potential integration solution for the gas-fired power plant and the gas processing plant at Kårstø.[476]

Gassnova states in an interview that the technology solution chosen for Kårstø would have to be suitable for flue gas cleaning, while also being technically and commercially mature at the time of the decision. Gassnova states that this limited the number of options. It meant that, as was the case for Test Centre Mongstad, post-combustion technology was the only option, see fact box 7.1. In principle, other technologies were desirable.

474) *Carbon Capture and Storage at Kårstø.* NVE report 13/2006. Operating expenses account for 50 per cent of the costs of the measure, while investment costs make up the remaining 50 per cent.
475) Naturkraft Integration Mapping Study 2009.
476) Proposition No 67 to the Storting (2008–2009) *Tilleggsbevilgninger og omprioriteringer i statsbudsjettet 2009 ('Supplementary allocations and reordering of priorities for the national budget 2009').*

Fact box 7.1 The use of natural gas in combined heat and power plants and carbon capture

Natural gas is suitable for conversion to electricity in gas-fired power plants. Gas-fired power plants operated by combined cycle gas turbines utilise the heat in the flue gas from the gas turbines to produce additional power by means of steam turbines. Together, these turbines have an efficiency of almost 60 per cent. A combined heat and power plant produces less electricity than a gas-fired power plant operated by combined cycle gas turbines from the same amount of gas. In a combined heat and power plant, however, a greater proportion of the energy content of the gas is utilised (about 60 per cent). A combined heat and power plant could e.g. supply high-pressure steam to nearby industrial enterprises or waste heat to district heating plants.

The flue gases formed by this process, however, consist of CO_2 that is emitted into the atmosphere. Greeenhouse gas emissions can be avoided by means of a four-stage process comprising capture, compression, transport and injection/storage/disposal. CCS means that CO_2 is separated from a power plant's flue gases before, during or after the process and is processed so that it is not emitted into the atmosphere.

There are three main carbon capture methods:

- Post-combustion: CO2 is captured after combustion in the power plant. The capture plant, which processes the flue gas, is separate from the power plant. The drawback is that the capture plant will have to process enormous quantities of gas. This is the only method commercially available at present.
- Pre-combustion: CO_2 is captured prior to combustion in the power plant. Natural gas and steam are converted into synthesis gas (H2, CO_2/CO). CO_2 is captured before the hydrogen-rich fuel is combusted in the gas turbine. In this solution, the capture system is part of the power plant.
- Oxy-fuel: Natural gas is burnt in the gas turbine with pure oxygen. The resulting flue gas will contain only CO_2 and water vapour, which means that the capture plant can be much smaller. The oxygen is separated from the air in a separate plant.

There are two technological solutions for post-combustion: carbon capture with amines and carbon capture with carbonate.

Carbon capture is an energy-intensive process. The amount of CO_2 captured will therefore exceed the amount of CO_2 avoided.

Sources: Gassnova's website, Norwegian Official Report NOU 2002:7 Gassteknologi, miljø og verdiskaping ('Gas technology, the environment and value creation'); Gasskraft med CO2-håndtering: Verdikjedevurderinger ('Gas power with carbon capture and storage: Value chain evaluations'), The Norwegian Directorate of Water Resources and Energy 2005

Photo: Helge Sunde / Samfoto

Gassnova also states that the choice of technology for the Kårstø capture plant is given in that possible types of technology have been evaluated on the basis of the most rapid construction possible at the lowest possible cost and risk. As regards the choice of technology, this meant that only players with previous experience of the technology at that time would be candidates (in pre-engineering).

In Gassnova's opinion, Kårstø is an example of a project that should have been given more thorough consideration. Furthermore, according to Gassnova, it is important to consider the purpose of a project like this – whether priority shall been given to reducing emissions or developing technology. Gassnova states that cleaning at Kårstø with the present choice of technology does not contribute to technology development. The Norwegian Directorate of Water Resources and Energy has also expressed the opinion that it does not consider full-scale cleaning at two plants based on the same technology solution to be an expedient solution.

Test Centre Mongstad (TCM) – Mongstad stage 1

Pursuant to the implementation agreement between the government and Statoil[477], a technology company will be formed to own and operate pilot carbon capture plants, and a full-scale CCS plant shall be established. The first carbon capture step will be implemented at the same time as the combined heat and power plant. The target is full-scale CCS from the combined heat and power plant by the end of 2014.

The purpose of the implementation agreement is to

- identify, develop, test and qualify possible technology solutions
- reduce the costs and risks relating to the construction and operation of a full-scale carbon capture plant

The government will contribute up to 80 per cent of investment and operating costs for the technology centre at Mongstad.[478] According to Proposition No 38 to the Storting (2008–2009), investments have been estimated at approx. NOK 5.2 billion (2009 kroner). The operating costs for the test centre are estimated at NOK 250 million per year.

477) StatoilHydro following the merger between Statoil and Norsk Hydro's oil and gas activities in October 2007.
478) Recommendation No 206 to the Storting (2008–2009).

On 7 June 2009, Gassnova announced on its website that an agreement for the building of Test Centre Mongstad (TCM) had been entered into between Gassnova SF, Statoil Hydro ASA and AS Norske Shell.[479] According to Proposition No 1 to the Storting (2009–2010), the technology centre agreement divides ownership as follows: the Norwegian state 77.67 per cent, Statoil 20 per cent and Shell 2.44 per cent. The participants will establish the test centre in order to verify the technology, reduce the risk relating to scale-up, and test the processes with a view to reducing the costs in accordance with the implementation agreement.

Two technology solutions will be tried out at the test centre. As regards the choice of technology, Gassnova states that as of today, these two technology solutions are the only possible options for development and implementation within the stipulated time limits. One solution is based on amine technology, the other one on carbonate technology. No other technologies have reached the level of maturity required.

There is only one supplier for carbonate technology. Gassnova does not perceive this to be a risk factor. According to Gassnova a contract has been negotiated that describes which elements will be verified on a small scale. Documentation from this test operation will clarify whether the risk warrants continuing to the next stage.

Gassnova states that there is a real delay for Test Centre Mongstad; the authorities had expected the investment decision to be made in 2008. Further delays were expected in 2009 due to negotiations with players. A decision on the building of the next stage (the full-scale solution) is scheduled for 2012.

Gassnova states that one of the consequences of this delay is increased costs. At the time when the Norwegian state signed the cooperation agreement with StatoilHydro, Shell, Dong and Vattenfall, the cost framework was NOK 1–2 million. The current estimate is NOK 4.2 billion excl. VAT. This increase is a result of extensive safety requirements resulting from, among other things, features of the industrial plant.

According to Gassnova, this delay also means that cleaning technology knowhow will have matured. However, it also means that testing of the facility, and thus also learning, will be delayed. Gassnova states that these tests will be less useful to the design of the full-scale plant if they do not start up until 2014.

Gassco, on behalf of the Government, has followed up the work on establishing a transport and storage solution for CO_2 from the test centre. The Ministry of Petroleum and Energy states that a number of options have been considered, including different storage locations and transport by pipeline versus transport by ship. Based on this, the estimated cost of a temporary shipping solution for transport and storage of CO_2 from Test Centre Mongstad to Melkøya is about NOK 3 billion. The Ministry of Petroleum and Energy stated in an interview that, given the cost limits and the short time horizon, the speedy establishment of a transport and storage solution was impossible. It was therefore decided to discontinue the work on a temporary shipping solution for transport and storage of CO_2 from the test centre at Mongstad.[480] This means there will be planned CO_2 emissions from the test centre (i.e. captured CO_2 will not be permanently stored). The Ministry of the Environment stated in a letter of 7 December 2009 that conditions in the emission permit from the Norwegian Pollution Control Authority will be changed at this point in relation to the 2006 permit. According to the Ministry, the plan is to purchase emission allowances corresponding to an annual emission of 100,000 tonnes of CO_2 during the period when the test centre is operational.

Combined heat and power plant at Mongstad with full-scale carbon capture and storage

According to the implementation agreement, Statoil was to draw up a progress schedule for the establishment of carbon capture at Mongstad. This entailed as assessment by Statoil of different technology solutions.

It was also decided that by the first quarter of 2009, the authorities and Statoil would negotiate an agreement for the implementation of full-scale CCS at Mongstad. This agreement was to cover funding, risk sharing, implementation, organisation, company structures and commercial models. According to the agreement, StatoilHydro will cover the operating costs of full-scale CCS in an amount corresponding to the company's CO_2 costs without CCS. The Norwegian state will cover the investment costs for the capture plant

479) *Bygging av europeisk CO_2 teknologisenter på Mongstad (TCM) er startet ('The building of a European CO_2 technology centre at Mongstad (TCM) has started'),* news item on Gassnova's website dated 17 June 2009.

480) Cf. Proposition No 59 to the Storting (2007–2008) etc.

and operating costs over and above StatoilHydro's share. Development costs are included in the investment costs. Gassnova stated in an interview that the result of this cost allocation is that the State is the only party with a direct incentive to limit costs.

Statoil's master plan[481] presents an investment estimate of NOK 25 billion regardless of whether carbonate or amine technology is chosen. This estimate covers capture both from the combined heat and power plant and from the refinery's cracker. For the time being, only StatoilHydro has prepared cost estimates for full-scale CCS at the combined heat and power plant at Mongstad. Based on the experience from the Kårstø project, Gassnova and StatoilHydro initiated work to clarify the composition and level of StatoilHydro's cost estimate. This was completed in April 2009. In Proposition No 67 to the Storting (2008–2009) *Tilleggsbevilgninger og omprioriteringer i statsbudsjettet 2009 ('Supplementary allocations and reordering of priorities for the national budget 2009')*, the Ministry of Petroleum and Energy states that a rough estimate from Gassnova indicates that the planning costs for a full-scale plant will amount to NOK 2 billion.

The Ministry of Petroleum and Energy states that the decision on a development solution for Mongstad is scheduled to be made in 2012. According to Gassnova, this means that the choice of technology will actually have to be made before this time. If this schedule is maintained, that, in turn, would entail a conservative choice of technology, with the emphasis on minimising risk, and leaving no room for new and better technology. Further development of technological possibilities requires somewhat more time than the scheduled 2012 construction start-up will allow.

Storage

The Ministry of the Environment states that the Norwegian Pollution Control Authority will be responsible for granting a carbon storage permit pursuant to the Pollution Control Act, and for stipulating the requirements necessary to ensure environmentally safe storage, including requirements relating to the composition of the CO_2 flow, monitoring of stored CO_2, reporting, plans for remedial measures, financial security etc.[482]

The Petroleum Directorate said in an interview that the focus on capture has distracted attention from the issue of storage. In the interview in winter 2009, the Directorate stated that there are indications that the schedule for storage of CO_2 from TCM at Mongstad and from Kårstø is unrealistic (immature), and that it will also be very expensive. It emerged in an interview with Gassnova that the project to establish a storage solution is running in parallel with the capture projects and has the same schedule as the project working on capture from Kårstø. In this context, Gassnova points out that it is always a challenge when a performance target is linked with a concrete deadline and reaching the target depends on negotiations with other parties. Fixed deadlines augment the risk of increased costs because they give suppliers more power in negotiations.

Gassnova states in an interview that the plan is to pipeline CO_2 to the Sleipner area, either via Sleipner A or via an independent storage site in the same area (the Utsira formation). These proposals have been made because these solutions have reached a sufficient degree of technological maturity. There are some options that would be more expedient, but the schedule is too tight. This was confirmed in an interview with the Petroleum Directorate. Gassnova considers the establishment of storage solutions before a full-scale capture facility at Mongstad is operational to be realistic.

7.2.5 Evaluations

In 2005 a decision was made to establish full-scale CCS for the gas-fired power plant at Kårstø by 2009. It was also decided to establish a CCS test plant at Mongstad with start-up in 2011, and a full scale carbon capture plant for the thermal power plant at Mongstad with start-up in 2014. Cleaning requirements have been stipulated in accordance with the Pollution Control Act, while an implementation agreement for the project has been signed by the Norwegian state, represented by the Ministry of Petroleum and Energy, and Statoil. The initiative in this field has been motivated by a wish to develop new technology and by climate considerations.

The investigation shows that ambitious deadlines have been set for the work on developing technological solutions for establishing CCS for gas power facilities. It has proven difficult to keep to these deadlines due to a great deal of uncertainty in relation to the technology solutions. The time frame also limits the range of technology

481) CO_2 Masterplan Mongstad, StatoilHydro.
482) Letter of 7 December 2009 from the Ministry of the Environment.

solutions available, which limits the opportunity to implement projects that would contribute to real technology development in line with the initiative's goal.

At the moment, the possibility is being considered of integrating the gas processing plant into the establishment of a capture plant at Kårstø. This will further delay start-up of the cleaning plant. The reason for establishing CO_2 cleaning at Kårstø was to help to fulfil existing climate commitments. The investigation shows that the environmental authorities deem CCS for gas-fired power plant to be unimportant in terms of fulfilling Norway's short-term climate commitments, but expect it to be important to emission reductions in relation to the 2020 target.

As regards CCS at Mongstad, there has been a real delay for the test centre. This could result in less time for technology trials if the deadline for construction of a full-scale plant is to be met. If CCS is not established for this facility from 2014, there will be a significant increase in emissions up to 2020.

The investigation also shows that it is difficult to set a cost limit for the implementation of measures based on untested technology. Planning alone is costly, and the government administration confirms that the schedules determine conditions for the cost ceilings, the state's negotiating position and the choice of technology. Cost sharing in which the Norwegian state finances most of the costs of development and investment as well as operation will entail a significant risk of budget overruns, since it is primarily the State that will have a direct interest in limiting costs.

The investigation shows that there has been little focus on transport and storage in relation to the capture facilities for gas power. Consequentially, no storage solution will be established for the test centre, and this will result in emissions of CO_2 from the centre. It also entails a risk that optimum storage solutions will not be chosen when the capture plants at Kårstø and Mongstad are established. Inadequate focus on storage is a risk factor that could result in a further increase in costs and delay the projects further.

7.3 What are the prerequisites for target achievement in the Climate and Forest Initiative?

According to the IPCC, deforestation and forest degradation are behind approximately 17 per cent of global greenhouse gas emissions. The emission commitments under the Kyoto Protocol cover greenhouse gas emissions from deforestation, but the most important countries when it comes to deforestation have no quantified emissions reduction commitments under the Protocol. Nor are deforestation projects covered by the Clean Development Mechanism. At the same time, reduction of emissions from deforestation and forest degradation has been deemed a necessary and cost-effective measure to control global greenhouse gas emissions.[483]

This chapter will first present the targets and organisation of the Climate and Forest Initiative. It will continue with a description of risk factors in the Climate and Forest Initiative and how they affect priorities in the work of the climate and forest project. Finally, it will give a brief summary of performance audits from Brazil and Indonesia which look into their respective authorities' work to reduce deforestation.

7.3.1 The Climate and Forest Initiative

The purpose of the effort to prevent deforestation and forest degradation in developing countries is to make a substantial contribution to combating global warming.[484] In addition to the climate targets, the initiative also has an overriding objective of contributing to sustainable development and combating poverty. In working to achieve the various targets, it aims to make climate policy and development policy mutually supportive.

The allocations shall be used to support measures in line with the objectives of the initiative:

- To work towards the inclusion of reduction of emissions from deforestation and forest degradation in developing countries (REDD) in a new international climate agreement[485] (see fact box 7.2)

483) *Stern Review on the economics of climate change;* IPCC (2007): Summary for Policymakers. *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*; Proposition No 1 to the Storting (2008–2009) for the Ministry of the Environment.

484) Proposition No 1 to the Storting (2009–2010) *Ministry of Foreign Affairs.*

485) The Norwegian authorities' work to promote international climate negotiations is not part of this investigation.

Fact box 7.2 What is REDD?

REDD is an acronym for Reduced Emissions from Deforestation and Forest Degradation.

The purpose of the international REDD initiatives, including the UN-REDD programme, is primarily to help to enable developing countries to participate in an international mechanism to reduce emissions from deforestation and forest degradation. The plan is to establish this mechanism under the UN Climate Convention. Today, this type of emission is one of the largest sources of greenhouse gas emissions in developing countries.

- To take early action to achieve cost-effective and verifiable reductions in greenhouse gas emissions from deforestation and forest degradation in developing countries
- To promote the conservation of natural forests to maintain their carbon storage capacity

The Climate and Forest Initiative has objectives relating to both climate and developmental policy.[486] The Ministry of the Environment is responsible for the progress, management and priorities and for environment-related and political processes. The Ministry of the Environment and the Ministry of Foreign Affairs stated in interviews[487] that the Ministry of the Environment is responsible for the decision-making processes in government, apart from in cases directly linked to budget work. In such cases, the Ministry of the Environment recommends the main framework and budget text, while the Ministry of Foreign Affairs submits the case to the Government (since the funds are appropriated over the Ministry of Foreign Affairs' budget).

The Ministry of Foreign Affairs has responsibility for allocating the climate and forest funds and is responsible for development-related quality assurance. The funds and follow-up responsibility for some of the measures in question have been delegated to the embassies relevant to the bilateral collaboration (at present in Brazil and Tanzania). Norad is responsible for allocating support to voluntary organisations.

486) The division of responsibility between ministries is described in the quality assurance document *Regjeringens klima- og skoginitiativ: Bakgrunn og retningslinjer for gjennomføring ('The Government of Norway's International Climate and Forest Initiative: Background and guidelines for implementation')*.

487) This report does not distinguish between the Ministry of the Environment and the Ministry of Foreign Affairs in its discussion of the Climate and Forest Initiative. The two ministries agree on the interview statements. The paragraph on roles and responsibilities explains how the initiative is organised.

Status of work in the Climate and Forest Initiative

Measures are being planned for all three large tropical forest areas in the world: the Amazon, the Congo Basin, and Indonesia and Papua New Guinea.[488] A total of NOK 1.5 billion was allocated for 2009, and according to Proposition No 1 to the Storting (2008–2009) for the Ministry of Foreign Affairs, the funds were allocated as follows:

- Funding through multilateral channels: approx. NOK 600 million
- Funding for climate and forest measures in Tanzania: approx. NOK 100 million
- Funding for the Brazilian Amazon Fund: approx. NOK 600 million
- Funding for voluntary organisations, research and development, including funding for monitoring, analysis, reporting and verification of forest and the carbon content of forest: NOK 175 million

Proposition No 1 to the Storting (2009–2010) for the Ministry of Foreign Affairs proposes stepping up the total allocation for the Climate and Forest Initiative for 2010 to NOK 2.1 billion.

Risk elements and risk management in work processes

It is pointed out in Proposition No 1 to the Storting (2008–2009) for the Ministry of Foreign Affairs that the effort to prevent deforestation and forest degradation in developing countries entails considerable risk. The Ministry of the Environment and the Ministry of Foreign Affairs have identified a number of risk elements and strategies for managing them. The risks and proposed ways of managing these risks are summarised in fact box 7.3.

The Climate and Forest Initiative requires the establishment of satisfactory international mechanisms to handle large transfers of funds to forest measures.[489] The Ministry of the Environment and the Ministry of Foreign Affairs state in interviews that this is why the use of multilateral channels such as the UN and the World Bank is a priority. The plan is for Norway to channel its support multilaterally in the countries that present the greatest challenges.[490] The Ministry of the Environment and the Ministry of Foreign Affairs state that they also make a point of using

488) Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.

489) Recommendation No 145 to the Storting (2007–2008), cf. Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.

490) Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.

Fact box 7.3 Risk elements and risk management strategies

Risk elements:

- There is uncertainty about measurements of the carbon reserves in forests and changes in these reserves, both for measurements of forest areas and of carbon density in forest
- It is difficult to establish a baseline level for future emissions that does not reward countries with a history of high deforestation rates at the expense of countries without such a history
- Leakages – reduced deforestations in one place results in increased deforestation elsewhere
- Duration – reduced deforestation in one period is reversed in a subsequent period
- Insufficient public administration capacity may weaken national ownership of REDD strategies
- There are many strong forces counteracting work on preventing prevent deforestation and forest degradation
- Corruption is both a cause of illegal deforestation and an obstacle to the implementation of programmes to counteract deforestation
- Legislation relating to ownership and right of disposition over the forest is often inadequate or not enforced
- Poverty and a lack of alternative livelihoods: As long as survival or maximum financial gain for those who live in and around the forest is linked with over-exploitation of forest resources, deforestation and forest degradation will tend to continue
- Reducing deforestation and forest degradation as a climate measures is a pioneering effort internationally, it is an area in which Norway does not have a lot of experience, and it involves working in a number of countries from which Norway has little aid experience

Risk management strategies:

- Work to have deforestation and forest degradation included in a future climate agreement
- Establish a reliable capacity to monitor and verify forest areas and the carbon content of forest, as well as changes in these factors
- Establish a robust, effective and flexible international architecture for the work to combat deforestation and forest degradation
- Establish a varied initiative portfolio in terms of degrees of difficulty, risk, geography, forest types and partners, provided that there is an explicit political willingness in the partner countries to develop and follow up national REDD strategies
- Plan for a context-dependent approach, with different ways of working depending on progress, reliability and chance of target achievement
- Give priority to capacity-building in situation where it is necessary, both at the national and international level
- Cooperate closely with Norwegian and international voluntary organisations with relevant expertise and capacity
- Establish performance-based support for work to combat deforestation and forest degradation
- Endeavour to make the Norwegian contribution to REDD act as catalyst for contributions from other countries
- Carry out systematic evaluation

Source: Proposition No 1 to the Storting (2008–2009) The Ministry of Foreign Affairs; interviews with the Ministry of Foreign Affairs, the Ministry of the Environment and Norad

multilateral organisations because these organisations will probably also be involved in a REDD mechanism under the United Nations Framework Convention on Climate Change.[491] The need to avoid corruption is also a key argument in support of using multilateral channels.

Based on the risk elements and pertaining management strategies, the Climate and Forest Initiative has established a project portfolio with particular focus on the UN-REDD Programme, the Forest Carbon Partnership Facility (an initiative administered by the World Bank) and bilateral cooperation with Brazil. The portfolio also includes cooperation with the Congo Basin Forest Fund, which is administered by the African Development Bank, and a combination of multilateral and bilateral work in relation to Tanzania. The Ministry of the Environment and the Ministry of Foreign Affairs also states that a bilateral Memorandum of Understanding has been signed between Norway and Guyana, and the intention is to channel funds multilaterally.[492]

It was made clear in interviews with the Ministry of the Environment, the Ministry of Foreign Affairs and Norad that there is a risk involved in operating in many countries, several of them new to the Norwegian foreign service and development cooperation. Norad points out that the Climate and

491) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

492) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

Photo: Mikkel Østergaard / Samfoto

Forest Initiative is active in countries and areas, such as Brazil, Papua New Guinea, the Congo area, Guyana and Liberia, that are new to Norway, both in the aid project context and for the foreign service in general. According to Norad, considerations must be weighed against each other to determine how far Norway should establish its own expertise or use multilateral organisations.

United Nations REDD programme

The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (the UN-REDD Programme)[493] comprises the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The programme creates a framework for cooperation between these UN organisations and other REDD participants such as the World Bank. The purpose of the programme is to initiate national REDD processes that could, in the long term, result in the inclusion of emissions from deforestation and forest degradation in a future global climate agreement.[494]

The Ministry of the Environment and the Ministry of Foreign Affairs state that there are great challenges relating to internal cooperation within the UN system. Both ministries consider it necessary to have an institutionalised focus for the work in order to ensure uniform and strategic progress. Norway has worked for the establishment of a joint secretariat for the UN-REDD programme. A joint secretariat was established in the first half of 2009.

Norad identifies further challenges to the UN organisations' REDD work:

- It is a challenge to make several UN organisations act under one joint system. Lack of coordination between UN organisations is an important potential obstacle to early target achievement for the Climate and Forest Initiative.
- The Food and Agriculture Organization of the United Nations (FAO) must modify its forest monitoring to focus on more than just monitoring forest areas. The UN must also use nationally verified data, which can be a challenge.
- The United Nations Development Programme (UNDP) has no own funds, but shall act via other organisations. It therefore has limited opportunity to initiate projects rapidly.
- Cooperation between the UN organisations and the World Bank varies in quality, particularly at the country level.

The Ministry of the Environment and the Ministry of Foreign Affairs state that the United Nations Environment Programme (UNEP) has funds for normative work and some catalytic pilot projects, but that its funds are not sufficient to make significant contributions to development measures and that the UNEP's presence at country level is negligible.[495]

Until November 2009 Norway was the UN-REDD Programme's only donor, contributing NOK 275

493) UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Delveloping Countries, UN-REDD.

494) FAO, UNDP and UNEP: *UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, UN-REDD: Framework Document*, 20 June 2008.

495) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

million.[496] The Ministry of the Environment and the Ministry of Foreign Affairs state that Denmark has now made a contribution, and Spain has promised to contribute from 2010.[497] The two ministries state in an interview that there are both advantages and disadvantages to this. The advantage is that the system has become operational in a short time and has an expedient design. It was also the intention that Norway should be a leading country in international REDD work.[498] According to the Ministry of the Environment and the Ministry of Foreign Affairs, the first phase of the UN-REDD Programme (see fact box 7.4) has considerable value in itself regardless of future development, because the work carried out in this phase will contribute to develop and strengthen the countries' forest management.

Fact box 7.4 A phased approach to REDD

1. Analysis phase: Generate plans rooted in the national authorities and with broad support from civil society. National REDD strategies, capacity-building and competence-raising will be important results in this phase.
2. Implementation of strategy: In this phase, countries must meet the challenges identified in phase 1. Results will include the drafting of legislation, establishment of necessary institutions and development of measuring systems for forest resources and carbon emissions.
3. Performance-based support: Countries are compensated for emission reductions in relation to a predefined baseline level.

Source: Arild Angelsen et al. (2009)

It also became clear in interviews with the Ministry of the Environment and the Ministry of Foreign Affairs as well as with Norad that it is not desirable for Norway to remain the UN-REDD Programme's sole donor, among other things because broader ownership may be important to the inclusion of REDD in the climate agreement.

To help rapid initiation of demonstration measures at country level, the UN-REDD Programme has identified measures called Quick Start Actions. Such pilot programmes have been planned in nine countries: Bolivia, the Democratic Republic of the Congo, Indonesia, Panama, Papua New Guinea, Paraguay, Vietnam, Tanzania and Zambia. The selection criteria were the countries' political will and interest to participate, the potential for achieving emission reductions and the degree of cooperation with the UN organisations.[499]

It emerged from interviews that no clear performance indicators have been prepared for the UN-REDD Programme. According to the Ministry of the Environment and the Ministry of Foreign Affairs such indicators are unnecessary, because the deliveries are clear and simple: national REDD plans, concepts for national monitoring, started capacity-building with plans for further work, and building of the international support organisation. In addition, the Ministry of the Environment and the Ministry of Foreign Affairs stress that the REDD work is carried out step by step (as described in fact box 7.4), and that the success of the Climate and Forest Initiative depends on each country's national ownership and national approach, which must be developed over time. The two ministries stated in interviews that they are not willing to commit large sums of money to a country before they know that there are nationally supported REDD strategies in place that can be expected to be implemented. According to the ministries, the phased approach is a key component of the project's risk management.

The Ministry of the Environment and the Ministry of Foreign Affairs also see a major challenge in a situation where few countries have well-functioning systems for measuring emissions from deforestation and forest degradation. The Climate and Forest Initiative has therefore chosen to concentrate a considerable proportion of its funds on developing expertise and capacity in monitoring, analysis, reporting and verification of emissions throughout the UN-REDD Programme.

The UN-REDD programme's work in relation to Indonesia

Norway granted USD 1 million to the UN-REDD Programme's pilot programme in Indonesia in 2009, and a further USD 5 million in 2010.[500] Proposition No 1 to the Storting (2008–2009) for the Ministry of Foreign Affairs signals that Indonesia is one of the countries in which measures are planned. Indonesia is one of the principal deforestation countries, containing more than 10 per cent of the world's tropical rainforests. Annual emissions from deforestation and forest

496) According to Proposition No 1 to the Storting (2009–2010) *The Ministry of Foreign Affairs,* NOK 66 million was allocated to the UN-REDD programme in 2008.
497) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.
498) Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.
499) *Decisions support memo – Norwegian support for the UN's multi-donor REDD fund,* the Ministry of the Environment, 7 July 2008.
500) See the 'Standard Joint Programme Document' drawn up by FAO, UNDP and UNEP in connection with the start-up of the UN-REDD programme in Indonesia.

degradation exceed 500 million tonnes of CO_2 equivalents. This corresponds to 80 per cent of Indonesia's total greenhouse gas emissions, which, according to the World Resource Institute, gives Indonesia one of the highest emission levels in the world.

The pilot programme in Indonesia has a threefold objective:[501]

- to strengthen the participation of all important players in order to reach agreement on the REDD effort at a national level
- to establish a baseline for emission from deforestation and forest degradation, a system for monitoring, analysis, reporting and verification of the carbon content of forests and how it changes
- to build capacity to implement a decentralised REDD system, including a reward structure for the provinces

Norad states in an interview that it has participated in UN-REDD Programme visits to Indonesia. The main conclusion drawn from this work is that there is growing interest and effort around deforestation in Indonesia, but that inadequate interaction between national and provincial authorities on REDD strategies represents a threat to this.

Forest Carbon Partnership Facility

The Forest Carbon Partnership Facility (hereinafter called FCPF) is an initiative established in 2006 that is administered by the World Bank. This initiative is intended to help to build REDD capacity in developing countries and test an incentive-based mechanism for compensation for achieved reductions in emissions from deforestation and forest degradation.

The FCPF comprises two mechanisms and two corresponding funds: the *Readiness* Mechanism and Readiness Fund, and the *Carbon Finance* Mechanism with the pertaining Carbon Fund.[502] The Readiness Fund will provide funding for analysis of the emissions development, the preparation of baseline scenarios, preparatory work for national REDD strategies and the design of a system to monitor, analyse, report and verify the carbon content of forests. The Carbon Fund is a financing scheme for countries that have already gone through the Readiness Mechanism and can be compensated for emission reductions.

The Ministry of the Environment and the Ministry of Foreign Affairs state that Norway, among other things, has influenced the World Bank's process towards collaboration with the UN-REDD programme. According to the two ministries, Norway set a condition that the World Bank would open up the possibility for cooperation with the UN-REDD programme, and vice versa.

Norway paid NOK 32 million into the Readiness Fund and approx. NOK 70 million into the Carbon Fund in 2009. As of 7 December 2009, approx. NOK 133 million had been paid into the Readiness Fund.[503]

In June 2009, Indonesia's application for financing from the Readiness Fund was deemed to provide an adequate basis for further work and for the signing of a financial agreement with the World Bank.[504] The agreement between the World Bank and Indonesia contains provisions that weaknesses pointed out in Indonesia's plans must be remedied. The country must also meet other requirements relating to payments from the World Bank, including environmental and social impact assessments, before an agreement can be signed.

Norway's agreement with Brazil on support to the Amazon Fund

Brazil is the world's number one country in terms of forest area, having 30 per cent of the world's remaining rainforest. Deforestation and forest degradation accounts for 70 per cent of the country's greenhouse gas emissions. Brazil has drawn up a strategy to reduce deforestation which includes systematic monitoring and measuring of forest resources. According to the Ministry of the Environment and the Ministry of Foreign Affairs, this strategy forms the basis for performance-based contributions through the Amazon Fund.

The Amazon Fund was established by the Brazilian government in 2008 and is managed by the Brazilian Development Bank, BNDES. The Fund's overall development objective is to support projects that help to reduce greenhouse gas emissions from deforestation. The Fund shall contribute to the implementation of measures to prevent and reduce deforestation, and to promote

501) *Standard Joint Programme Document*. Drawn up by FAO, UNDP and UNEP in connection with the start-up of the UN's REDD programme in Indonesia.

502) This paragraph is based on the World Bank's Forest Carbon Partnership Facility, *Information Memorandum* (13 June 2008).

503) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

504) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

Photo: Curt Carnemark / Samfoto

sustainable development in the Amazon region. The Amazon Fund shall contribute to meeting the targets in the Brazilian national climate plan. This applies in particular to the target of a 40-per cent reduction in the deforestation rate during the period 2006–2009. The target for the next two four-year periods is a further reduction of 30 per cent compared with the previous period. The Ministry of the Environment and the Ministry of Foreign Affairs state that the Amazon Fund's target is an 80-per cent reduction in the deforestation rate by 2020.[505] For the Amazon region, this may mean that accumulated greenhouse gas emissions will be reduced by 3.5 billion tonnes of CO_2 for the period 2006–2017.[506]

An agreement was signed in 2008 between Norway and Brazil on Norwegian support for the fund. Norway has committed itself to giving up to USD 1 billion to the Amazon Fund in the period up to 2015, provided that results are achieved. For 2009, NOK 123 million was paid to BNDES. This sum was based on the expected consumption over the ensuing six months.[507]

The criteria for payments to Brazil use a performance-based model as a starting point. The amount received by the fund is directly related to the results achieved in the form of reduced greenhouse gas emissions. The contribution will be calculated as follows:

- A baseline level for emissions from deforestation shall be calculated on the basis of average emissions for the past ten years. The average will be revised every five years. The baseline can only be adjusted downwards.
- If emissions for a year should exceed the baseline, no contributions from the fund can be applied for.
- The amount of CO_2 emissions exceeding the baseline in one year will be transferred to the following year.

505) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

506) *Allocation memo – Norwegian support for the Amazon Fund*, the Ministry of the Environment, 27 February 2009.

507) Letter of 3 December 2009 from the Ministry of Foreign Affairs and letter of 7 December 2009 from the Ministry of the Environment.

- Annual payments are thus calculated on the basis of the difference between average deforestation during the reference period and deforestation during a given year, and any excess emissions from the year before will also be taken into consideration[508]

Norad has prepared an assessment of the Brazilian Development Bank, BNDES, as a channel for future forest collaboration with Brazil. This report became available in June 2008.[509] Norad pointed to potentially weak links between the Amazon Fund and individual forest owners as well as between the fund and national plans to combat deforestation. The Ministry of the Environment and the Ministry of Foreign Affairs state in an interview that this is no longer the case, and that an investment system has been established within seven areas that are also identified in Brazil's national REDD strategy. Norad states that its recommendations have been taken into consideration in the further work on the Amazon Fund.

The Ministry of the Environment and the Ministry of Foreign Affairs stress that BNDES is judged to be a good manager of large funds for development purposes, and that it has satisfactory security procedures, including good anti-corruption procedures and follow-up of audit reports. It has also been pointed out that this is the first time that BNDES will be managing an international fund.[510]

The Ministry of the Environment and the Ministry of Foreign Affairs state in interviews that the nine rainforest countries in South America have had very limited success in establishing a coordinated anti-deforestation policy. In addition, Brazilian forest areas outside the Amazon region are excluded from the Brazilian deforestation policy until 2011. This entails a risk that reduced deforestation in the Amazon region of Brazil may cause increased deforestation elsewhere.[511] The Amazon Fund covers the leakage issue by setting aside 20 per cent of its funds for the development of monitoring systems in other areas of Brazil and in other tropical forest countries.

Another risk element relevant to the Brazil investment is ensuring lasting emission reductions. The Ministry of the Environment and the Ministry of Foreign Affairs state that this risk can be reduced by establishing a system providing predictable long-term financing. According to both ministries, the calculation model for contributions to the Amazon Fund provides financial incentives for lasting reductions in emissions in that the amount of CO_2 emitted in excess of the baseline in one year is transferred to the next year.

The Ministry of the Environment, the Ministry of Foreign Affairs and Norad all emphasise that taking account of developmental considerations is a prerequisite for lasting results. Norad points out that taking the population into consideration will create incentives for sustainable use of the forest, and that the population may profit from preserving forest. It is therefore Norad's opinion that the money should first and foremost target the people, not the authorities.

The Ministry of the Environment and the Ministry of Foreign Affairs point out that it is a challenging task to determine how much the Amazon Fund shall be entitled to each year. Target achievement will primarily comprise reduced greenhouse gas emissions as a result of reduced deforestation. The two ministries also emphasise that the funds must be satisfactorily managed by BNDES, among other things in terms of contributions to development and combating poverty as well as preventing irregularities and corruption.

The Regulations on Financial Management in Central Government requires payment of funds to be adapted to requirements and progress. The Ministry of the Environment and the Ministry of Foreign Affairs point out in interviews that BNDES will need to know the amount of donations coming into the fund for each year before it can invite applications for support from the fund. It will also need firm commitments before it can sign any binding agreements with recipients of support from the fund. As a consequence of this, BNDES cannot submit a traditional budget. The practical arrangement is that a first contribution is paid into the fund when BNDES can submit an estimate of the expected financial requirements for the year in question ('good faith projections'). Subsequent payments will therefore have to be adjusted if the estimate proves to be inaccurate.

508) The sum that the Amazon Fund is entitled to is arrived at by multiplying this difference by the carbon value per forest area and the carbon price. The Ministry of the Environment and the Ministry of Foreign Affairs stated in interview that both the carbon value per forest area and the carbon price have intentionally been set rather low, and the figures arrived at for emission reductions and the value of these reductions are conservative.

509) Assessment of BNDES as a potential mechanism for Norwegian support to Fundo Amazônia (Amazon Fund), Norad, 27 June 2008.

510) Allocation memo – Norwegian support to the Amazon Fund, Ministry of the Environment, 27 February 2009.

511) The Ministry of Foreign Affairs, in a letter dated 3 December 2009, and the Ministry of the Environment, in a letter dated 7 December 2009, state that an important reason to cooperate with countries such as Guyana, which historically has had a low rate of deforestation, is to reduce the risk of leakage.

7.3.2 The Brazilian Court of Audit´s audit report on forest management

According to the Brazilian Court of Audit, the deforestation rate remains high, despite a decreasing tendency in recent years. Deforestation in 2008 amounted to nearly 12,000 square kilometres. Since 1970, 18 per cent of Brazil's forests have disappeared. Between 70 and 75 per cent of Brazil's carbon emissions stem from deforestation, and 96 per cent of these emissions are due to the conversion of rain forest into agricultural land.

The performance audit evaluates the government's policy for reducing greenhouse gas emissions in the Amazon. The investigation pursued the following lines of inquiry:

- Does the public Amazon policy that results in increased emissions also have mechanisms to compensate for or reduce these effects?
- Has the public policy for the Amazon been designed in such a way that it reduces greenhouse gas emissions?
- Does the existing policy take such aspects as management and responsibility into consideration in a manner that promotes reduction of greenhouse gas emissions?

Emission-driving sectors

The Sustainable Amazon Plan (PAS)[512] from 2008 emphasises that there are deficiencies in the integration of environmental aspects into the management of the Amazon. In its investigation, the Brazilian Court of Audit examined conflicts of goals in the country's agricultural policy, transport and communications policy and land reform policy.

According to the Brazilian Court of Audit, the Ministry of Agricultural Development, Brazilian Company of Agriculture and Livestock Research is not sufficiently effective as a driving force for reducing greenhouse gas emissions. The Brazilian Court of Audit points out that the various funding offered for agricultural and deforestation purposes is not seen in relation to each other. Only 7 per cent of the funding required to implement the management plan for sustainable development of the agricultural industry in the Amazon has been made available. Even though the Ministry of Agricultural Development, Brazilian Company of Agriculture and Livestock Research can apply for funds to finance the management plan from other sources, such as the Amazon Fund and the World Bank, the Brazilian Court of Audit nonetheless finds it likely that the plan will be underfunded during its first year.

Brazil's national transport plan proposes improved utilisation of the waterways and increased railway building in the Amazon. According to this plan, 30 per cent of total infrastructure investments in the Amazon are to be spent on waterways. However, a review of the transport and communications investments in the region shows that only 10 per cent of all investments for the period 2008–2011 have been earmarked for waterways.

The Brazilian Court of Audit reports that the land reform and settlement policy under the auspices of Incra (the Brazilian agency for settlement and land reform) has not been sufficient to achieve protection of the environment. Incra's statistics show that the deforestation uncovered in the settlements has accounted for an increasing proportion of the total deforestation in the Amazon region.[513]

According to the Brazilian Court of Audit, Incra's environmental action plan is also underfunded. Even though funding schemes exist that could help to reduce deforestation, these schemes are used less in the Amazon region than in other regions of Brazil.

Evaluation of goal achievement

Brazil's National Climate Change Plan (PNMC) from 2008 stipulates two quantitative targets for the reduction of deforestation: one for the persisting average reduction in deforestation, and one to stop the net loss of forest area in Brazil by 2015.[514]

The Brazilian Court of Audit points out that the national plan does not distinguish between legal and illegal deforestation. This makes it difficult to establish whether the targets have been reached or not. The National Institute for Space Research (INPE) provides satisfactory documentation of deforestation, but the Brazilian Ministry of the Environment does not make the necessary adjustments to the figures reported by INPE based on whether the deforestation is legal or illegal.

512) PAS is a plan drawn up by the Brazilian federal authorities and the governors of the provinces in the Amazon region.

513) While it accounted for 13 per cent of the total deforestation in 2003, this figure had increased to 21 per cent in 2008. The Brazilian SAI also points out that, in previous reports, it has found that settlements have been built without an environmental licence, and that settlements do not facilitate sustainable development.

514) This means that the Brazilian authorities will compensate for any deforestation that continues to take place after 2015, for example by planting new forest.

According to the Brazilian Court of Audit, the Brazilian Ministry of the Environment receives poor information from the states, which are the bodies that possess information about the exploitation of forest areas. The states do not meet the structural prerequisites for approving exploitation of forest, and this makes it even more difficult to clearly distinguish between legal and illegal deforestation.

The Forest Portal has been created in order to make forest management information available for each state, including approval of plans for sustainable forest management and removal of natural forest vegetation. The portal is in operation, but most of the information is still not available. In the Brazilian Court of Audit's view, this weakens not only the measuring of illegal deforestation, but also the environmental agencies' monitoring and control.

Management of the Amazon policy
The National Climate Change Plan (PNMC) involves different players, levels of responsibility and projects, which makes it difficult to coordinate measures across sectors. According to the Brazilian Court of Audit, the plan has failed to establish the required coordination and control mechanisms. Nor have tools been created to communicate the results achieved by the national plan.

According to the Brazilian Court of Audit, PNMC has not defined budgetary and financial responsibility, and this makes it impossible to conclude that the budget will be sufficient to meet current commitments. Nor does the National Climate Change Plan stipulate deadlines, responsibilities, performance targets or the purpose of the measures. In the Brazilian SAI's view, this makes it extra difficult to achieve the targets.

7.3.3 The Audit Board of the Republic of Indonesia's audit report on forest management

Indonesia is the world's third largest forest country, with 133 million hectares of tropical forest.[515] That is ten per cent of the world's tropical rainforest and half of all the tropical rainforest in Asia. According to the Audit Board of the Republic of Indonesia, 48.8 million people lived in or around the forest areas in 2003, and six million people's livelihoods were directly related to forest.

The basis for the Indonesian audit is the deforestation and forest degradation rate experienced by Indonesia. The average annual deforestation for the period 2000–2005 was more than 1 million hectares.[516] On the basis of the figures reported by the Audit Board of the Republic of Indonesia, it can be estimated that more than four per cent of the forest in Indonesia disappeared between 2000 and 2005.

The Ministry of Forestry is responsible for forest management in Indonesia. The Ministry of Forestry regulates ownership, management and rights of use of forest resources. This is done by determining what are defined as forest areas, by granting permits for use of forest areas for commercial purposes, and through ordinary forest management.

The Audit Board of the Republic of Indonesia has pursued the following lines of inquiry:
- Has a satisfactory internal control system been developed and designed for
  – estimating the carbon inventory of forest?
  – mitigating the emissions from deforestation and forest degradation?
  – issuing permits for the use of forest, including felling (including reporting of felling)?
  – protecting forests and forest areas?
  – organising the rehabilitation of deforested areas?
- Is forest management in accordance with the decisions, including legislation, that govern this management area?

The audit report states that the most important reasons for deforestation in Indonesia are illegal felling, forest fires, conversion of forest into agricultural land, and the use of forest areas for other purposes, primarily mining.

The Audit Board of the Republic of Indonesia concludes that the internal control system for forest management has significant weaknesses. It points out that there are conflicts between forest policy and policies in other areas, and that statutes and regulations are not enforced or complied with. The Audit Board of the Republic of Indonesia states that illegal felling takes place in nearly all the country's national parks. The report refers to the fact that 78 per cent of Indonesian timber stems from illegal felling.

515) The supreme audit institution of Indonesia uses two different figures: 133 million hectares and 120 million hectares. The UN-REDD programme, on the other hand, estimates that there are about 118 million hectares of forest in Indonesia (55 per cent of the country's total land area).

516) This is based on statistics from the Indonesian Ministry of Forestry covering seven islands: Sumatra, Kalimantan, Sulawesi, Maluku, Papua, Java, Bali and Nusa Tenggara.

The investigation shows that seven per cent of the areas defined as forest areas have not been mapped. The mapping of forest areas in Indonesia is decided through a process involving both national and regional authorities. The Audit Board of the Republic of Indonesia points out that two of the provinces with the largest forest areas have not implemented this process. This means that the limits of forest areas have not been agreed. In the Audit Board of the Republic of Indonesia's view, this makes forest management more difficult. There are also indications of misclassification of forest areas. According to figures from the Ministry of Forestry, 33 million hectares of forest areas have no vegetation, while eight million hectares of forest have not been defined as forest areas.

The Audit Board of the Republic of Indonesia reports that the Ministry of Forestry has not established a national inventory of CO_2 emissions and carbon removals resulting from forest and land use changes. Nor has it identified a method for the calculation of such emissions. The result is that the country has no baseline level against which to assess the effect of the programmes and measures that have been initiated. The Audit Board of the Republic of Indonesia goes on to point out that the lack of a baseline level can adversely affect Indonesia's chances of participating in REDD projects and projects under the Clean Development Mechanism.

According to the Audit Board of the Republic of Indonesia, the National Board for Climate Change (DNPI)[517] was created without consideration to aspects such as sustainability, the possibility of holding the authorities accountable and regional interests. There are weaknesses relating to verification of DNPI's actions and how DNPI coordinates climate work, and relating to climate policy implementation at the regional level not being optimal.

7.3.4 Evaluations

The Government's Climate and Forest Initiative was started in 2007, with targets including contributing to reducing greenhouse gas emissions from deforestation and forest degradation in developing countries. It is too soon to evaluate target achievement in this project. The Climate and Forest Initiative requires an effort that entails significant risk, among other things in relation to governance, economic incentives and geographical factors.[518] The Ministry of the Environment and the Ministry of Foreign Affairs have, in Proposition No 1 to the Storting (2008–2009) for both ministries, described many of the elements of risk associated with this project as well as proposed risk management strategies.

However, the investigation shows that the fact that Norway has been the UN-REDD Programme's only donor represents a risk. There are also risks associated with coordination of multilateral work at country level, particularly the work of the involved UN agencies.

It is clear from the investigation that there are challenges relating to national ownership of the REDD work in both Indonesia and in Brazil. In Brazil, there are considerable conflicts of goals between reducing deforestation and the agricultural, land reform, and transport and communications policies. The Brazilian Court of Audit reports major cooperation challenges between ministries that are responsible for the causes of deforestation in the Amazon. The Audit Board of the Republic of Indonesia points out that forest management is facing major challenges relating to the implementation and enforcement of legislation. Indonesia also has conflicts of goals between REDD work and forest-based commercial activities.

The investigation also shows that there are challenges as regards monitoring forest areas. Indonesia lacks proper mapping of forest areas and an overview of CO_2 emissions resulting from deforestation and forest degradation. In Brazil, while the monitoring of forest areas has been deemed to be satisfactory, the Brazilian Court of Audit reports that the authorities do not distinguish between legal and illegal felling in its reporting.

517) DNPI is a newly established advisory entity that is also charged with monitoring the implementation of climate policy, both as regards adaptation and emission reductions. The council's role and responsibility has not been fully defined. See the 'Standard Joint Programme Document' drawn up by FAO, UNDP and UNEP in connection with the start-up of the UN-REDD programme in Indonesia.

518) Proposition No 1 to the Storting (2008–2009) *The Ministry of Foreign Affairs*.

8 How does the Ministry of the Environment fulfil its coordination responsibility and role as a driving force in national climate policy?

Reducing greenhouse gas emissions is an inter-sectoral task. The Ministry of the Environment has a coordinating role in this work. The Ministry stated in an interview that, since 1998, the national work on developing policy instruments has primarily taken place through the preparation of reports to the Storting and in state secretary committees as required.

8.1 Which ministries are responsible for targets being reached and policy instruments being utilised?

As the preceding chapters have shown, the sector ministries have different policy instruments at their disposal that can help to reduce emissions. Responsibilities for targets and policy instruments that can help to reach the targets are summarised in table 8.1.

Table 8.1 shows that several ministries are responsible for the same targets, and that several ministries are responsible for policy instruments that can contribute to target achievement within one and the same area. Responsibility for the sector targets for the transport sector is divided between the Ministry of Transport and Communications and the Ministry of Trade and Industry (shipping), while the target for primary industries/waste is divided between the Ministry of the Environment, the Ministry of Fisheries and Coastal Affairs and the Ministry of Agriculture and Food. It is also shown in section 6.6 that it is unclear which ministry is responsible for the sector target for industry being reached. The Ministry of Trade and Industry does not regard itself as being responsible for the sector target for industry, but it is responsible for general business and industry-oriented policy instruments through Innovation Norway and the Research Council of Norway, see section 7.1.

8.2 How is the authorities' work coordinated?

Figure 8.1 shows the most important coordination channels since 1998. It shows that a number of channels have existed and still exist at civil servant level and state secretary level. Contact

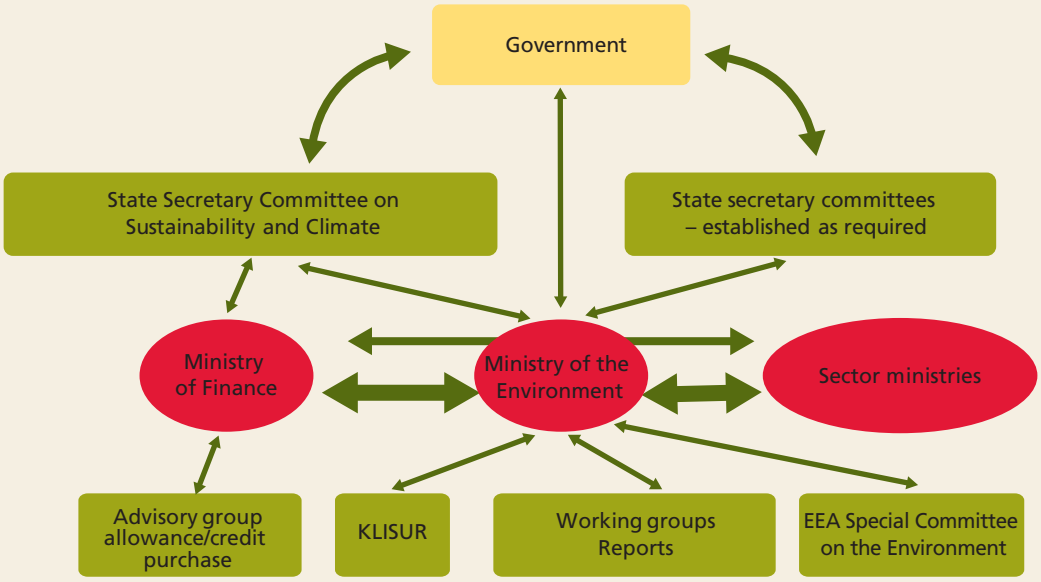
Table 8.1 The ministries' responsibility for national targets, sector targets and policy instruments[519]

	Ministry						
Target	The Ministry of the Environ-ment	The Ministry of Finance	The Ministry of Petroleum and Energy	The Ministry of Transport and Communi-cations	The Ministry of Trade and Industry	The Ministry of Agriculture and Food	The Ministry of Foreign Affairs
The Kyoto Commitment (2008–2012)	TP	P	P	P	P	P	
Target for strengthening of the Kyoto Protocol commitments (2008–2012)	T	P					P
National target 2020	T						
- Sector target, industry	P	P	P		(P)		
- Sector target, petroleum and energy	P	P	TP			P	
- Sector target, transport	P	P		TP	TP		
- Sector target, primary industries and waste	TP	P				TP	

T = target; P = policy instrument

519) The Ministry of Fisheries and Coastal Affairs and the Ministry of Local Government and Regional Development also have policy instruments at their disposal that can help to reduce greenhouse gas emissions, but they are not included in this investigation.

Figure 8.1 Chart showing the parties involved in interministerial work on national climate policy



between the Ministry of the Environment and the various sector ministries, and between the Ministry of the Environment and the Ministry of Finance, has partly taken place through the interministerial groups and partly bilaterally. There is also bilateral contact between the Ministry of Finance and the sector ministries on designing indirect taxes. There have also been a several committees at state secretary level. The Ministry of the Environment states that other working groups are appointed as required.[520]

8.2.1 KLISUR

In 1992, an interministerial committee, KLISUR, was created to work on national action plans relating to climate changes. KLISUR's steering committee comprised representatives from the Ministry of the Environment, the Ministry of Petroleum and Energy, the Ministry of Transport and Communications, the Ministry of Finance, the Office of the Prime Minister, the Ministry of Foreign Affairs and the Ministry of Agriculture.

According to KLISUR's remit, the committee was to consist of high-level civil servants. It was to discuss and clarify strategies for the preparation, implementation and follow-up of international negotiations on climate and acid precipitation, and to discuss and coordinate work on national action plans in these areas.

Two specialist groups were established under KLISUR: one for climate and one for acid precipitation. These groups were to obtain and coordinate the factual basis for the national action plans and report to the civil servant group. The Ministry of the Environment led the specialist groups and was responsible for their secretariat functions.

The Ministry of the Environment states that KLISUR worked on national as well as international issues. The specialist group for climate, however, worked almost exclusively on international negotiations after 1998. There is little documentation available from the climate part of KLISUR's work. The Ministry of the Environment stated in an interview that KLISUR was discontinued in 2007.

8.2.2 The State Secretary Committee for Sustainable Development and Climate

The State Secretary Committee for Sustainable Development was appointed in autumn 2005 to lead the work on drawing up a national strategy for sustainable development and help to coordinate the Government's work in this area. Its remit and composition were expanded in 2008 to improve climate policy follow-up, and climate was included in the committee's name to reflect this. The national strategy for sustainable development was presented in the national budget for 2008. The state secretary committee has since worked to follow up this strategy. The Ministry of

520) Letter of 7 December 2009 from the Ministry of the Environment.

Finance stated in an interview that the committee is administered by the Ministry of Finance, and that meetings are chaired by the state secretary from the Ministry of Finance. When climate-related issues are considered, the committee is chaired by the state secretary from the Ministry of the Environment.

According to the Ministry of Finance, the committee has no decision-making powers, but is primarily an advisory and coordinating body tasked with preparing and discussing issues relating to sustainable development and climate. The purpose of the work is to arrive at an agreed decision-making basis for the government's work. As regards the agenda and objectives of the committee, the Ministry of Finance states that there is no long-term pattern in relation to which matters are considered by the committee. The committee considers relevant political matters relating to sustainable development and climate.

8.2.3 EEA Special Committee on the Environment

Matters with EU/EEA relevance, such as work on the emissions trading scheme, are considered by the EEA Special Committee on the Environment. The Ministry of the Environment states that it can be difficult for this committee to deal with complicated acts that require more detailed follow-up and frequent meetings. For this reason, a subordinate interministerial working group was established under the EEA Special Committee on the Environment in 2008 to consider the directive on the inclusion of aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (Directive 2008/101/EC) and the revised emissions trading directive (Directive 2009/29/EC).

8.2.4 The Ministry of the Environment's bilateral contact with other ministries

In addition to the work carried out by inter-ministerial groups, there is also continuous bilateral contact between ministries about climate-related issues. The Ministry of the Environment states that there is systematic follow-up at all levels, in connection with individual matters as well as in the general contact between ministries. This contact is both bilateral and sometimes between several ministries about matters or processes that involve several ministries. The Ministry states that specialist departments and sections in the Ministry have a clear responsibility for following up climate policy and act as a driving force through their continuous work in relation to other specialist sections and departments with sector responsibility for climate policy.[521] The Ministry of the Environment creates channels that can act as driving forces based on what the Ministry deems to be an expedient way of working, and it takes initiatives for contact when the Ministry sees a need for this. This applies, for example, in connection with extensive processes and matters in the sector ministries, such as drawing up the National Transport Plan and CO_2 cleaning of the gas-fired power plant at Mongstad. Informal contact and processes between the Ministry of the Environment and sector ministries are common in the period before draft reports to the Storting are formally presented.

8.3 Work on policy instruments prior to 2007

The Kyoto Report from 1997[522] emphasised that working targets were to be established for sectors for which this was expedient. This was done in order to clarify responsibilities, rationalise work on policy instrument issues and facilitate efficient performance monitoring. The Ministry of the Environment stated in an interview that endeavours were made in the Kyoto Report to highlight the effect of the use of policy instruments in the various sectors, but the Ministry also underlines that cross-sectoral policy instruments were most important.

8.3.1 Environmental action plans

In Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the Environment in Norway* and, subsequently, Report No 15 to the Storting (2000–2001)[523], the sector ministries were assigned responsibility for drawing up *sectoral environmental action plans* for the sectors of society for which each ministry is responsible. These sectoral environmental actions plans were to form the basis for an improved reporting system to enable an effective overall environmental protection policy to be pursued. The environmental action plans were to present working targets for each sector as well as policy instruments and measures within the environmental policy result areas. The plans for each sector were to be included in the sector's ordinary management systems and presented in the sector ministry's budget propositions. The climate problem was emphasised as an important element in the environmental action plans. Environmental

521) Letter of 7 December 2009 from the Ministry of the Environment.
522) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol').*
523) Report No 15 to the Storting (2001–2002) *Amendment to Report No 54 to the Storting* (2000–2001).

action plans were drawn up by all ministries during the period 1999–2002.

In 2003, Statskonsult submitted an evaluation report on the contents results of the plans.[524] Statskonsult's evaluation shows that most of the ministries found it difficult to arrive at environment-related policy instruments that were at their own disposal, and that this made it difficult to meaningfully study sector targets further. The lack of coordination of environmental challenges in connection with the preparation of these plans, both between sector ministries and between the environmental authorities and sector ministries, was pointed out in the evaluation. The problems was that, on the one hand, sector ministries wanted a national system in which the Ministry of the Environment would have a coordinating role, but, on the other hand, they did not want the Ministry of the Environment to control the work in each sector in detail. Statskonsult's report concluded that the boundary between each individual ministry's sector responsibility and the government's cross-sector responsibility was unclear, and that there was a need for a clarification of the division of roles and responsibilities in the environmental field in relation to cross-sector issues.

A review of all reports and propositions to the Storting and of interviews with sector ministries shows that no working targets aimed at greenhouse gas emissions were adopted in any of the sector ministries during the period from the signing of the Kyoto Protocol until Report No 34 to the Storting (2006–2007) in 2007. However, several ministries have targets relating to the environment in general and targets that could contribute to reducing greenhouse gas emissions, although these targets are not always motivated by climate policy, see chapter 6.

The Ministry of the Environment states that, partly based on Statskonsult's evaluation of the plans in 2003, it was concluded that the environmental action plans would not be continued as a permanent arrangement.

8.4 Work on policy instruments since 2007

During consideration of Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy,* sectoral climate action plans and sector targets for the key emission sectors in Norway were adopted. The main purpose of the sectoral climate action plans is to identify the policy instruments that produce cost-effective emission reductions for each sector and that are not implemented through the current use of policy instruments. This forms the basis for the targets set for the sectors.

8.4.1 The ministries' understanding of sector targets

The Ministry of the Environment stated in an interview that sector ministries also have a responsibility for ensuring that sector targets are followed up and achieved within their areas, as regards both the use of policy instruments and overall policy. The Ministry of the Environment expects proposals presented by sector ministries to be based on climate policy guidelines, and it also expects sector ministries to be familiar with the national targets in the area. It is the sector ministries' responsibility to ensure that climate targets are integrated into their policy, and this responsibility also involves ensuring that sector targets are well defined and operationalised.

The Ministry of the Environment states that, before the targets were drawn up, it often found that there was no shared understanding between the Ministry of the Environment and the sector ministries about what the sector targets involved.[525] This is confirmed by documentation showing that, in connection with the work on the Climate Report, opinions often differed between ministries about the assumptions used to set targets. Opinions also differed on, for example, how expedient binding sector targets and quantification of these targets were. In this context, reference was made to uncertainty relating to the underlying development of emissions, the future availability of new emission-reducing technology and costs of measures at sector level. There were also differing views on what cost-effectiveness entailed, and whether a ceiling should be set for what was cost-effective, for example in relation to allowance prices or the level of carbon tax. There was also disagreement about whether sectoral policy instruments were needed or whether the cross-sector policy instruments were adequate.

The Ministry of the Environment states that opinions may also differ about how the targets are to be operationalised after they have been adopted. Interviews with several different ministries show that different ministries have different interpretations of what the sector targets involve. Several of the

524) Statskonsult *Sektorvise miljøhandlingsplaner – et egnet virkemiddel? ('Sectoral action plans – an appropriate policy instrument?')* Report 2003:6.

525) Letter of 7 December 2009 from the Ministry of the Environment.

sector ministries do not see sector targets as the sector ministries' responsibility, but as a shared responsibility for the Government. The Ministry of Trade and Industry stated in a letter[526] that it is not necessarily the individual minister, but the Government that is responsible for the national targets. The Ministry of Petroleum and Energy shares this opinion, and stated in an interview that the Kyoto commitments form a framework for work in the Ministry, but that responsibility for the national targets must be seen in conjunction with other ministries' responsibilities.

The Ministry of Agriculture and Food stated in an interview that the ministry has sector responsibility for the agricultural sector and will contribute to reaching the targets set by the Goverment. The Ministry sees it as its responsibility to operationalise and implement measures within its area of responsibility. The Ministry of Transport and Communications regards it as its responsibility to implement and propose measures within its area of responsibility that can help to achieve the climate targets for transport, but it points out that several other ministries and local authorities are responsible for policy instruments that could also contribute to the targets being achieved. The Ministry states that its work is seen in the context of the 2020 target for the sector, but that it has not developed specific working targets for the climate area other than at a general level in the action plan for the environment.

The Ministry of the Environment points out that sector targets are a relatively new phenomenon, and that there used to be political agreement that sector targets should not be set. The Ministry of the Environment's therefore believes that full integration of these targets in the sector ministries must be expected to take time.

Some of the sector targets are divided between several different sectors. This applies to 'primary industries and waste' and 'transport'. The Climate Report did not describe which sector ministries are responsible for achieving sector targets that are divided between ministries. It emerged from interviews with those sector ministries that share responsibility with other ministries that none of them know how responsibility for the targets is to be divided between the ministries in question.

526) Letter of 21 August 2009 from the Ministry of Trade and Industry.

8.5 Performance monitoring

The Ministry of the Environment stated in an interview that internal performance monitoring in the administration takes place through budget processes and internal governing documents. Budget propositions describe the working targets, some of which may also involve relations with other ministries. The Ministry of the Environment stated in an interview that the Ministry's activity plans takes these targets as their starting point, and that it reports on working targets and whether they are achieved during the year.

8.5.1 The budget propositions' environmental profile

Following Statskonsult's evaluation in 2003, it was decided that reporting on the environmental action plans was to take place through the ordinary work on budgets and reports to the Storting. It emerged in an interview with the Ministry of the Environment that the ministries' environmental profile in the budget propositions are seen both as a management tool and a monitoring system. The Ministry of the Environment also states that it can contribute input during the budget process. The overall environmental effort for each year is presented as part of the Ministry of the Environment's budget proposition. The interviews with the sector ministries confirm that the ministries see their environmental profile in the budget propositions as their reporting on the status of climate work in their own sectors.

8.5.2 Performance monitoring by means of bilateral contact

The Ministry of the Environment also considers bilateral contact to be an important channel for performance monitoring. The Ministry stated in an interview that a better management tool is now available in the form of the climate targets stipulated in the Climate Settlement. The Ministry of the Environment can point out to sector ministries what the consequences of having sector targets should be, and that new policies must be consistent with the sector targets.

8.5.3 Emission accounts

The emission accounts prepared by Statistics Norway and the Norwegian Pollution Control Authority show the status and development of national emissions and the uptake of greenhouse gases. The purpose of the emission accounts is, among other things, to show the degree of target achievement in relation to international environmental conventions and national targets and to

provide input to local action plans.[527] According to the national budget for 2009[528] sustainability indicator 3 is 'Norwegian greenhouse gas emissions'. The Ministry of Finance stated in an interview that the climate indicators serve as one of many management tools in the climate field.

8.5.4 Projections and the baseline scenario for greenhouse gas emissions

The projections state what the future level of emissions will be given today's policy instruments (current policy) and assumptions about the future economic development. The Ministry of the Environment stated in an interview that it regards the projections prepared by the Ministry of Finance to be important management information in terms of evaluating the adequacy of existing policy instruments. According to the Norwegian Pollution Control Authority, the projections also form the basis for mitigation analyses prepared by the authority.

The Ministry of Finance and the Norwegian Pollution Control Authority are responsible for the content of emission projections. The Ministry of Finance stated in an interview that the work on projections for emissions to air requires more thorough analyses of individual sectors, and that it is carried out in collaboration with the Norwegian Pollution Control Authority. Some types of data are based on input from other ministries and subordinate agencies. The modelling tools and most important elements of uncertainty in the projections are briefly described in fact box 8.1.

Projections of national emissions have been presented in all climate policy reports since 1998, as well as in some reports from the Ministry of Finance. The sector projections, however, have not been reproduced in the climate policy reports. The Norwegian Pollution Control Authority prepares sector projections and publishes them in connection with mitigation analyses and through the Ministry of the Environment's reporting to the United Nations Framework Convention on Climate Change (National Communications). The Norwegian Pollution Control Authority stated in an interview that the sector projections are prepared for the authority's own use, and that the Ministry of Finance is not responsible for them. A review of the sector projections shows that the sector classification does not fully agree with the sectors used for sector targets in Report No 34 to the Storting (2006–2007).

527) www.ssb.no.
528) Report No 1 to the Storting (2008–2009) *The National Budget 2009.*

It emerged from interviews that the sector ministries do not take sector projections into account to any significant extent. Some state that sector projections are inadequate for their purposes, while other state that they have prepared their own projections for the sector.

Fact box 8.1 Modelling tools for projections and uncertainty factors

Analyses of future emission development trends have largely been carried out using the long-term equilibrium model MSG, which was developed by Statistics Norway. Statistics Norway has developed an additional model on assignment from the Ministry of Finance that enables emission projections to be generated in line with the projections for the Norwegian economy.

MSG is a macroeconomic model that provides a picture of the whole economy, and that can model substitution between input factors and sectors. However, the MSG model is poor at modelling changes in technology. Other models are therefore used for this purpose. Moreover, MSG projections do not show effects for individual enterprises or at detailed industry levels.

There is considerable uncertainty relating to projections of emissions to air. The most important factors are:

- continual economic development
- technological developments
- energy prices
- the international allowance price
- developments in the petroleum sector
- closures of large individual sources in the process industry
- households' demand for transport services
- developments in economic and climate policy in other countries
- the effect of adopted policies
- simplifications in the model

The report Long-term Perspectives for the Norwegian Economy from 2009 presented projections based on different assumptions. Alternative assumptions were modelled for productivity growth, the oil price and population. Each of these factors can change emissions in 2020 by about one million tonnes of CO_2.

Source: Interviews with the Ministry of Finance, the Ministry of the Environment, the Ministry of Trade and Industry and Statistics Norway; Report No 34 to the Storting (2006–2007) Norwegian Climate Policy; Report No 9 to the Storting (2008–2009) *Long-term Perspectives for the Norwegian Economy*

The national emissions target for 2020 and the sector targets have, as described above, been set in relation to a baseline scenario, i.e. what greenhouse gas emissions will be in 2020 given the

current policy. In order to assess whether this target will be reached, it is necessary to know the subsequent effect of implemented policy instruments and measures that were not originally included in the baseline scenario.

Statistics Norway stated in an interview that it is difficult to estimate what emissions would have been without the measures. The Ministry of the Environment and the Norwegian Pollution Control Authority both agree. Statistics Norway also states that the Norwegian authorities' estimate of the effect of measures and policy instruments is very rough, and that it would not be correct to add up data calculated using different methods.

The Ministry of the Environment and the Norwegian Pollution Control Authority also state that no indirect effects of the measures have been calculated. An independent audit team appointed by the United Nations Framework Convention on Climate Change has reviewed the Norwegian projections, and the team concluded that Norway's reporting of the effect of measures was incomplete.[529]

8.5.5 The greenhouse gas budget

It was decided in the Storting's Climate Settlement that, in connection with follow-up of the sustainability strategy and the ordinary budget proposals, a greenhouse gas budget shall be presented that evaluates the consequences of the budget for greenhouse gas emissions.[530] The effect of proposed efforts must be evaluated regardless of whether they influence emissions in a positive or negative direction. The Ministry of the Environment states that the greenhouse gas budget as a reporting system was used as a pilot in 2008, but that the tool needs to be developed further and requires a number of improvements. According to the Ministry, the plan was to implement full-scale reporting from autumn 2009, and to develop this tool to become a more specific management system. The Norwegian Pollution Control Authority is working on assignment for the Ministry of the Environment to develop a common methodology. The Ministry of the Environment's budget proposition for 2010[531] states that no complete greenhouse gas budget has been prepared, but that the plan is to develop this further in the period leading up to the 2011 budget.

529) Report on the centralized in-depth review of the fourth National Communication of Norway. FCCC/IDR.4/NOR.
530) Recommendation No 145 to the Storting (2007–2008), cf. Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy*.
531) Proposition No 1 to the Storting (2009–2010) *The Ministry of the Environment*.

8.5.6 Performance monitoring

The Ministry of the Environment states that, since the sector targets were not quantified previously, the follow-up processes in the budget propositions were qualitative rather than quantitative. Target achievement was therefore largely a matter of opinion. The Ministry states that, as of today, the Climate Report and the Climate Settlement are the Ministry of the Environment's most important governing documents in relation to the sector ministries. Since January 2008, the sector targets have been used to operationalise the overriding targets and have functioned as part of the management and control system. According to the Ministry of the Environment, the sector targets will become more concrete as a result of climate policy being integrated into the sector. This is done by concrete proposals from the sector ministries being assessed in relation to the sector targets. The Ministry of the Environment thereby believes that the sector targets are seen as useful management parameters. It has also been assumed that two thirds of the cuts in the national emission target for 2020 will take place in Norway, and the Ministry states that it uses this as a management argument in relation to the sector ministries.

The targets in the climate report, however, have been set on the basis of a baseline scenario. The Ministry of the Environment stated in an interview that this means the targets might be revised every time the baseline scenario is changed.

8.6 The Ministry of the Environment's role as a driving force and challenges relating to this role

The Ministry of the Environment stated in an interview that its role as a driving force in climate policy means that the Ministry shall ensure that the climate targets adopted by the Storting form the basis for and shall be taken into account in policy formation in various sector areas. The Ministry of the Environment points out that it is the sector authorities' responsibility to initiate and implement measures in their own areas. The Ministry also states that various channels are available to it in the performance of its role as a driving force. To the extent that the available policy instruments are not adequate to achieve the targets set, this role will also entail proposing new policy instruments and changes to existing ones. The Ministry of the Environment also states that leadership of the national work on further developing and implementing policy instruments

Photo: Svein Grønvold / NN / Samfoto

is largely exercised through political processes in the Ministry, the Government and the Storting by submitting draft legislation or reports.

It emerged from an interview with the Ministry of the Environment that it is facing a number of challenges in its role as a driving force in the area of climate. The Ministry of the Environment emphasises that conflicts between climate policy targets and other targets are the primary challenge. The energy and transport sectors are examples of this. In these sectors, new developments have been adopted that could lead to increases in greenhouse gas emissions. When conflicts of goals arise in important matters, sector interests will often take priority over climate targets.

The Ministry of the Environment expects sector ministries to be familiar with climate policy targets and to highlight the consequences for emissions of various proposals from the ministries. According to the Ministry, the sector ministries cannot be said to follow this up. In the Ministry of the Environment's view, a better management tool is now available in the form of the climate targets stipulated in the Climate Settlement.

The Ministry also points out that it may represent a challenge to its role as a driving force that ministries place different emphasis on the purpose of policy instruments. For example, the Ministry of Petroleum and Energy regards Enova as a policy instrument for security of supply, while the Ministry of the Environment also regards it as a climate-related policy instrument.

Many small changes can add up to large increases in emissions, and it is more difficult to deal with and assess this when targets are not quantified.

The Ministry of the Environment also stresses that this is a challenge. All sector ministries stated in interviews that they now see the Ministry of the Environment as a driving force in climate policy work.

8.7 Evaluations

The Ministry of the Environment has a particular responsibility for the Government's environmental policy, and is responsible for coordinating the Government's climate policy targets and ensuring performance monitoring in the climate policy context.[532] The Ministry is tasked with initiating, developing and implementing measures using policy instruments at its disposal, but it shall also act as a driving force in relation to various national sector authorities.

Climate is a cross-sector policy area, and a number of ministries are responsible for sectors that emit greenhouse gases. Policy instruments are spread across many ministries, and the ministry responsible for the target is not always the ministry responsible for the policy instruments. The investigation also shows that it is unclear what responsibility each ministry has for ensuring that climate targets are achieved and policy instruments utilised to reduce greenhouse gas emissions. Since sector targets were stipulated, opinions differ as to whether it is the sector ministries or the government as a whole that is responsible for the sector targets being achieved. Unclear roles and responsibilities entail a risk that targets will not be followed up and that sufficient policy instruments will not be implemented in efforts to achieve the climate targets.

The Ministry of the Environment has exercised its role as coordinator and driving force through its work on reports and through bilateral contact with the sector ministries. Interministerial groups have been established in connection with reports, among other things. The only interministerial group at civil servant level that has existed for any length of time, KLISUR, worked very little on national climate policy during the period from 1998 until it was discontinued in 2007. According to the Ministry of the Environment, much of the follow-up work is done by specialist departments, but the investigation shows that this work has only been documented to a very limited extent. It is therefore difficult to evaluate whether the Ministry of the Environment has carried out its role as a driving force in the field of climate systematically over time. The lack of documentation of this work could make it difficult to ensure access to and verify decision-making processes. It could also be an obstacle to good management and performance monitoring.

The investigation shows that the Ministry of the Environment faces considerable challenges in the form of strong sector interests in its execution of its role as a driving force. The ministries have differing views about whether a cross-sectoral approach is sufficient, or whether sector-specific issues must also be emphasised. Among other things, these differences are expressed through divergent views on the need for sectoral mitigation analyses and projections, and the extent to which sector-specific policy instruments should be used. Disagreements between the ministries have made it challenging for the Ministry of the Environment to promote the introduction of effective policy instruments in the sectors. Moreover, the field is characterised by conflicts of goals that could entail a risk of long-term climate targets not being achieved.

The investigation shows certain weaknesses in management information relating to the national target for 2020 and the sector targets. The sector projections have not been highlighted in Reports to the Storting, not even in Report No 34 to the Storting (2006–2007), in which the sector targets were stipulated. It is unclear what emission developments are expected in the sectors, and this represents a challenge in relation to performance monitoring and verifiability. Moreover, the 2020 targets are based on a baseline scenario. Monitoring of the national targets will therefore require the effect of implemented measures to be registered in retrospect both at the national level and at sector level. The investigation shows that this will be very methodologically demanding because it is difficult in retrospect to distinguish changes in emissions that are the results of measures from the effect of, for example, business cycle fluctuations. This means that the presentation of the effects of measures will be uncertain and difficult to verify. There has been no systematic reporting of the effects of policy instruments since the Storting endorsed the targets.

532) Proposition No 1 to the Storting (2007–2008) *The Ministry of the Environment.*

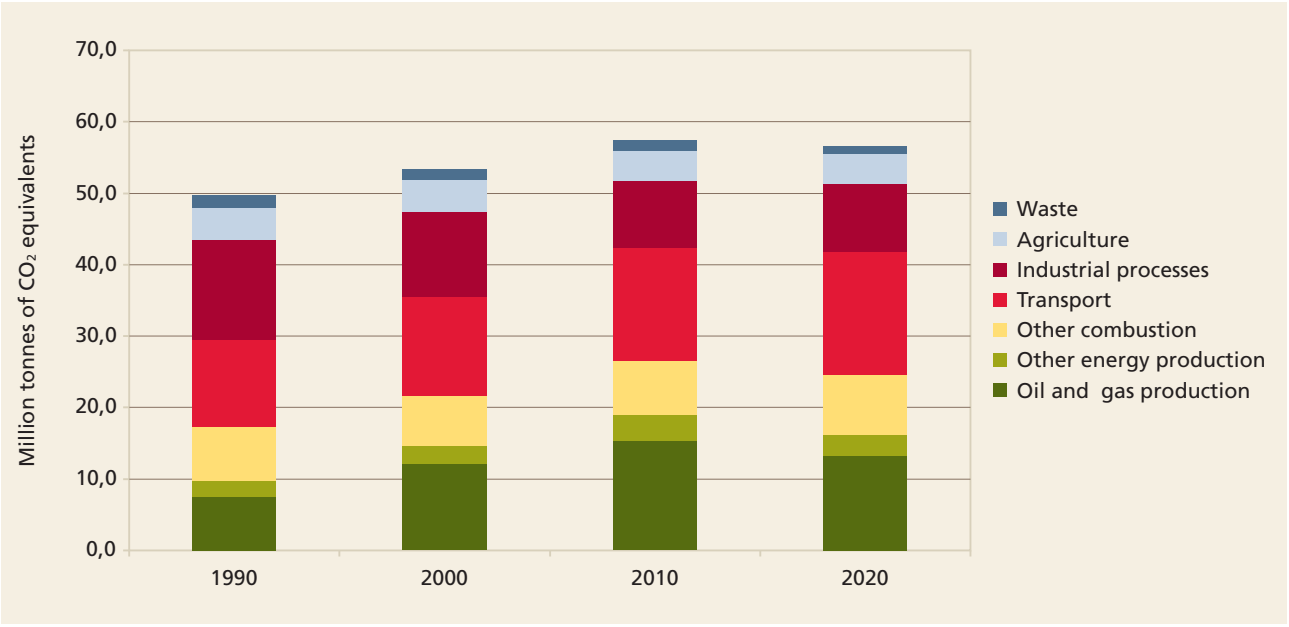
9 Will Norway reach its national climate targets and meet its Kyoto commitments?

The national climate policy targets are to strengthen Norway's commitments under the Kyoto Protocol for the period 2008–2012 and the more long-term climate targets for 2020 and 2030 set through the Storting's consideration of Report No 34 to the Storting (2006–2007). As described above, the climate policy targets can be reached through domestic emission reductions combined with use of the flexible mechanisms.

9.1 What will the Norwegian emission levels be in 2010 and 2020?

Figure 9.1 shows the estimated greenhouse gas emissions until 2020 based on emission projections. Greenhouse gas emissions are estimated to be 57.3 million tonnes of CO_2 equivalents in 2010 and 56.5 million tonnes of CO_2 equivalents in 2020 unless further measures are implemented.[533] This baseline scenario for 2020 has been changed in relation to the scenario presented in the Climate Report[534] in which emissions were estimated at 58.9 and 58.8 million tonnes of CO_2 equivalents in 2010 and 2020, respectively.[535] According to Report No 9 to the Storting (2008–2009), the changes in the baseline scenario for 2020 can partly be explained by changes in the assumptions on which it is based (including a significantly higher oil price).[536] According to the Ministry of Finance, it can nonetheless be assumed that the measures implemented in recent years have helped to reduce emissions, but that this reduction cannot be quantified.[537]

Figure 9.1 Greenhouse gas emissions by sector in 1990 and 2000, and projections for 2010 and 2020



Source: E-mail from the Norwegian Pollution Control Authority, 3 April 2009 and Statistics Norway

533) Report No 9 to the Storting (2008–2009) *Long-term Perspectives for the Norwegian Economy* and Report No 1 to the Storting (2009–2010) *The National Budget 2010*.
534) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
535) See chapter 8 for an explanation of the baseline scenario and emission projections and a description of elements of uncertainty relating to them.
536) New population projections and projections of emissions from petroleum activities indicate that the emissions will be higher. However, these projections are based on a considerably higher long-term oil price, which would result in lower emissions from road traffic and the use of fuel oil, among other things. Moreover, somewhat lower emission levels have been assumed for power-intensive industry and power production.
537) Letter of 12 March 2009 from the Ministry of Finance.

Table 9.1 The effect of national policy instruments implemented since 1990 (in million tonnes of CO_2 equivalents)

	1995	2000	2005	2010
Climate-specific policy instruments				
Offshore carbon tax (cf. section 6.2)	0.6	3.0	3.0	3.7
Carbon tax for stationary onshore sources (cf. section 4.3)		0.8	0.8	0.8
Requirement for the collection of landfill gases (cf. section 4.5)	0.25	0.4	0.5	0.6
Other policy instruments in the waste sector (cf. section 4.3)		0.07	0.25	0.55
HFC tax and recycling (cf. section 4.3)			0.3	0.5
Agreement with the aluminium industry (cf. section 6.6)[a]	0–1.6	0.6–3.0	1.4–4.0	1.4–4.1
SF_6 reduction agreement (cf. section 6.6)			0.06	0.06
Understanding with the process industry (cf. section 6.6)				0.6
The emissions trading scheme (cf. 4.4).			0–0.5	0–0.5
Regulation of NMVOC emissions[b]		0.01	0.22	0.24
Voluntary reductions				
SF_6 from magnesium production[c]	1.0	1.4	0.5	0.5
N_2O from production of nitric acid	0.4	0.3	0.3	0.3
Use of biocarbon in cement production		0.02	0.1	0.1
Total emission reductions (excl. voluntary reductions and NMVOC)	**0.85–2.5**	**4.9–7.3**	**6.3–9.4**	**8.2–11.4**
Total emission reductions (incl. voluntary reductions and NMVOC)	**2.3–3.9**	**6.6–9.0**	**7.4–10.5**	**9.3–12.4**

a The lower figures reflect the direct effects of the agreement, while the higher figures include measures implemented before the agreement was entered into in 1997.

b This is not a gas with a direct effect on the climate. However, reduced emissions of NMVOC (hydrocarbons) indirectly help to reduce emissions of CO_2. NMVOC are regulated pursuant to the Pollution Control Act.

c The effect of production closures is not included.

Source: Report No 34 to the Storting (2006-2007) *Norwegian Climate Policy;* Norway's reporting to the United Nations Framework Convention on Climate Change *National Communications from Annex I Parties;* memo from the Norwegian Pollution Control Authority to the Ministry of the Environment of 19 October 2005

The projections show continued growth in emissions from the transport sector until 2020, but emissions from oil and gas production are expected to decrease between 2010 and 2020.[538] Only minor changes are expected in other sectors (< 0.5 million tonnes increase or decrease). The Norwegian Pollution Control Authority stated in an interview that reaching the Climate Settlement targets will be a challenge. According to the Norwegian Pollution Control Authority, the most important risk factor is the willingness to implement sufficiently effective policy instruments at an early date.

9.2 What effect do the adopted policy instruments have on national emissions?

Table 9.1 shows how much higher greenhouse gas emissions would have been if the different policy instruments had not been implemented. The Ministry of the Environment stated that possible effects of energy and transport policy instruments on greenhouse gas emissions have not been quantified. Sections 4.3 and 6.7, however, show that, seen in isolation, the carbon tax has had little effect on greenhouse gas emissions in the transport and communications sector. The 2008 emissions trading scheme's effect on national emissions is uncertain and has not been quantified (see section 4.4), and it is therefore not included in the table. Nor are other measures implemented since 2007 included in the table, as data for these measures are incomplete or lacking.[539] In an interview, the Norwegian Pollution Control Authority pointed out that the presentation in this table does not include the effect of measures that have contributed to increasing greenhouse gas emissions. The Ministry of the Environment states that, generally speaking, it is difficult to assess whether measures would have been implemented irrespective of the implementation of policy instruments.

Table 9.1 shows that the effect of domestic policy instruments implemented since 1990 totals about

538) However, more recent projections from the Petroleum Directorate *(Facts 2009 – The Norwegian petroleum sector)* shows that the emissions from this sector will not peak until 2019, see section 6.2.

539) According to a letter of 12 March 2009 from the Ministry of Finance, the projections do not provide a basis for presenting the isolated contribution of new measures after Report No 34 to the Storting 2006–2007) *Norwegian Climate Policy* was submitted.

eight million tonnes per year in 2010, if only direct regulation is included in the figures. If we include voluntary reductions, the regulation of volatile organic compounds (NMVOC) and reductions made before the policy instruments were adopted, the estimate increases to 12.4 million tonnes. The fifth Norwegian National Communication to the Climate Convention of January 2010 estimated the effect in 2010 of policy instruments to be 8.8–12.2 million tonnes of CO_2 equivalents (including voluntary reductions and NMVOC measures). The effect of policy instruments not included in the Climate Report baseline scenario amounts to 0.2–0.5 million tonnes of CO_2 equivalents. The most effective policy instruments were the offshore carbon tax and the agreement with the aluminium industry.

9.3 What is the Norwegian allowance requirement for fulfilment of the Kyoto Protocol?

A review of climate policy reports and budget propositions from before 2007 does not reveal any concrete plans for the fulfilment of Norway's Kyoto Protocol commitments for the period 2008–2012, neither in terms of the reductions to be achieved through domestic policy instruments nor in terms of the need to buy emission allowances.

The Ministry of the Environment states that no complete plan for Norway's fulfilment of its emissions commitments under the Kyoto Protocol existed before 2007. In 2007, decisions were made regarding the scope and total amount of allowances in the emissions trading scheme, and this in practice determines the extent to which the emissions trading scheme will help Norway to meet its emissions commitments. A more extensive budget for the state allowance purchasing programme was also adopted in 2007. Together with the domestic measures, this can ensure that Norway secures enough emission allowances to meet its emission commitment, and probably also reach the target of strengthening the commitment by 10 per cent as stipulated in connection with the Climate Settlement.

Responsibility for the purchase of allowances in order to fulfil the Kyoto Protocol has been assigned to Norwegian enterprises subject to a duty to surrender allowances pursuant to the revised Greenhouse Gas Emission Trading Act[540] and to the Norwegian State pursuant to the Ministry of Finance's mandate.[541] The division of responsibility between the enterprises and the State is decided by the Ministry of the Environment within the framework of the revised Greenhouse Gas Emission Trading Act (the allocation plan).[542]

Table 9.2 presents the State and the enterprises' allowance requirements under the emissions trading scheme. The amount of allowances required to fulfil the Kyoto Protocol is determined by how much Norwegian emissions in 2010 exceed the emissions allowance stipulated for Norway under the Protocol.[543] This results in a total national allowance requirement of just under six million tonnes (7.2 million tonnes if credits from net removals by existing forest areas are not included).

Total allowances in the national emissions trading scheme have been set at approximately 15.0 million tonnes per year. Projections estimate that emissions from enterprises subject to a duty to surrender allowances will total 22 million tonnes in 2010.[544] Emissions in excess of allowances must be compensated, either by purchasing allowances in the European emissions trading scheme or by using the Clean Development Mechanism or Joint Implementation. The difference between the total allowances and the actual emissions will thus help to achieve Norway's climate targets. Unless further measures are implemented, this difference will total about 7.0 million tonnes. If the enterprises reduce their emissions more than projected, the enterprises' need to purchase allowances will be reduced.

Table 9.2 shows that, should this situation arise, the State will not need to purchase allowances to meet its Kyoto commitment, but will have surplus allowances. This is because enterprises participating in the emissions trading scheme are expected to surrender a sufficient number of allowances to meet the Kyoto commitment. The State is also responsible for the purchase of allowances to achieve the goal of strengthening

540) Proposition No 19 to the Odelsting (2008–2009) *Om lov om endringer i klimakvoteloven m.m.* ('*On the Act relating to amendment of the Greenhouse Gas Emission Trading Act* ').
541) Report No 2 to the Storting (2006–2007) *The revised National Budget 2007*.
542) The Ministry of the Environment's regulations of 25 March 2009.
543) In addition, Norway will be credited for net removals in existing forest areas in accordance with article 3.4 of the Kyoto Protocol, limited to maximum 1.5 million tonnes per year in the period 2008–2012.
544) Report No 1 to the Storting (2009–2010) *The National Budget 2010*.

Table 9.2 Overview of the allowance requirements needed to fulfil and strengthen the Kyoto Protocol commitment (in million tonnes of CO_2 equivalents or credits)

	Per year (average)	For the period 2008–2012	Source
Domestic allowance requirement			
Emissions without further measures	57.3	286.5	Long-term Perspectives for the Norwegian Economy
- Norway's emission allowance under the Kyoto Protocol	50.1	250.5	The United Nations Framework Convention on Climate Change
- Credits from forest measures (articles 3.3 and 3.4)	1.5	7.5	Annex to the Kyoto Protocol
A) Assumed national allowance requirement to strengthen the Protocol ommitment	5.7 (7.2 excl. forest)	28.5	Emissions with no further measures, minus Norway's emission allowance and credits from forest measures
The allowance requirement of enterprises subject to a duty to surrender allowances			
Total allowances in the emissions trading scheme	15.0	75.0	Press release from the Ministry of the Environment, 25 March 2009.
- Emissions from enterprises subject to a duty to surrender allowances without further measures	22.0	110	The Ministry of the Environment
B) Assumed allowance requirements, sector subject to a duty to surrender allowances	7.0	35	The difference between emissions from enterprises subject to a duty to surrender allowances and the total allowances in the emissions trading scheme
The State's allowance requirement to fulfil the Kyoto Protocol	0 (surplus: 1.3)	0 (surplus: 6.5)	The difference between A (allowance requirement to fulfil the Protocol) and B (allowance requirement, sector subject to a duty to surrender allowances)
+ The State's need for allowances to strengthen the Kyoto Protocol commitment incl. forest	6.5	32.5	Proposition No 1 to the Storting (2008-2009) The Ministry of Finance.
= Total state purchase requirement	5.2	26	

the Protocol commitment. The allowances required to strengthen the Protocol commitment by ten percentage points correspond to five million tonnes per year. In addition, an objective has been defined of purchasing allowances in order to refrain from using credits allocated to Norway for net removals in existing forest areas pursuant to article 3.4. This corresponds to 1.5 million tonnes per year.[545] This results in a total state purchase requirement of approx. 5.2 million tonnes per year (or approx. 26 million tonnes in total).

9.4 How large is the State's allowance surplus for the period 2008–2012?

The Norwegian allocation plan means that the Norwegian State will be left with about 6.3 million allowances.[546] This surplus is the result of the ratio between the total allowances in the emissions trading scheme and the allocation of free allowances. As long as the total number of allowances exceeds the number allocated free of charge, the State will be left with some allowances. These allowances will be sold in the European emissions trading market.[547] The allocation plan means the loss of State revenues in the form of carbon tax, but the sale of allowances will raise about NOK 825 million per year.[548] The sale of allowances will also increase the State's need to purchase credits through the Kyoto mechanisms, cf. table 9.2.

The Ministry of Finance stated in an interview that the assumption is that the State will participate in the development of the Clean Development Mechanism market as well as the EU emissions trading scheme. Norway will sell almost half its allowances in the market and, according to the Ministry of Finance, this is seen as a contribution to demonstrating the positive effects of sales. The price difference between EU allowances and credits from the Clean Development Mechanism

545) Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy* and Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance.*

546) Report No 1 to the Storting (2009–2010) *The National Budget 2010.*

547) Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* ('*On the Act relating to changes in the Greenhouse Gas Emission Trading Act etc.* ').

548) Proposition No 1 to the Storting (2009–2010) *The Ministry of Finance.*

Photo: Jens Sølvberg / Samfoto

will result in net income for the State of around NOK 126 million per year.[549] The Ministry of Finance stated in an interview that the amount of allowances that Norway sells in the EU market is unlikely to have a significant impact on the allowance price in the EU emissions trading scheme.[550]

9.5 What is the status of allowance purchases?

Through the Greenhouse Gas Emission Trading Regulations,[551] the Norwegian Pollution Control Authority was assigned responsibility for checking that enterprises surrender allowances in accordance with their actual emissions. In 2009, the authority carried out a control of the allowance settlement for 2008. The Norwegian Pollution Control Authority's website shows that 112 out of 113 enterprises complied with their duty to surrender allowances.[552] The enterprises primarily used EU allowances to settle this obligation (19.1 million of a total of 19.23 million). However, the right to use credits from the Clean Development Mechanism can be banked for later use.

In the 2009 budget, the Ministry of Finance was authorised to enter into allowance contracts worth up to NOK 6.3 billion.[553] The status of state allowance purchases is summarised in table 5.1. This table shows that purchase contracts have been signed for approximately 11 million emission allowances, and that more than nine million of them are to be delivered during the period 2008–2012. The table also shows that most of the contracts entered into involve early-phase projects. Since Norway's policy is that allowances are primarily paid on delivery, the amounts disbursed so far have been small compared with the funds allocated for the purchase of allowances (NOK 873,000 in 2007 and NOK 4.7 million in 2008).

The Ministry of Finance stated in an interview that the actual delivery of allowances will be less than the contractual volume.[554] There is uncertainty relating to whether projects in an early phase will

549) Assuming an allowance price of NOK 130 per tonne for sales and NOK 110 per tonne for purchases (excl. VAT), Proposition No 1 to the Storting (2009–2010) *The Ministry of Finance*.

550) See also Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* (*'On the Act relating to amendment of the Greenhouse Gas Emission Trading Act etc.'*).

551) Regulations relating to greenhouse gas emission allowance trading and the duty to surrender emission allowances (Greenhouse Gas Emission Trading Regulations), Regulations No 1851 of 23 December 2004/ Regulations No 350 of 24 March 2009.

552) 112 av 113 virksomheter overholdt kvoteplikten *('112 of 113 enterprises complied with their duty to surrender allowances')*. Article from the Norwegian Pollution Control Authority, 11 May 2009.

553) Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance*.

554) Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance*.

be approved as projects by the CDM Executive Board under the United Nations Framework Convention on Climate Change. Even if a project is approved, the actual delivery of allowances could be lower if the project is delayed, is not implemented or proves to be less effective than expected. The Ministry of Finance expects a delivery rate of 70 per cent after contracts are signed.[555] This figure was confirmed in a study carried out by Econ Pöyry on behalf of the Office of the Auditor General.[556]

The Ministry of Finance stated in an interview that it sees no great risk of a shortage of allowances in 2012, but that the price will depend on the amount of allowances available in the scheme. A comparison carried out by UNEP Risø shows that the numbers of approved projects, applications for registration and allowance deliveries is increasing steadily, even though the number of allowances delivered so far is low.[557] Proposition No 1 to the Storting (2009–2010) from the Ministry of Finance assumes that it may be an option to purchase guaranteed allowances in the secondary market. The secondary market trades in allowances already issued. The price of such allowances will be higher than when contracts are entered into with early-phase projects, see figure 4.4.

9.6 Flexible implementation of the climate policy

The Ministry of the Environment states that the possibility of using the Kyoto mechanisms, including the Clean Development Mechanism, was a prerequisite for Norway's acceptance of the emission commitments under the Kyoto Protocol.

Estimates made before Norway ratified the Kyoto Protocol show that it would cost about three times as much to meet Norway's commitments through domestic measures alone as by using flexible implementation.[558] It was calculated that the total reduction requirement would be 12.3 million tonnes of CO_2 equivalents in relation to the baseline scenario in 2010. It was deemed to be profitable for Norway to reduce domestic emissions by around five million tonnes and fulfil the remainder of its commitments through allowance purchases and measures abroad.

555) Proposition No 1 to the Storting (2008–2009) *The Ministry of Finance*.
556) Econ Pöyry (2009): CDM – *Styrker og svakheter ('CDM – Strengths and weaknesses')*, Econ Pöyry Report 2009-038.
557) http://cdmpipeline.org.
558) Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*.

Subsequently, the costs of meeting Norway's Kyoto commitment were calculated to be higher.[559] This was due to changes in the calculation basis, but also to increased restructuring costs because there was less time until the commitments had to be met. The Quota Commission estimated that if Norway were to refrain from using the mechanism, that would result in the closure of a considerable proportion of the refining, carbide, ammonia and cement industries.[560] Flexible implementation reduces the restructuring costs and the risk of carbon leakages (i.e. increased emissions in other countries as a result of reduced emissions in Norway).

The Ministry of Finance has pointed out that it is difficult to produce precise estimates of costs relating to emission-reducing measures in Norway, but that model calculations carried out by the Ministry indicate that the costs of large domestic emission reductions could be considerable (a reduction of 10 million tonnes in 2020 will result in annual costs corresponding to NOK 16 billion).[561] On the other hand, the Low Emission Commission studied ways in which Norway can achieve a significant reduction in domestic greenhouse gas emissions up to 2050, and concluded that emissions in Norway can be reduced considerably without major cost to society.[562]

Table 9.3 Expected use of the Kyoto mechanism in selected countries

	Expected use of the Kyoto mechanism (million tonnes of CO_2)	Expected use of the mechanism in relation to 1990 emissions (in per cent)
Denmark	4.2	6.1
EU-15	126.5	3.0
Finland	1.4	2.0
Ireland	3.6	6.5
The Netherlands	13.0	8.4
Norway	6.9	14.0
Portugal	5.8	9.6
Spain	57.8	19.9
Switzerland	1.6	3.0
Sweden	0.0	0.0
Austria	9.0	11.4

Source: The European Environment Agency

559) Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy*.
560) NOU 2000:1 *A Quota System for Greenhouse Gases – A policy instrument for fulfilling Norway's emission reduction commitments under the Kyoto Protocol*.
561) Letter of 15 June 2007 from the Ministry of Finance to the Ministry of the Environment.
562) NOU 2006:18 *A climate-friendly Norway*.

Table 9.3 shows the allowance requirements of a selection of other European countries. The table shows that Norway is among the countries most dependent on using the mechanisms seen in relation to the size of domestic emission levels in 1990. Norway's allowance requirement is 14 per cent of its 1990 emissions.[563] By comparison, the EU-15 average is three per cent, Denmark's requirement is six per cent, Finland's two per cent and Sweden's allowance requirement is very low.

9.7 Evaluations

9.7.1 Uncertainty relating to strengthening of the Kyoto Protocol commitment

Through the Kyoto Protocol, Norway has undertaken to limit its average greenhouse gas emissions during the period 2008–2012 to one per cent more than the 1990 level. The Storting has endorsed the goal that Norway shall strengthen its Kyoto Protocol emission commitment by 10 percentage points. This strengthening will be achieved through allowance purchases in other countries, primarily developing countries. Greenhouse gas emissions increased by 8.4 per cent from 1990 to 2008, and in 2008 emissions totalled 53.8 million tonnes of CO_2 equivalents. This means that, unless more measures are implemented to reduce greenhouse gas emissions, Norway will need allowances for about 5.7 million tonnes per year in order to meet its commitments under the Protocol.

Responsibility for the purchase of allowances to fulfil the Kyoto Protocol commitment has been assigned to Norwegian enterprises subject to a duty to surrender allowances pursuant to the revised Greenhouse Gas Emission Trading Act and to the Norwegian State pursuant to the Ministry of Finance's mandate. As a result of the delay in the work on designing the emissions trading scheme for the period 2008–2012, the Norwegian plan for the fulfilment of the country's Kyoto Protocol commitments for the period 2008–2012 was not finalised until late in 2007. That was when the framework for the total allowances in the emissions trading scheme was stipulated.

The enterprises participating in the emissions trading scheme surrendered the required number of allowances to the State in 2009 as settlement for their emissions in 2008. In the event of problems with the enterprises' allowance settlements in the period 2009–2012, state allowance purchases intended to strengthen the Protocol commitment will help to ensure that Norway has the allowances needed to meet its commitments. Funds have been allocated over the national budget or contingent authorisations granted to meet the allowance requirement required to strengthen the Protocol commitment, provided that the allowance price does not rise significantly.

As of 1 October 2009, the Norwegian State had signed contracts for the delivery of just over nine million allowances for the period 2008–2012. At an assumed delivery rate of 70 per cent, this corresponds to about 25 per cent of the purchase requirement for strengthening the Protocol commitment. The investigation shows that credits generated by the Clean Development Mechanism are steadily increasing, and the Norwegian authorities see no great risk of a shortage of allowances in 2012. However, the Norwegian authorities were slow to start their allowance purchases, and most of the contracts entered into are related to projects in an early phase. This means that there is uncertainty relating to actual deliveries in 2012 from contracts that have already been signed. It is therefore uncertain whether Norway will achieve the target of strengthening the Protocol commitment by 2012 by entering into contracts with projects for future delivery of allowances. The target can, however, be achieved through purchases in the secondary market, but the price in this market will be higher.

9.7.2 Norway has helped to reduce emissions at home, but needs to purchase allowances

The investigation shows that using the flexible mechanisms reduces the cost of meeting the Kyoto Protocol commitment. The Parties to the Kyoto Protocol have decided that use of the flexible mechanisms should come in addition to national measures, and that national measures should account for a significant part of target achievement. It has not been stipulated how great a proportion national measures should account for in relation to use of the flexible mechanisms. This means that there is no national target for greenhouse gas emissions for the period 2008–2012. However, the majority of the Standing Committee on Energy and the Environment stated that it is important that Norway meets a considerable proportion of its commitments through national measures. The investigation

563) The Norwegian allowance requirement assumed in this report is somewhat greater than the more recent figures on which table 9.2 is based.

shows that emissions in 2010 would have been at least eight million tonnes of CO_2 equivalents higher if the policy instruments had not been implemented after 1990. The effect of the implemented policy instruments is uncertain, but it probably exceeds Norway's need to purchase allowances from other countries in order to meet the country's commitments under the Protocol. At the same time, however, greenhouse gas emissions have increased and are expected to keep increasing until 2010, and national policy instruments have only helped to curb the growth, not reverse the trend.

9.7.3 Continued growth in emissions until 2020

The Ministry of Finance's most recent projections indicate that Norwegian greenhouse gas emissions will continue to increase given the current use of policy instruments, and that emissions will have reached 56.5 million tonnes of CO_2 equivalents in 2020. This is an increase of five per cent compared with 2008. The national target is to reduce Norwegian emissions by 15–17 million tonnes of CO_2 equivalents compared with the baseline scenario presented in the national budget for 2007. The baseline scenario has been revised since this target was adopted. However, the authorities have not quantified the expected effect of new policy instruments adopted since 2007, such as the voluntary agreement with the process industry, the inclusion of nitrous oxide in the emissions trading scheme and the change in registration tax for passenger cars. This target involves considerably greater annual reductions in national emissions compared with the baseline scenario than have been achieved so far, and indicates that further policy instruments are required.

10 Overall evaluations

The global average temperature has increased since the middle of the 20th century. According to the most recent report from the UN Intergovernmental Panel on Climate Change, it is highly probable that this is caused by anthropogenic greenhouse gas emissions. The report concludes that lacking or delayed implementation of emissions-reducing measures will have major economic, biological and social consequences. Large global emission cuts are necessary to avoid significant climate change. Accordingly, Norway has signed the United Nations Framework Convention on Climate Change and the Kyoto Protocol, and also set a national target of strengthening its Kyoto Protocol commitment by 10 percentage points.

In the Climate Settlement in the Storting it was decided that Norway, in the period up until 2020, was to commit itself to cutting global emissions of greenhouse gases by an amount corresponding to 30 per cent of Norwegian emissions in 1990. Report No 34 to the Storting (2006–2007) and the Climate Settlement in the Storting state that it is a realistic goal to reduce emissions *in Norway* by 15–17 million tonnes of CO_2 equivalents compared with the baseline scenario as presented in the national budget for 2007. That means that the reduction will be seen in relation to the expected emissions given the current policy. In its consideration of Report No 29 to the Storting (1997–98) *Norges oppfølging av Kyoto-protokollen ('Norwegian follow-up of the Kyoto Protocol')*, the Standing Committee on Energy and the Environment emphasised the importance of Norway meeting a considerable proportion of its commitments through domestic measures, among other things in order to avoid far greater restructuring costs at a later date, when we will probably face even stricter emission commitments.

10.1 The Kyoto target will probably be reached as a result of enterprises buying allowances

Through the Kyoto Protocol, Norway has committed itself to limiting its total greenhouse gas emissions to one per cent above the 1990 level during the commitment period, which runs from 2008 to 2012. The investigation shows that Norwegian greenhouse gas emissions increased by 8.4 per cent from 1990 to 2008, and that the annual growth was higher before 1999 than during the past ten years. Pursuant to the Kyoto Protocol regulations, however, the purchase of credits via the flexible mechanisms can compensate for increased emissions. Norwegian enterprises' purchases of allowances in the European emissions trading scheme will probably secure sufficient allowances to meet Norway's commitment under the Protocol. If this should prove to be insufficient, allowance purchases by the state will provide added security. It is therefore probable that Norway will meet its commitment under the Kyoto Protocol.

The investigation shows that there is uncertainty relating to the Climate Settlement target of strengthening the Kyoto Protocol commitment by ten percentage points by 2012. Norway was slow to start its allowance purchases and has limited experience, and it will remain uncertain for a long time whether projects with which contracts have been signed will deliver the expected amount of allowances. It is possible, however, to purchase allowances in the secondary market. This gives greater security for the delivery of a sufficient number of allowances, but it is also considerably more expensive than purchasing credits from projects at an early stage.

10.2 The use of national policy instruments has failed to reverse the trend of increasing greenhouse gas emissions

Domestic measures shall account for a significant part of target achievement, and use of the flexible mechanisms shall come in addition to national measures. The investigation shows that Norwegian greenhouse gas emissions in 2010 would have been at least eight million tonnes higher in the absence of national policy instruments, while the Norwegian allowance requirement needed to meet the Kyoto commitment will be about six million tonnes per year. National greenhouse gas emissions have strongly increased, particularly in the petroleum and transport sectors. The most recent projections from the Ministry of Finance indicate that emissions in 2010 will be the highest since 1990. There is reason to point out

that the national policy instruments that have been implemented have only helped to curb emissions growth, not reverse the trend of growing emissions. A risk of increased restructuring costs in connection with long-term climate goals is one consequence of this.

10.3 Limited contribution from cross-sectoral policy instruments outside the petroleum sector

Cross-sectoral policy instruments have been based on the principle of cost-effectiveness, i.e. that the policy instruments trigger measures that result in the greatest possible reduction of emissions from the resources invested. Two cross-sectoral policy instruments, carbon tax and the emissions trading scheme, have been key elements in Norway's climate policy. The carbon tax has been a long-term policy instrument, and the investigation shows that the tax has triggered many emissions-reducing measures, primarily in the petroleum sector, where the tax level has been consistently high. The tax provides financial incentives for taking the climate into consideration when making investment decisions. Today, there are fewer remaining measures that can be implemented in relation to existing activities on the continental shelf for which the costs are equal to or lower than the total cost of allowances and taxes. The design of the tax has resulted in it having only a relatively small effect on total greenhouse gas emissions from emission sources in mainland Norway. Regulation via the emissions trading system has gradually replaced taxes in several sectors. At the current allowance price, this provides weaker incentives for implementation of national measures for most sectors than the tax did.

Effectiveness means that a policy instrument should lead to targets being achieved with the highest possible degree of certainty. The Pollution Control Act is seen as an effective policy instrument. By stipulating conditions for emission permits, the environmental authorities can regulate emission levels, compliance with the principle of use of the best available techniques and set specific requirements relating to technology. In accordance with the Storting's intention of avoiding double regulation, the Pollution Control Act has been little applied in areas where other policy instruments have been available. However, the Act has been effectively applied in the waste sector and to stipulate requirements for carbon capture and storage for gas-fired power plants.

10.4 Work on the emissions trading scheme has taken time

Norwegian enterprises' right to trade with enterprises in other countries through the EU emissions trading scheme is intended to contribute to more cost-effective implementation of the climate policy. The investigation showed that Norway was not affiliated to the EU emissions trading scheme until 2009. One of the reasons for this is that it remained unclear for quite some time whether the EU Emissions Trading Directive had to be incorporated into the EEA Agreement. Disagreement between Norway and the EU meant that it was not until 2007 that a final decision was made to incorporate the directive into the EEA Agreement.

The authorities have also taken a long time to clarify the allocation rules for the period 2008–2012. The Norwegian allocation plan for allowances was initially not approved by ESA, among other things because the definition of 'new entrants' conflicted with the definition in the directive. This meant that the Storting had to reconsider the Greenhouse Gas Emission Trading Act. The consequence of this was that a preliminary plan for how Norway was to meet its commitments under the Kyoto Protocol was not finalised until late 2007. There was also uncertainty relating to the allocation of allowances to individual enterprises, and the issue was not finally clarified until 2009.

10.5 Inadequate exercise of sector responsibility

The sector authorities are responsible for maintaining an overview of the environmental impact of activities in their sector and for initiating and implementing measures in their own fields. Environmental work in the individual sectors must be carried out in accordance with the national goals for such work set by the Storting and the Government.

The investigation shows that emissions from the petroleum sector and the transport sector increased by 90 and 36 per cent, respectively, from 1990 to 2007. Emissions from these sectors accounted for 26 and 30 percent, respectively, of total greenhouse gas emissions in 2007. Emissions from agriculture have remained relatively stable throughout the period and account for nine per cent of greenhouse gas emissions. Emissions from industry were reduced by 25 per cent from

1990 to 2007 and accounted for 26 per cent of total greenhouse gas emissions in 2007.

The investigation shows that only to a small extent, or not at all, have sector ministries operationalised climate goals through working targets and specification of the use of policy instruments in their own sectors. The sector ministries have largely failed to give specific management signals to subordinate agencies regarding climate targets. There has been a positive development, however, in management signals from 2008 onwards.

The investigation also shows that policy instruments capable of triggering climate-oriented measures in the sectors have been applied to a varying extent, and that a number of targets that can help to reduce greenhouse gas emissions will probably not be achieved. The sector ministries largely emphasise the current tax level/carbon price as the defining factor when deciding which measures are deemed to be cost-effective, and it appears that these assessments fail to take the expected increase in carbon price into consideration. There is reason to question whether uncertainty relating to costs and what can be deemed to be cost-effective has been an obstacle to the implementation of policy instruments in the sectors. Nor do considerations of effectiveness relating to long-term climate goals appear to have played a major part in assessments. Taken together, this gives grounds for questioning whether sector responsibilities in climate policy are adequately exercised.

10.5.1 The petroleum sector does not consider emission-reducing solutions to a sufficient extent

The investigation shows that emissions from the petroleum sector are expected to increase until 2020. Emissions per produced unit have increased in recent years due to the fact that the continental shelf has become more mature. Based on the developer's and the authorities' overall assessments of other regulation, the most important long-term conditions for emission-reducing solutions for individual installations are decided through the preparation of plans for development and operations (PDO).

The investigation shows that the documentation made available provides little evidence that the petroleum authorities require the developer to use emissions-reducing technology solutions. Few fields have been electrified, and the petroleum authorities primarily emphasise profitability considerations and security of supply based on the companies' own assessments in their case processing. There is reason to question whether the reduction potential of alternative solutions has been sufficiently highlighted in PDO documents. This makes it difficult to evaluate whether sufficient account has been taken of the emissions-reduction considerations.

10.5.2 Inadequate target achievement in the energy sector

Increased use of renewable energy and less total use of energy have indirect effects on greenhouse gas emissions. The availability of emission-free power is also a precondition for the electrification of the continental shelf and other sources. Among other things, the targets for increased production of renewable energy are to be achieved by means of Enova's support schemes, but insufficient profitability entails a risk that planned projects may not be realised. Two adopted support schemes, including green certificates, have not been implemented. This has resulted in uncertain framework conditions for producers of renewable energy. There has also been insufficient licence processing capacity at the Norwegian Water Resources and Energy Directorate. The fact that the wind power target will not be reached means that the targets for heat and energy efficiency, quantified in Enova's total target of 18 TWh, have indirectly been increased. This illustrates how a lack of target achievement in one field of the energy sector can affect target achievement in another field. The risk of targets not being achieved in the energy sector also constitutes a considerable risk as regards long-term climate targets.

10.5.3 Growth in road traffic – freight a special challenge

The investigation shows that freight transport has increased more than passenger transport, and this trend is expected to continue until 2020. At the same time, the Ministry of Transport and Communications' efforts to transfer a greater proportion of freight transport from road to rail has not yielded satisfactory results. It can therefore be questioned whether sufficient importance has been attached to the development and implementation of policy instruments in relation to freight transport.

There has been a certain improvement in energy efficiency in the transport sector, so that vehicles now use less fuel per kilometre, but this has not made up for the growth in the amount of transport. A change in registration tax for passenger cars was implemented from 2007, and this has given

consumers stronger incentives to choose low-emission cars. There is still a significant risk that the target of average emissions from new passenger cars of maximum 120 g CO_2/km by 2012 will not be reached. The Ministry of Transport and Communications states that it does not have power of decision in relation to many policy instruments aimed at reducing greenhouse gas emissions from transport, such as taxes, parking policy, land use policy and road pricing. Many policy instruments require local political support and cooperation across ministries. The investigation points out that, together with the expected continued growth in the transport sector, coordination across sectors and administrative levels is a particular challenge in relation to reaching the long-term climate targets.

10.5.4 Voluntary agreements have contributed to emission reductions in industry

The reduction in greenhouse gas emissions from industry can be attributed to modernisation, new technology, process reorganisations and closures of emission-intensive enterprises. Voluntary agreements have been the most important policy instrument in the industry sector during the period. About half of Norwegian industry was left unregulated when the understanding between the Ministry of the Environment and the process industry expired in 2007. In 2009, a new agreement was signed with the industry pursuant to which the process industry will reduce emissions by 200,000 tonnes compared with 2007 emissions. However, when the agreement was signed, an even greater reduction had already been achieved as a result of the closure of one plant and the market situation in 2009. It can therefore be questioned whether this agreement is sufficiently ambitious to contribute to real regulation of greenhouse gas emissions from industry.

10.5.5 The use of policy instruments in the agricultural sector does little to achieve the climate targets

The investigation shows that policy instruments effected through the National Agricultural Agreement contribute indirectly to reducing greenhouse gas emissions. The knowledge base has been emphasised as a challenge to implementation of policy instruments in the agricultural sector. It can be questioned whether the Ministry of Agriculture and Food has done enough to obtain a knowledge-based decision-making basis that can help to reduce greenhouse gas emissions in agriculture.

The aim is a policy that will promote increased tree felling while also taking account of biodiversity and other environmental values. The investigation shows that a sufficient supply of bioenergy is a prerequisite if district heating is to contribute to reducing greenhouse gas emissions. An increase in bioenergy production requires the felling of more trees. Since 1998, the planting of new forest has decreased and felling has remained stable. It can therefore be questioned whether the use of policy instruments in the forest sector underpins the climate policy objectives to a sufficient extent.

10.6 Technology development can contribute to the achievement of long-term climate targets, but entails a high level of risk

The investigation shows that the costs of major national emission reductions may be high, but that they can be reduced through the development and implementation of new technology. The research effort has been stepped up considerably in recent years. The stepping up of research investments came late in relation to the climate targets for 2008–2012, but could form an important basis for reaching the more long-term climate targets. The investigation shows that renewable energy and carbon capture and storage have been the top priorities. Technological research aimed at greenhouse gas emissions from the process industry is not a priority at present.

The Storting has supported plans for CO_2 cleaning at two gas-fired power plants, at Kårstø and Mongstad. The investigation shows that the timeframe is tight and the technological goals challenging. This results in increased costs. A delay at the Test Centre Mongstad will result in less time for technology trials if the deadline for the construction of a full-scale plant is to be met. The short timeframe entails a risk that the cleaning projects will not contribute substantially to the development of new technology.

On the other hand, delayed implementation of cleaning will result in increased greenhouse gas emissions at Kårstø and Mongstad. The investigation shows that little importance has been attached to transport and storage of CO_2 in connection with capture technology at these facilities, and this may result in less than optimal storage solutions.

10.7 Uncertain effect of emission-reducing measures in other countries

It is an objective that part of the national target for 2020 shall be met by emission reductions in other countries, and that Norway is to be carbon neutral in 2030. The investigation shows that emission reductions in other countries will help to reduce the costs of achieving the climate policy targets. There is uncertainty, however, relating to the CDM mechanism's actual contribution to emission reductions, among other things because it is difficult to determine whether a project would have been carried out regardless of the income from CDM credits. It is also uncertain how much emissions increase in other places as a result of the implementation of a project. This is largely a consequence of the absence of a global climate agreement. This means that there is uncertainty about the size of the emission reductions that result from Norway purchasing allowances from countries without emission commitments.

Target achievement in the Climate and Forest Initiative depends on factors in other countries. It is a risk that many countries in the target group are facing considerable forest management challenges in terms of coordination, management and performance monitoring. This is confirmed by audit reports from the SAIs of Brazil and Indonesia. Both these audit reports points to a lack of national ownership of the efforts to reduce deforestation and to conflicts of goals between the efforts to reduce deforestation and commercial activities.

10.8 Challenges in interministerial work

The Ministry of the Environment has a coordinating position in Norwegian climate work. The Ministry is tasked with initiating, developing and implementing measures using policy instruments at its disposal, but it shall also act as a driving force in relation to various national sector authorities. It is also responsible for monitoring policy performance.

The investigation shows that the responsibility for policy instruments are shared between several ministries' areas of responsibility, and that there is not always a connection between responsibility for targets and policy instruments. Since sector targets were stipulated, opinions differ between ministries as to whether it is the sector ministries or the government as a whole that is responsible for the sector targets being achieved. Unclear roles and responsibilities entail a risk that targets will not be followed up. This is a particular challenge in fields that are largely regulated by cross-sectoral policy instruments. This gives grounds for questioning whether enough has been done to facilitate a clear division of roles and responsibilities between ministries in order to ensure long-term, uniform and efficient use of policy instruments.

The investigation shows that the Ministry of the Environment faces considerable challenges in the execution of its role as a driving force in the form of strong sector interests and conflicts of goals. The investigation also shows that there is little documentation of how the Ministry of the Environment has fulfilled its role as a driving force. There is reason to ask whether this may not be an obstacle to good and systematic execution of its role. The lack of documentation of this work could make it difficult to ensure access to and verify decision-making processes. This gives grounds for questioning whether this could be an obstacle to good management and performance monitoring.

The investigation also shows some weaknesses in management information relating to the national target for 2020 and the sector targets. It is seen as a weakness that the sector projections have no official status and have not been submitted to the Storting. There is reason to point out that the authorities have not assessed the emissions trading scheme's expected contribution to national emission reductions for the period 2008–2020, and that the basis for assessing the effect of the carbon tax on domestic emission sources appears uncertain. One of the consequences of the targets being stipulated in relation to a baseline scenario is that it will be very methodologically demanding to monitor the national targets for 2020. The evaluation of target achievement presupposes knowledge of the emission-reducing effect of the measures that have been implemented. There has been no systematic reporting of the effect of implemented measures after the measures were adopted. It can therefore be questioned whether the Ministry of the Environment has sufficient management information to carry out continuous assessments of target achievement and thus ensure good performance monitoring through its role as a driving force in relation to other ministries.

10.9 A challenge to achieve long-term climate targets

According to the Ministry of Finance's most recent projections, unless further emission-reducing measures are implemented, greenhouse gas emissions are expected to increase by about five percent from 2008, to 56.5 million tonnes of CO_2 equivalents in 2020. The 2020 target involves significantly higher annual reductions in national emissions than were achieved until 2008, which means that further measures are required. The investigation shows that, in their current form, the cross-sectoral policy instruments will not be sufficient to reach the national emission target for 2020.

The climate issue is cross-sectoral, and many ministries are responsible for contributing to target achievement in this field. This underlines how important it is that the Ministry of the Environment exercises its coordination responsibility and role as a driving force, and that the sector ministries fulfil their sector responsibilities. However, conflicts of goals represent a major challenge in all sectors, and several ministries have pointed to the high national cost of measures as an important challenge.

Overall, the investigation gives grounds for pointing out that there is a considerable risk relating to whether the national climate goals for 2020 will be achieved.

11 References

Interviews carried out

One or more interviews have been carried out with the following players:

- Gassnova
- NORAD
- Statistics Norway
- The Confederation of Norwegian Business and Industry
- The Federation of Norwegian Industries
- The Institute of Transport Economics
- The Ministry of Agriculture and Food
- The Ministry of Finance
- The Ministry of Foreign Affairs
- The Ministry of Petroleum and Energy
- The Ministry of the Environment
- The Ministry of Trade and Industry
- The Ministry of Transport and Communications
- The Norwegian Agricultural Authority
- The Norwegian Directorate of Water Resources and Energy
- The Norwegian Forest and Landscape Institute
- The Norwegian National Rail Administration
- The Norwegian Oil Industry Association
- The Norwegian Petroleum Directorate
- The Norwegian Pollution Control Authority
- The Norwegian Public Roads Administration – Directorate of Public Roads
- The Research Council of Norway

Statutes

- *Act No 11 of 19 May 1933 relating to Special Taxes.*
- *Act No 6 of 13 March 1981 relating to Protection against Pollution and relating to Waste* (the Pollution Control Act).
- *Act No 50 of 29 June 1990 relating to the Generation, Conversion, Transmission, Trading, Distribution and Use of Energy etc.* (the Energy Act).
- *Act No 72 of 21 December 1990 relating to CO_2 Tax in the Petroleum Activity on the Continental Shelf.*
- *Act No 23 of 12 May 1995 relating to Land* (the Land Act).
- *Act No 72 of 29 November 1996 relating to Petroleum Activities* (the Petroleum Activities Act).
- *Act No 99 of 17 December 2004 relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances* (Greenhouse Gas Emission Trading Act).
- *Act No 31 of 27 May 2005 relating to Forestry* (the Forestry Act).
- *Act No 71 of 27 June 2008 relating to Planning and the Processing of Building Applications* (Planning and Building Act).

Regulations

- *Regulations No 747 of 21 March 1986 for Pedestrian and Motor Vehicle Traffic* (Traffic rules).
- *Regulations No 921 of 1 October 1993 relating to public parking regulation and parking fines* (Regulations relating to public parking regulation etc.).
- *Regulations No 653 of 27 June 1997 relating to the Petroleum Activities Act* (Regulations relating to the Petroleum Activities Act).
- *Regulations No 791 of 1 July 1999 relating to planning of the use of fertilisers.*
- *Regulations No 268 of 19 March 2001 relating to the registration tax on motor vehicles.*
- *Regulations No 951 of 4 July 2003 relating to fertiliser products etc. of organic origin* (Regulations relating to fertilisers of organic origin).

- *Regulations No 1157 of 3 September 2001 relating to Conduct of Activities in the Petroleum Activities* (the Activities Regulations).
- *Regulations No 1377 of 10 December 2001 relating to payment of add-ons to the network tariff to the Energy Fund* (Regulations relating to the Energy Fund).
- *Regulations No 54 of 15 January 2003 relating to environmental plans.*
- *Regulations No 931 of 1 June 2004 relating to pollution control* (the Pollution Regulations).
- *Regulations No 1851 of 23 December 2004 relating to greenhouse gas emission allowance trading and the duty to surrender emission allowances* (Regulations relating to greenhouse gas emission trading).
- *Regulations No 881 of 3 July 2006 relating to forest trust funds etc.*

EU directives

- *Framework directive 1992/75/EC on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances.*
- *Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control* (the IPPC Directive).
- *Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market* (the Renewable Directive).
- *Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.*
- *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC* (the emissions trading directive).
- *Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms* (the Linking Directive).
- *Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community* (the revised emissions trading directive).

Other regulations and guidelines

- *Regulations on Financial Management in Central Government adopted on 12 December 2003, last amendment on 14 November 2006*.

International commitments

- *United Nations framework convention on climate change of 9 May 1992 No 1 Multilateral* (the United Nations Framework Convention on Climate Change)
- *The Kyoto Protocol to the UN Framework Convention on Climate Change of 11 December 1997* No 3 Multilateral.

Parliamentary documents

Budget propositions

- Proposition No 1 to the Storting *The Ministry of Finance* (from 1998 to 2009).
- Proposition No 1 to the Storting *Decisions relating to direct and indirect taxes and customs duties* The Ministry of Finance (from 1998 to 2009).
- Proposition No 1 to the Storting *The Ministry of Food and Agriculture* (from 1998 to 2009)
- Proposition No 1 to the Storting *The Ministry of Foreign Affairs* (from 1998 to 2009).
- Proposition No 1 to the Storting *The Ministry of Petroleum and Energy* (from 1998 to 2009).
- Proposition No 1 to the Storting *The Ministry of the Environment* (from 1998 to 2009)
- Proposition No 1 to the Storting *The Ministry of Trade and Industry* (from 1998 to 2009).
- Proposition No 1 to the Storting *The Ministry of Transport and Communications* (from 1998 to 2009).
- Proposition No 1 to the Storting (2009–2010) from the ministries listed above.

Propositions to the Odelsting

- Proposition No 59 to the Odelsting (1998–1999) *Lov om endring i lov av 13. mars 1981 nr. 6 om vern mot forurensninger og om avfall (forurensningsloven) ('Act relating to amendment of Act No 6 of 13 March 1981 relating to protection against pollution and relating to waste (the Pollution Control Act)')*.
- Proposition No 35 to the Odelsting (2000–2001) *Om lov om endringar i lov 29. juni 1990 nr. 50 om produksjon, omforming, overføring, omsetning og fordeling av energi m.m.* ('*On the act relating to amendments to Act No 50 of 29 June 1990 relating to the generation, conversion, transmission, trading distribution and use of energy etc.')*.
- Proposition No 13 to the Odelsting (2004–2005) *Om lov om kvoteplikt og handel med kvoter for utslipp av klimagasser (klimakvoteloven)* ('*On the Act Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances (The Greenhouse Gas Emission Trading Act)'*).
- Proposition No 66 to the Odelsting (2006–2007) *Om lov om endringer i klimakvoteloven m.m.* ('*On the Act relating to amendment of the Greenhouse Gas Emission Trading Act etc.*').
- Proposition No 19 to the Odelsting (2008–2009) *Om lov om endringer i klimakvoteloven.* ('*On the Act relating to amendment of the Greenhouse Gas Emission Trading Act* ').
- Proposition No 62 to the Odelsting (2008–2009) *Om lov om endringer i energiloven* ('*On the Act relating to amendment of the Energy Act* ').

Other propositions

- Proposition No 54 to the Storting (1997–1998) *Green Taxes*.
- Proposition No 8 to the Storting (1998–1999) *Utbygging av Huldrafeltet ('Development of the Huldra field')*.
- Proposition No 36 to the Storting (1999–2000) *Development and operation of Ringhorne*.
- Proposition No 53 to the Storting (1999–2000) *Development of Kvitebjørn and Grane, decommissioning of installations on Tommeliten Gamma and Lille-Frigg, and the status of cost developments for the Åsgard chain.*
- Proposition No 24 to the Storting (2001–2002) *Changes to appropriations in the central government budget for 2001, etc, relating to the Ministry of Petroleum and Energy and development, installation and operation of the Kristin field.*
- Proposition No 35 to the Storting (2001–2002) *Development, installation and operation of the Snøhvit LNG project*.
- Proposition No 49 to the Storting (2001–2002) *Samtykke til ratifikasjon av Kyotoprotokollen av 11. desember 1997 til FNs rammekonvensjon om klimaendring av 9. mai 1992 ('Consent to the ratification of the Kyoto Protocol of 11 December 1997 to the United Nations Framework Convention on Climate Change of 9 May 1992')*.
- Proposition No 41 to the Storting (2003–2004) *Utbygging og drift av Ormen Lange og anlegg og drift av Langeled mv. ('Development and operation of Ormen Lange and installation and operation of Langeled etc.')*.
- Proposition No 63 to the Storting (2003–2004) *Tilleggsbevilgninger og omprioriteringer i statsbudsjettet 2004 ('Supplementary allocations and reordering of priorities for the national budget 2009')*.
- Proposition No 54 to the Storting (2004–2005) *Endra plan for utbygging og drift av Statfjordfeltet og plan for anlegg og drift av Tampen Link ('Modified plan for development and operation of the Statfjord field and for development and operation of Tampen Link')*.
- Proposition No 30 to the Storting (2005–2006) *Utbygging, anlegg og drift av Tyrihans. ('Development, installation and operation of Tyrihans*').
- Proposition No 49 to the Storting (2006–2007) *Samarbeid om CO_2-håndtering på Mongstad ('Cooperation on carbon capture and storage at Mongstad')*. The Ministry of Petroleum and Energy.
- Proposition No 64 to the Storting (2006–2007) *Utbygging av Gjøa, Vega og Vega Sør ('Development of Gjøa, Vega and Vega South')*.
- Proposition No 76 to the Storting (2006–2007) *Utbygging og drift av Valhall videreutvikling ('Development and operation of Valhall further development')*.
- Proposition No 77 to the Storting (2006–2007) *Om jordbruksoppgjøret 2007 – endringer i statsbudsjettet for 2007 m.m. ('On the agricultural settlement 2007 – changes in the national budget for 2007 etc.')*.
- Proposition No 26 to the Storting (2007–2008) *Om samtykke til godkjennelse av EØS-komiteens beslutning nr. 146/2007 av 26. oktober 2007 om innlemmelse i EØS-avtalen av direktiv 2003/87/EF av*

13. oktober 2003 om en ordning for handel med kvoter for klimagassutslipp (kvotedirektivet), samt tilhørende rettsakter ('On consent to approval of the EEA Joint Committee's decision No 146/2007 of 26 October 2007 to incorporate into the EEA Agreement Directive 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community (the Emissions Trading Directive), and pertaining acts').

- Proposition No 59 to the Storting (2007–2008) *Tilleggsbevilgninger og omprioriteringer i statsbudsjettet 2008 ('Supplementary allocations and reordering of priorities for the national budget 2008')*.
- Proposition No 69 to the Storting (2007–2008) *Om jordbruksoppgjøret 2008 – endringer i statsbudsjettet for 208 m.m. ('On the agricultural settlement 2008 – changes in the national budget for 2008 etc.')*
- Proposition No 38 to the Storting (2008–2009) *CO_2-håndtering på Mongstad ('Carbon capture and storage at Mongstad')*.
- Proposition No 64 to the Storting (2008–2009) *Utbygging og drift av Goliatfeltet ('Development and operation of the Goliat field'*).
- Proposition No 67 to the Storting (2008–2009) *Tilleggsbevilgninger og omprioriteringer i statsbudsjettet 2009 ('Supplementary allocations and reordering of priorities for the national budget 2009')*.
- Proposition No 75 to the Storting (2008–2009) *Om jordbruksoppgjøret 2009 – endringer i statsbudsjettet for 2009 m.m. ('On the agricultural settlement 2009 – changes in the national budget for 2009 etc.')*

Reports to the Storting

- Report No 29 to the Storting (1997–1998) *Norges oppfølging av Kyotoprotokollen ('Norwegian follow-up of the Kyoto Protocol')*.
- Report No 17 to the Storting (1998–1999) *Verdiskaping og miljø – muligheter i skogsektoren ('Value creation and environment – opportunities in the forest sector')*.
- Report No 29 to the Storting (1998–1999) *On Norwegian Energy Policy.*
- Report No 8 to the Storting (1999–2000) *The Government's Environmental Policy and the State of the Environment in Norway.*
- Report No 36 to the Storting (2000–2001) *The Norwegian Industrial and Regional Development Fund (SND): Ny giv, ny vekst og nytt næringsliv ('New initiative, new growth, new business and industry')*.
- Report No 54 to the Storting (2000–2001) *Norwegian Climate Policy.*
- Report No 15 to the Storting (2001–2002) *Amendment to Report No 54 to the Storting (2000–2001) Norwegian Climate Policy.*
- Report No 9 to the Storting (2002–2003) *On domestic use of natural gas etc*.
- Report No 18 to the Storting (2003–2004) *Om forsyningssikkerheten for strøm mv*. *('On security of supply for electricity etc.')*.
- Report No 47 to the Storting (2003–2004) *Om Innovasjonsverksemda for miljøvennlege gasskraftteknologiar mv. ('On innovation activities for environmentally friendly gas technologies etc.')*.
- Report No 21 to the Storting (2004–2005) *The Government's Environmental Policy and the State of the Environment in Norway.*
- Report No 2 to the Storting (2006–2007) *The revised National Budget 2007.*
- Report No 11 to the Storting (2006–2007) *Om støtteordningar for elektrisitetsproduksjon for fornybar energi (fornybar elektrisitet) ('On the funding schemes for electricity production for renewable energy sources (renewable electricity)')*.
- Report No 26 to the Storting (2006–2007) *The Government's Environmental Policy and the State of the Environment in Norway.*
- Report No 34 to the Storting (2006–2007) *Norwegian Climate Policy.*
- Report No 1 to the Storting (2008–2009) *The National Budget 2009.*
- Report No 7 to the Storting (2008–2009) *An Innovative and Sustainable Norway.*
- Report No 9 to the Storting (2008–2009) *Long-term Perspectives for the Norwegian Economy.*
- Report No 16 to the Storting (2008–2009) *National Transport Plan 2010–2019.*
- Report No 39 to the Storting (2008–2009) *Climate Challenges – Agriculture part of the Solution.*
- Report No 1 to the Storting (2009–2010) *The National Budget 2010*.

Budget recommendations

- Budget Recommendation No 1 to the Storting Skatte-, avgifts- og tollvedtak *('Decisions relating to direct and indirect taxes and customs duties')* The Ministry of Finance 1999–2009.
- Budget Recommendation No 1 to the Storting (2005–2006) (2006–2007) *Innstilling fra finanskomiteen om skatte-, avgifts- og tollvedtak for 2006 og 2007 ('Recommendation from the Standing Committee on Finance and Economic Affairs regarding direct and indirect taxes and customs duties for 2006 and 2007')*.
- Budget Recommendation No I to the Storting (2008–2009) *Innstilling frå finanskomiteen om nasjonalbudsjettet 2009 og forslaget til statsbudsjett for 2009 ('Recommendation from the Standing Committee on Finance and Economic Affairs regarding the national budget 2009 and the proposed national budget for 2009')*.
- Budget Recommendation No 3 to the Storting (2008–2009) *Innstilling fra utenrikskomiteen ('Recommendation from the Standing Committee of Foreign Affairs')*.
- Budget Recommendation No 6 to the Storting (2007–2008).
- Budget Recommendation No 8 to the Storting (2001–2002) (2005–2006) (2007–2008) (2008–2009) *Allocations on the national budget.*
- Budget Recommendation No 9 to the Storting *Innstilling fra energi- og miljøkomiteen om bevilgninger over statsbudsjettet vedkommende Olje- og energidepartementet og Miljøverndepartementet* (2001–2002) (2005–2006) (2006–2007) (2007–2008) (2008–2009) *('Recommendation from the Standing Committee on Energy and the Environment regarding the allocations over the national budget relating to the Ministry of Petroleum and Energy and the Ministry of the Environment')* (2001–2002) (2005–2006) (2006–2007) (2007–2008) (2008–2009).
- Budget Recommendation No 13 to the Storting (2008–2009) *Innstilling fra transport- og kommunikasjonskomiteen om bevilgninger på statsbudsjettet for 2009, kapitler under Samferdsels-departementet, Fiskeri- og kystdepartementet, Fornyings- og administrasjonsdepartementet og Justis- og politidepartementet (rammeområde 17) ('Recommendation from the Standing Committee on Transport and Communications regarding allocations on the national budget for 2009 relating to the Ministry of Transport and Communications, the Ministry of Fisheries and Coastal Affairs, the Ministry of Government Administration and Reform and the Ministry of Justice and the Police (framework area 17)')*.

Recommendations to the Odelsting

- Recommendation No 59 to the Odelsting (2000–2001) *Innstilling frå energi- og miljøkomiteen om lov om endringar i lov 29. juni 1990 nr. 50 om produksjon, omforming, overføring, omsetning og fordelingen av energi med mer (energilova) ('Recommendation from the Standing Committee on Energy and the Environment relating to act on amendments to Act No 50 of 29 June 1990 relating to the generation, conversion, transmission, trading distribution and use of energy etc. (The Energy Act)')*.
- Recommendation No 100 to the Odelsting (2006–2007) *Innstilling fra energi- og miljøkomiteen om lov om endringer i klimakvoteloven m.m. ('Recommendation from the Standing Committee on Energy and the Environment regarding the act relating to amendment of the Greenhouse Gas Emission Trading Act etc.')*.
- Recommendation No 104 to the Odelsting (2008–2009) *Innstilling fra energi- og miljøkomiteen om lov om endringer i energiloven. ('Recommendation from the Standing Committee on Energy and the Environment regarding the act relating to amendment of the Energy Act')*.

Other recommendations to the Storting

- Recommendation No 114 to the Storting (1995–1996).
- Recommendation No 150 to the Storting (1997–1998).
- Recommendation No 233 to the Storting (1997–1998) *Innstilling fra energi- og miljøkomiteen om Norges oppfølging av Kyotoprotokollen ('Recommendation from the Standing Committee on Energy and the Environment on Norwegian follow-up of the Kyoto Protocol')*.
- Recommendation No 247 to the Storting (1997–1998) *Innstilling fra finanskomiteen om grønne skatter ('Recommendation from the Standing Committee on Finance and Economic Affairs regarding green taxes')*.
- Recommendation No 208 to the Storting (1998–1999) *Innstilling fra næringskomiteen om verdiskaping og miljømuligheter i skogsektoren (Skogmeldingen) ('Recommendation from the Standing*

Committee on Business and Industry regarding value creation and environmental opportunities in the forest sector (the Forest Report)').

- Recommendation No 122 to the Storting (1999–2000) *Innstilling fra energi- og miljøkomiteen om energipolitikken ('Recommendation from the Standing Committee on Energy and the Environment on the energy policy')*.
- Recommendation No 256 to the Storting (1999–2000) *Innstilling fra energi- og miljøkomiteen om Regjeringens miljøvernpolitikk og rikets miljøtilstand og om tilleggsmelding til St.meld. nr. 8 (1999–2000) ('Recommendation from the Standing Committee on Energy and the Environment regarding the Government's Environmental Policy and the State of the Environment in Norway and regarding Amendment to Report No 8 to the Storting (1999–2000)')*.
- Recommendation No 263 to the Storting (2000–2001) *Innstilling fra energi- og miljøkomiteen om vasskraft og kraftbalansen ('Recommendation from the Standing Committee on Energy and the Environment regarding hydropower and the power balance')*.
- Proposition No 185 to the Storting (2001–2002) *Innstilling fra utenrikskomiteen om samtykke til ratifikasjon av Kyotoprotokollen av 11. desember 1997 til FNs rammekonvensjon om klimaendring av 9. mai 1992 ('Recommendation from the Standing Committee on Foreign Affairs regarding consent to the ratification of the Kyoto Protocol of 11 December 1997 to the United Nations Framework Convention on Climate Change of 9 May 1992')*.
- Recommendation No 240 to the Storting (2001–2002) *Innstilling fra energi- og miljøkomiteen om Norsk klimapolitikk og om Tilleggsmelding til Norsk klimapolitikk ('Recommendation from the Standing Committee on Energy and the Environment regarding Norwegian Climate Policy and the Amendment report to Norwegian Climate Policy')*.
- Recommendation No 167 to the Storting (2002–2003) *Innstilling fra energi- og miljøkomiteen om innenlands bruk av naturgass mv.('Recommendation from the Standing Committee on Energy and the Environment on domestic use of natural gas etc.')*.
- Recommendation No 250 to the Storting (2003–2004) *Innstilling fra finanskomiteen om tilleggs-bevilgninger og omprioriteringer i statsbudsjettet medregnet folketrygden 2004 ('Recommendation from the Standing Committee on Finance and Economic Affairs regarding supplementary allocations and reordering of priorities for the national budget, including the National Insurance scheme, for 2004')*.
- Recommendation No 228 to the Storting (2004–2005) *Innstilling fra energi- og miljøkomiteen om Regjeringens miljøvernpolitikk og rikets miljøtilstand ('Recommendation from the Standing Committee on Energy and the Environment regarding the Government's Environmental Policy and the State of the Environment in Norway')*.
- Proposition No 107 to the Storting (2007–2008) *Innstilling fra energi- og miljøkomiteen om samtykke til godkjennelse av EØS-komiteens beslutning nr. 146/2007 av 26. oktober 2007 om innlemmelse i EØS-avtalen av direktiv 2003/87/EF av 13. oktober 2003 om en ordning for handel med kvoter for klimagassutslipp (kvotedirektivet), samt tilhørende rettsakter (Recommendation from the Standing Committee on Energy and the Environment regarding consent to approval of the EEA Joint Committee's decision No 146/2007 of 26 October 2007 to incorporate into the EEA Agreement Directive 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community (the Emissions Trading Directive), and pertaining acts*).
- Recommendation No 132 to the Storting (2007–2008) *Innstilling fra energi- og miljøkomiteen om Regjeringens miljøpolitikk og rikets miljøtilstand ('Recommendation from the Standing Committee on Energy and the Environment regarding the Government's Environmental Policy and the State of the Environment in Norway')*.
- Recommendation No 145 to the Storting (2007–2008) *Innstilling fra energi- og miljøkomiteen om norsk klimapolitikk ('Recommendation from the Standing Committee on Energy and the Environment on Norwegian climate policy')*.
- Proposition No 320 to the Storting (2007–2008) *Innstilling frå næringskomiteen om jordbruks-oppgjøret 2008 – endringer i statsbudsjettet for 2008 m.m. ('Recommendation from the Standing Committee on Business and Industry regarding the agricultural settlement 2008 – changes in the national budget for 2008 etc.')*
- Recommendation No 170 to the Storting (2008–2009) *Innstilling frå næringskomiteen om et nyskapende og bærekraftig Norge. ('Recommendation from the Standing Committee on Business and Industry on an innovative and sustainable Norway')*.

- Recommendation No 206 to the Storting (2008–2009) *Innstilling fra energi- og miljøkomiteen om investering i teknologisenter for CO_2-håndtering på Mongstad ('Recommendation from the Standing Committee on Energy and the Environment regarding investment in a technology centre for carbon capture and storage at Mongstad')*.
- Recommendation No 300 to the Storting (2008–2009) *Innstilling fra transport- og kommunikasjons-komiteen om Nasjonal transportplan 2010–2019. ('Recommendation from the Standing Committee on Transport and Communications regarding the National Transport Plan 2010–2019')*.

Other governing documents

- Annual reports from the Norwegian Petroleum Directorate 1998–2008.
- The Ministry of Agriculture and Food (1998–2009) *Allocation letter to the Norwegian Agricultural Authority.*
- The Ministry of the Environment (1998–2009) *Allocation letter to the Norwegian Pollution Control Authority.*
- The Ministry of Petroleum and Energy (1998–2009) *Allocation letter to the Norwegian Petroleum Directorate.*
- The Ministry of Petroleum and Energy (2000–2009) *Allocation letter to the Norwegian Directorate of Water Resources and Energy.*
- The Ministry of Petroleum and Energy (2001) *Miljøhandlingsplan for olje- og energisektoren 1999 ('Environmental Action Plan for the Petroleum and Energy Sector 1999')*.
- Annual reports from The Norwegian Water Resources and Energy Directorate 2001–2008.
- Result reports from Enova 2003–2004.
- Ministry of Transport and Communications (2004–2009) *Allocation letter to the Norwegian Public Roads Administration.*
- Annual reports from Gassnova 2007–2008.
- The Ministry of Petroleum and Energy (2008) *Agreement between the Ministry of Petroleum and Energy and Enova SF regarding the administration of the Energy Fund during the period from 1 June 2008 to 31 December 2011. 2008.*
- The Storting (2008) *Agreement on Norway's climate policy. Agreement between the Norwegian political parties Labour, the Socialist Left Party, the Centre Party, the Conservative Party, the Christian Democratic Party and the Liberal Party on comments to Report No 34 to the Storting (2006–2007) Norwegian Climate Policy*, cf. Recommendation No 145 to the Storting (2007–2008).
- The Ministry of Petroleum and Energy (2009) *Agreement on principles for further development of a joint market for electricity certificates, 7 September 2009.*

Official Norwegian Reports

- NOU (1996:6) *Green Taxes – policies for a better environment and high employment.*
- NOU (1998:11) *Energi- og kraftbalansen fram mot 2020 ('The Energy and Power Balance towards 2020')*
- NOU (2000:1) *A Quota System for Greenhouse Gases*
- NOU (2002:7) *Gassteknologi, miljø og verdiskaping ('Gas technology, the environment and value creation').*
- NOU (2006:18) *A climate-friendly Norway.*
- NOU (2007:8) *En vurdering av særavgiftene ('An evaluation of special taxes').*
- NOU (2009:16) *Globale miljøutfordringer – norsk politikk ('Global environmental challenges – Norwegian policy')*.

Other documents and reports from the Government and the government administration

- Norad (2008) *Assessment of BNDES as a potential mechanism for Norwegian support to Fundo Amazônia (Amazon Fund)*, 27 June 2008.
- Statistics Norway (2008) *Energibruk og utslipp til luft fra innenlands transport ('Energy use and emissions to air from domestic transport')*. Report 2008/49.
- Statistics Norway (2008) *Jordbruk og miljø: Resultatkontroll jordbruk 2007 ('Agriculture and environment: Performance control for agriculture 2007').* Report 2008:1.
- Statistics Norway (2008) *Utslipp av klimagasser i Norge – i dag, i går og den nære framtid. ('Greenhouse gas emissions in Norway – today, yesterday and in the near future').* Report 2008:17.

- Statistics Norway (2009) *Jordbruk og miljø: Tilstand og utvikling*. *('Agriculture and environment: State and development.')* Report 2009:37.
- Statskonsult (2003) *Sektorvise miljøhandlingsplaner – et egnet virkemiddel? ('Sectoral action plans – an appropriate policy instrument?')* Report 2003:6.
- The Ministry of the Environment (2007) *'Norwegian National Allocation Plan for the emissions trading system in 2008–2012'*.
- The Ministry of Finance (2007) *A Peer Review of Norway's Policy for Sustainable Development.*
- The Ministry of Finance (2007) *Bilavgifter, rapport fra interdepartemental arbeidsgruppe ('Vehicle taxes, report from an interministerial working group'),* 20 September 2007.
- The Ministry of Petroleum and Energy (2002) *Strategi for utbygging av vannbåren varme ('Strategy for development of water-borne heat')*.
- The Ministry of Petroleum and Energy (2008) *Strategi for økt utbygging av bioenergi ('Strategy for increased bioenergy development')*.
- The Ministry of Petroleum and Energy (2008) *'Guidelines to plan for development and operation of a petroleum deposit'*.
- The Ministry of Transport and Communications (1998) *Miljøhandlingsplan for samferdselssektoren 1998 ('Environmental action plan for the transport and communications sector 1998')*.
- The Norwegian Agricultural Authority (2009) *Evaluering av SMIL – spesielle miljøtiltak i jordbruket ('Evaluation of SMIL – special environmental measures in agriculture')*. Report no 5/2009.
- The Norwegian Directorate of Water Resources and Energy (2005) *Gasskraft med CO_2-håndtering: Verdikjedevurderinger ('Gas power with carbon capture and storage: Value chain evaluations')*. NVE report 20/2005.
- The Norwegian Directorate of Water Resources and Energy (2005) *Kostnader ved produksjon av kraft og varme ('The costs of producing power and heat')*. Handbook no 1 2007.
- The Norwegian Directorate of Water Resources and Energy (2006) *Carbon Capture, Transport and Storage at Kårstø.* NVE report 13/2006.
- The Norwegian Petroleum Directorate (2004) *CO_2 – Utredning av muligheter for en mer effektiv energiforsyning på norsk sokkel ('CO_2 – A study of more efficient energy supply options on the Norwegian continental shelf')*. The Petroleum Directorate, the Norwegian Oil Industry Association, Statoil, Hydro and ConocoPhillips, 16 July 2004.
- The Norwegian Petroleum Directorate (2008) *Kraft fra land til norsk sokkel. 2008. ('Power generated onshore to the Norwegian continental shelf. 2008.')* The Petroleum Directorate, the Norwegian Directorate of Water Resources and Energy, the Petroleum Safety Authority Norway and the Norwegian Pollution Control Authority, 4 January 2008.
- The Norwegian Petroleum Directorate (2008) *'Facts 2008 – The Norwegian petroleum sector.'* The Norwegian Petroleum Directorate (2009) *'Facts 2009 – The Norwegian petroleum sector.'*
- The Norwegian Petroleum Directorate and the Norwegian Directorate of Water Resources and Energy (2002) *Kraftforsyning fra land til sokkelen – Muligheter, kostnader og miljøvirkninger ('Supply of power generated onshore to the continental shelf – Opportunities, costs and environmental impact')*.
- The Norwegian Pollution Control Authority (2000) *Reduksjon av klimagassutslipp i Norge. En tiltaksanalyse for 2010. ('Reduction of greenhouse gas emissions in Norway. A mitigation analysis for 2010.') Report TA-1708:2000.*
- The Norwegian Pollution Control Authority (2005) *Reduksjon av klimagassutslipp i Norge. En tiltaksanalyse for 2010 og 2020. ('Reduction of greenhouse gas emissions in Norway. A mitigation analysis for 2010 and 2020.')* Report TA-2121:2005.
- The Norwegian Pollution Control Authority (2007) *Reduksjon av klimagassutslipp i Norge. En tiltaksanalyse for 2020. ('Reduction of greenhouse gas emissions in Norway. A mitigation analysis for 2020.')* Report TA-2254:2007.
- The Norwegian Pollution Control Authority (2008) *UN Intergovernmental Panel on Climate Change's (IPCC) fourth assessment report. Working group I. Summary for Policymakers.* Norwegian translation (Norwegian Pollution Control Authority (SFT) report 2329/2008)
- The Norwegian Pollution Control Authority (2009) *Vurdering av framtidige kvotepriser ('Assessment of future prices of emissions allowances')*. A report from the agency group Climate Cure 2020, TA-2545/2009.

Reports from the Office of the Auditor General
- Document No 3:11 (2006–2007) *The OAG's investigation of sustainable land-use planning and land use.*
- Document No 3:4 (2008–2009) *The OAG's investigation into the effectiveness of Innovation Norway as a promoter of industrial development.*

Reports from other supreme audit institutions
- National Audit Office (2009) *'European Union Emissions Trading Scheme: A review by the National Audit Office'. UK, March 2009.*
- Tribunal de Contas as União (2009) *Operasjonell revisjon for å evaluere den offentlige politikken rettet mot Amazonas-området med tanke på reduksjon i utslipp av drivhusgasser. ('Operational audit to evaluate the public policy for the Amazon area with a view to reducing greenhouse gas emissions'.)* Report from the supreme audit institution of Brazil.
- United States Government Accountability Office (2009) *'Lesson Learned from the European Union's Emission Trading Scheme and the Kyoto Protocol's Clean Development Mechanism.'* GAO-09-151.

Press releases
- Enova SF (2009) *Enova bevilger 1,1 milliarder til vindkraftprosjekter ('Enova allocates NOK 1.1 billion to wind power projects').* Press release, 9 July 2009.
- Gassnova (2009) *Construction Startup of the European CO_2 Technology Centre Mongstad (TCM) in Norway.* News item, 17 June 2009.
- The Ministry of the Environment (2009) *Krav om CO_2-håndtering til industrikraft ('CCS requirement for power for industry').* Press release, 16 May 2009.
- The Ministry of the Environment (2009) *Kvotereserve for høyeffektive kraftvarmeverk satt ('Allowance reserve for high-efficiency combined heat and power plants stipulated').* Press release, 27 February 2009.
- The Ministry of the Environment (2007) *Kvotereserve på 9 millioner tonn ('Allowance reserve of 9 million tonnes').* Press release, 21 December 2007.
- The Ministry of the Environment (2009*) Streng utslippstillatelse for reservekraftverk på Tjeldbergodden ('Strict emission permit for reserve power plant at Tjeldbergodden').* Press release, 18 January 2008.
- The Norwegian Pollution Control Authority (2007) *Anbefaler tidsbegrenset tillatelse på Nyhamna ('Recommends time-limited permit for Nyhamna').* News item, 14 June 2007.
- The Norwegian Pollution Control Authority (2009) *112 av 113 virksomheter overholdt kvoteplikten ('112 of 113 enterprises complied with their duty to surrender allowances').* News item, 11 May 2009.
- The Norwegian Pollution Control Authority (2007) *Utslippskrav til kraftvarmeverk på Mongstad ('Emission requirements for the combined heat and power plant at Mongstad').* News item, 10 May 2007.

Websites
- *Belønningsordningen for bedre kollektivtrafikk og mindre bilbruk i byene ('The reward scheme for better public transport and less use of cars in cities')*. <www.kollektivkampanjen.no> [Download date: 15 January 2010]
- Naturkraft (2009) *3 TWh passert! (3 TWh exceeded).* <http://www.naturkraft.no/default.asp?V_ITEM_ID=760> [Download date: 10 January 2010]
- Pütz, Konrad (2007) *Biofuel fact sheet,* The Bellona Foundation, 3 January 2007 [Download date: 7 July 2009]
- Statistics Norway (2009) *Energy balance and energy accounts 2007 and 2008.* <http://www.ssb.no/emner/01/03/10/energiregn/> Published on 1 December 2009.
- Statistics Norway (2009) *Road goods transport, 3rd quarter 2009*.
- The Ministry of Finance: *Avgift på elektrisk kraft ('Taxes on electric power').* <http://www.regjeringen.no/nb/dep/fin/tema/skatter_og_avgifter/saravgifter/avgift-pa-elektrisk-kraft.html?id=558368> [Download date: 17 April 2009]
- The Ministry of Finance: *Generelt om særavgifter ('General information about special taxes').* <http://www.regjeringen.no/nb/dep/fin/tema/skatter_og_avgifter/saravgifter.html?id=447103> [Download date: 15 April 2009]

- The Ministry of the Environment (2006) *Utslippstillatelse for CO_2 fra kraftvarmeverket på Mongstad ('Emission permit for CO2 from the combined heat and power plant at Mongstad').* <http://www.regjeringen.no/nb/dep/md/dok/andre/brev/utvalgte_brev/2006/utslippstillatelse-for-co2-for-statoils-.html?id=270811> Letter of 12 October 2006.
- The Norwegian Directorate of Water Resources and Energy (2008) *Norsk vindkraftproduksjon i 2008 ('Norwegian wind power production in 2008').* <http://www.nve.no/PageFiles/7407/prod-rapport2008-off.doc?epslanguage=no> Published on 20 May 2009.
- The Norwegian Directorate of Water Resources and Energy (2010) *Vindkraftproduksjon 2009 ('Wind power production 2009').* <http://www.nve.no/no/Energi1/Fornybar-energi/Vindkraft/Vindkraftproduksjon-2009/> Published on 2 February 2010.
- The Norwegian Pollution Control Authority (2006) *Etablering av kraftvarmeverk på Mongstad. Statens forurensningstilsyns anbefaling til Miljøverndepartementet ('Establishment of a combined heat and power plant at Mongstad. The Norwegian Pollution Control Authority's recommendation to the Ministry of the Environment.')* <http://www.klif.no/nyheter/dokumenter/mongstad-gasskraftverk_anbefaling180806.pdf> Published on 18 August 2006.
- The Norwegian Pollution Control Authority: *Gasskraft ('Gas power').* <http://www.klif.no/no/Tema/Klima-og-ozon/Gasskraft/> [Download date: 15 June 2009].
- The Norwegian Pollution Control Authority: *Gasskraftverk med konsesjon (List of gas-fired power plants granted a licence).* http://www.klif.no/seksjonsartikkel____41549.aspx. [Download date: 15 June 2009]
- The Petroleum Safety Authority Norway *(2009) Guidelines to Regulations relating to conduct of activities in the petroleum activities.* <http://www.ptil.no/aktivitetsforskriften/category383.html#_Toc250635989> [Download data: 10 January 2010]
- www.gassnova.no
- www.industrikraft.no.
- www.klimakur2020.no

Other sources

- Angelsen, Arild et al. (2009) *Reducing Emissions from Deforestation and Forest Degradation (REDD) An Options Assessment Report (Prepared for the Government of Norway*), Meridian Institute, 2009.
- Briseid, Tormod; Odd M. Harstad and John Morken (2008) *'Klimagasser fra landbruket: Utslipps-reduksjoner, forslag til mål, tiltak og virkemidler' ('Greenhouse gases from agriculture: Emission reductions, proposed targets, measures and policy instruments').* Bioforsk report vol. 3, no 9, 2008.
- Bruvoll, Annegrete and Bodil Merete Larsen (2004) *Greenhouse gas emissions in Norway: Do carbon taxes work.* Energy Policy 32, 493–505. 2004
- Econ Pöyry (2007) *Virkemiddelapparatet og miljøteknologi ('The policy instrument system and environmental technology').* Report 2007-096.
- Econ Pöyry (2007) *Energiloven og energieffektivisering ('The Energy Act and energy efficiency').* Report no 2007-077.
- Econ Pöyry (2009) CDM – Styrker og svakheter. ('CDM – Strengths and weaknesses') Report 2009-038.
- EEA (2008) *Greenhouse gas emission trends and projections in Europe, 2008. Tracking progress towards Kyoto targets*. European Environment Agency report 5/2008.
- Einang, G. (2006) *Olje- og gassproduksjon til havs – energibruk og effektivitet ('Offshore oil and gas production – energy use and efficiency').* Master's thesis, University of Stavanger.
- Energi21 (2008) *Energi 21– A collective R&D strategy for the energy sector.*
- Gassco (2009) *'Naturkraft Integration Mapping Study'* 6 March 2009.
- Civitas AS and Kjell Gurigard (2005) *Nasjonal klimatiltaksanalyse: Delanalyse om tiltak innenfor energibruk og -produksjon ('National Climate Measures Analysis: sub-analysis of measures in the field of use and production of energy').* .
- Hartmark Consulting AS (2003) *En evaluering av Statens miljøfond for Miljøverndepartementet ('An evaluation of Statens miljøfond for the Ministry of the Environment').*
- IPCC (2007) *Summary for Policymakers. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

- Langerud, Bjørn et al. (2007) *Bioenergi i Norge: Potensialer, markeder og virkemidler ('Bioenergy in Norway – potentials, markets and measures'*). Eastern Norway Research Institute report no 17, 2007.
- OECD (2001) *Environmental Performance Reviews Norway*. ISBN: 9789264195738.
- OG21 (2007) *OG21 – Technology Strategy for 'Environmental Technology for the Future'*. www.og21.org, 27 November 2007.
- The Norwegian Oil Industry Association (2006) *Veiledning for energiledelse ('Energy Management Guidelines')*.
- The Norwegian Oil Industry Association (2009) *The petroleum industry and climate issues.* KonKraft report 5.
- Statoil Hydro (2006) *CO_2 Masterplan Mongstad*.
- Stern, Nicolas (2007) *The economics of climate change. The Stern Review.* ISBN 0-521-70080-9. Cambridge University Press.
- The Norwegian Board of Technology (2005) *Bærekraftig innovasjons- og teknologipolitikk* ('Sustainable innovation and technology policy'), Report 2-2005.
- The Norwegian Board of Technology (2007) *Fra rådet til tinget nr. 16, november 2007*. Information from the Norwegian Board of Technology to the Storting.
- The Norwegian Board of Technology (2007) *Klimapolitikken og fremtidig pris på CO_2* ('Climate policy and the future price of CO_2'). Report 5-2007.
- The Institute of Transport Economics (2007) *Forecasts for Norwegian freight transport 2006–2040.* Institute of Transport Economics report 907/2007.
- Trømborg, Erik et al. (2007) *Klimagasser og bioenergi fra landbruket ('Greenhouse gases and bioenergy from agriculture') INA expert report 11*.
- UN-REDD (2008) *FAO, UNDP og UNEP, UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, UN-REDD: Framework Document,* 20 June 2008.
- UNFCCC*: Annex I National Communications and Reports Demonstrating Progress under the Kyoto Protocol.* www.unfccc.int.
- UNFCCC (2006) Report on the centralized in-depth review of the fourth national communication of Norway. FCCC/IDR.4/NOR.
- Urbanet Analyse and Norconsult (2007) *Evaluering av Belønningsordningen ('Evaluation of the reward scheme')*.

241 344
Print 07 Gruppen AS / Lobo Media AS 2010

Office of the Auditor General of Norway

Riksrevisjonen
P.O. Box 8130 Dep
N-0032 Oslo

+47 22 24 10 00 (Tel.)
+47 22 24 10 01 (Fax)
riksrevisjonen@riksrevisjonen.no

www.riksrevisjonen.no