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Foreword

Since the last Environmental Performance Review in 2001, Norway has promoted new policy approaches that continue to challenge and inspire.

Norway's sustainable development policy represents a unique approach for integrating economic and environmental policies. Particular attention is paid to ensuring that the depletion of oil and gas reserves contributes to increasing other forms of capital, especially human and natural capital. Policy implementation is overseen by the Ministry of Finance, and is supported by a strong analytical framework, and society's broad participation in policy making.

By virtue of its membership in the European Economic Area Agreement, Norway has adopted most EU environmental policies, and, with a few exceptions, is now fully compliant with their provisions. In some areas, Norwegian requirements are more stringent. As a result of effective policy implementation, the quality of Norway's air and water is relatively high, and the number of species threatened by extinction is relatively low.

Norway also plays a leading and innovative role in international environmental co-operation, especially in the areas of climate change, marine environment protection and chemicals. These efforts have been supported by substantial financial commitments: in recent years about one-quarter of Norway's bilateral ODA was allocated to the environment, which is high by OECD standards. This contribution is supported by Norway's official development assistance (ODA) which, at 1.06% of its gross national income, is the second largest in OECD.

Norway's continued environmental progress has been achieved against a backdrop of relatively high economic growth. Norway's pattern of economic development, including oil and gas exploitation, which accounts for more than 20% of GDP, has intensified some environmental pressures. For example, greenhouse gas emissions, municipal waste generation and pesticide use have all increased. This increases the need to improve the efficiency and effectiveness of environmental policies. This Review is intended to support Norway in this regard. It presents several recommendations, including:

- *Strengthen incentives for environmental protection in the main economic sectors by further removing environmentally harmful subsidies and exemptions to environmentally-related taxes.*
- *Agree on clear, realistic and cost-effective domestic targets for mitigating greenhouse gas emissions by 2020 and 2050, and strengthen the policies to meet these targets.*
- *Prevent and reduce waste generation more efficiently and effectively.*
- *Strengthen the management of protected areas, and promote environmentally sustainable aquaculture.*
- *Further reduce the use of hazardous chemicals.*

This Review is the result of a rich and co-operative dialogue between Norway and other members and observers of the OECD Working Party on Environmental Performance. It is meant to provide support for Norway to further strengthen its environmental performance. Norway's experiences should also provide insights for policy makers in other countries about effective and efficient approaches for achieving ambitious environmental policy objectives.

Angel Gurría

OECD Secretary-General

Preface

The principal aim of the OECD Environmental Performance Review programme is to help member and selected partner countries to improve their individual and collective performance in environmental management by:

- helping individual governments to assess progress in achieving their environmental goals;
- promoting continuous policy dialogue and peer learning;
- stimulating greater accountability from governments towards each other and the public opinion.

The present report reviews the environmental performance of Norway since the previous review in 2001. Progress in achieving domestic objectives and international commitments provides the basis for assessing environmental performance. Such objectives and commitments may be broad aims, qualitative goals, or quantitative targets. A distinction is made between intentions, actions and results. Assessment of environmental performance is also placed within the context of a country's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions, and demographic trends.

The OECD is indebted to the Government of Norway for its co-operation in providing information, for the organisation of the review mission to Norway (21-28 March 2010), and for facilitating contacts both inside and outside governmental institutions.

Thanks are also due to all those who helped in the course of this review, to the representatives of member countries participating in the OECD Working Party on Environmental Performance, and especially to the examining countries: Ireland, Japan, New Zealand and Sweden.

The team that prepared this Review comprised experts from reviewing countries: Mr. Joseph Curtin (Ireland), Mr. Koji Shimada (Japan), Ms. Dana Peterson (New Zealand), and Mr. Mark Marissink and Mr. Ulrik Westman (Sweden); members of the OECD Secretariat: Mr. Gérard Bonnis, Mr. Brendan Gillespie, Mr. Krzysztof Michalak, Mr. Tappei Tsutsumi and Ms. Frédérique Zegel. Nils-Axel Braathen contributed valuable input to several chapters while Ms. Carla Bertuzzi, Ms. Sara Margaret Crohem, Mr. Shayne MacLachlan and Ms. Sarah Sentier (OECD Secretariat) provided statistical and editorial support during the preparation of the report.

The OECD Working Party on Environmental Performance discussed the draft Environmental Performance Review of Norway at its meeting on 30 November 2010 in Paris, and approved the Assessment and Recommendations.

Table of Contents

Part II

Selected Issues

Tables

Figures

General Notes

Signs

The following signs are used in Figures and Tables:

. .: not available

–: nil or negligible

.: decimal point.

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD except Estonia and Slovenia,[1] *i.e.* Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom.

OECD: This zone includes all member countries of the OECD except Chile,[2] Estonia,[1] Israel[2] and Slovenia,[1] *i.e.* the countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Norwegian Krone (NOK)

In 2009, NOK 6.290 = USD 1.00.

In 2010, NOK 6.045 = USD 1.00.

Cut-off date

This report is based on information and data available up to the beginning of December 2010.

Notes

1. Slovenia has been a member of the OECD since 21 July 2010 and Estonia from 9 December 2010.
2. Chile has been a member of the OECD since 7 May 2010 and Israel from 7 September 2010.

Executive Summary

Since the last OECD Environmental Performance Review in 2001, Norway has continued to play a pioneering role in environmental protection and sustainable development. Nationally, environmental policies have been strengthened in many areas. As a result, the quality of air and water is generally high. The number of species threatened by extinction is low by OECD standards. Internationally, Norway has spearheaded an impressive range of important initiatives.

Norway's environmental progress was achieved in a period of relatively high growth: GDP rose by 18% from 2000-09. This growth increased many environmental pressures. Total final consumption (TFC) of energy increased, particularly private final consumption and transport use. CO_2 emissions, municipal waste generation and pesticide use all increased. Thus there is a continued need to implement efficient and effective environmental policies and to make them more coherent, both from an environmental policy perspective and in relation to economic and sectoral policies.

Norway experienced a comparatively short and modest downturn in the global economic and financial crisis. This reduced some environmental pressures. Economic recovery is now under way: the rate of growth is expected to be positive and to increase in 2010-11. The rapid recovery is due in part to a stimulus package of NOK 20 billion in 2009, equivalent to 0.8% of GDP. An additional stimulus of 0.6% of GDP was built into the 2010 budget. Some estimates suggest that about 17% of the 2009 stimulus was "green". However, many of the measures were designed to boost employment, and some were likely to reinforce environmental pressures. The overall environmental and economic impacts of these measures merit careful assessment. There is scope to remove environmentally harmful subsidies, and to scale back exemptions and increase revenue from environmentally related taxes. This would support policies for both fiscal consolidation and environmental protection.

Sustainable development is an overarching policy objective

Norway's leading role in environmental protection and sustainable development coincides with a period in which it has continued to benefit from the exploitation of oil and gas. In 2009, this sector accounted for about 24% of GDP and 46% of export revenue. In 2002, Norway adopted a National Sustainable Development Strategy (NSDS), which was revised in 2007. It focuses on how Norway can contribute to sustainable development globally and assure sustainable development nationally. The concept of sustainability nationally is

framed in terms of maintaining national capital over time. Key questions are: *i)* whether national wealth components – human, natural, produced and financial – are being built up; and *ii)* the extent to which depletion of Norway's oil and gas reserves is compensated by increases in other forms of capital.

To support this focus on national capital, Norway has established a strong analytical framework for integrating environmental, social and economic considerations. The Ministry of Finance is responsible for co-ordinating the government's work on sustainable development. The National Sustainable Development Strategy establishes seven priority areas[1] and five key principles[2] to be used when evaluating policies. Progress is monitored through a set of indicators. The evidence suggests that the total capital stock, and the income it generates, is increasing, despite the gradual depletion of oil and gas reserves. Human capital appears to account for about three-quarters of total national capital.

Substantial progress has been made in developing and implementing environmental policies

As a member of the European Economic Area (EEA), Norway has transposed all EU environmental directives covered by the EEA Agreement. In some areas, Norwegian requirements are more stringent. Steps have been taken to simplify regulatory procedures, such as those related to environmental permitting, and to reduce administrative burdens on the regulated community. Enforcement is better targeted, is risk based, and has a deterrent effect. The pioneering use of economic instruments has been extended in innovative ways, *e.g.* through taxes on waste landfilling and incineration, and on SO_x and NO_x emissions. The percentage of taxes in energy prices is higher in Norway than in most other OECD countries. In some cases, negotiated agreements with industry have played a useful role. The application of some environmental policy instruments has helped stimulate environmentally favourable innovations.

Emissions of conventional air pollutants (SO_x, NO_x, ammonia, NMVOCs and CO) decreased over the review period, despite the high rate of economic growth. These emission reductions have helped reduce the acidification and eutrophication effects of air pollution. Nevertheless, further efforts are needed to achieve the emission reduction target for NO_x, particularly from shipping, oil and gas extraction, and land transport, and to maintain urban air quality standards during winter.

Water management has improved. Discharges of nitrogen and phosphorus to inland and coastal waters were reduced from urban areas, industry and agriculture. However, eutrophication is expected to continue to be a challenge from these sources and, increasingly, from aquaculture. Norway has begun implementing the EU Water Framework Directive ahead of schedule. In June 2010, the government approved the first water management plans, covering about 20% of fresh and coastal waters. Modernisation of the water supply and sanitation networks should be accelerated to minimise potentially adverse effects on human health and reduce costs associated with leakage.

Norway has a long tradition of broad participation in policy formulation. Policy development is underpinned by a comprehensive information base and strong capacity for technical and economic analysis. There is increasing use of cost-benefit analyses and macro- and microeconomic modelling of policy options. Nevertheless, the cost-effectiveness of some policies aimed at achieving often ambitious targets could be enhanced, as could coherence among them.

Further efforts are needed to achieve ambitious climate targets

Norway continues to be a leader in the international effort to address climate change and has adopted ambitious emission mitigation targets. Its commitment under the Kyoto Protocol is a 1% increase of greenhouse gas (GHG) emissions compared to the 1990 level. Norway also made a unilateral commitment to reduce GHG emissions by 9% against the same baseline. Emissions, associated with a rapidly growing economy, were, until 2008, considerably higher than in 1990. A sharp fall in emissions in 2009, linked to the recession, brought the level close to the Kyoto target. As this reduction is most likely to be transitory, meeting the Kyoto commitments is expected to require the purchase of emission permits on international carbon markets.

CO_2 emissions from energy use have increased by 10% since 2000. The main sources of emissions are transport (36%), oil and gas extraction (26%), and industry (18%). Emissions per unit of GDP have decreased by 16% over the same period, and are well below the OECD Europe average. This reduction is linked to the high share (96%) of hydropower in electricity generation. The CO_2 emission intensity of offshore oil and gas extraction increased by 15% between 2000 and 2009.

Norway has pursued economy-wide as well as sector-specific approaches to reduce emissions. It was one of the first countries to introduce a carbon tax, and it joined the EU Emissions Trading System in 2008. However, the set of economic instruments has become complex, and opportunities exist to streamline and better target measures so as to make them more cost-effective and coherent. For emission sources that are directly or indirectly covered by the cap, further reductions in CO_2 emissions would not be achieved through additional instruments such as emission taxes, renewable energy targets, or energy efficiency standards. Additional instruments are required only if they provide co-benefits (such as improved health outcomes) or effectively address other market failures (*e.g.* technology spillover). They should be applied only if the benefits exceed the costs (without assuming any benefits regarding CO_2 emission reductions). Any subsidies should be well targeted to the relevant market failure and time bound.

Norway is still some distance from achieving its unilateral target for the Kyoto period. Nevertheless, it is considering ambitious targets for 2020 and 2050. This underlines the importance of carefully assessing the environmental and economic implications of such targets, applying the most cost-effective instruments to achieve them, and adapting policy measures in light of experience to close any implementation gaps that may arise.

New and innovative approaches are being applied to maintain biodiversity

Norway has developed an ambitious biodiversity policy, and significant progress has been made to provide the means to achieve its goals. The new, innovative Nature Diversity Act (2009) brings together many biodiversity-related issues, and introduces new principles and tools for sustainable management of biodiversity. In addition, several sectoral laws have been revised and new laws enacted that strengthen biodiversity protection. The area of land under protection has increased significantly. Sea management plans could open the way for better protection of marine areas. More broadly, there has been substantial investment in expanding the biodiversity knowledge base, including the establishment of a Biodiversity Information Centre. These activities have been supported by a substantial increase in public expenditure on biodiversity, especially in recent years.

Nevertheless, Norway still faces major challenges in the conservation and sustainable use of biological diversity. Protected areas do not sufficiently cover all nature types; on land, the low percentage of forests under protection is of particular concern. Norway lacks overall targets and objectives for forest protection, though a voluntary forest protection programme is beginning to pay-off five years after implementation. The conservation of biodiversity within protected areas is not sufficiently secured. Increasing aquaculture, including cod farming, poses a threat to fish stocks, water quality and biodiversity in Norwegian coastal waters and possibly beyond. Although Norway's four large carnivore species (brown bear, lynx, wolf and wolverine) show a slight upward trend, they are all listed as threatened on the 2010 Red List. Protection targets are set at levels too low to maintain viable populations. Spatial planning has not been effective in halting the loss of large "wilderness" areas, nor in preventing building in coastal zones and along lakes and rivers.

Waste generation continues to outstrip economic growth

Norway's regulatory framework for waste management was revised and simplified in 2004. New instruments were applied to curb waste generation and stimulate waste recovery, including several taxes on landfill and incineration. Consideration should be given to retaining the incineration tax, due to be abolished, as it has proved effective. Intermunicipal co-operation has been enhanced and greater use made of private and corporatised public waste management utilities. In 2008, half of the energy for district heating was produced from waste incineration, and the amount of energy from this source increased by 46% between 2000 and 2008.

Despite these measures, the target of reducing waste generation relative to the rate of economic growth has not been achieved. Some services, and manufacturing sectors such as food processing, have experienced significant growth. Municipal waste generation is higher than the OECD or EU15 average, although the reported household waste fraction corresponds to the OECD average and is significantly less per capita than those of Denmark, the Netherlands, Spain and Germany. Reported generation of hazardous waste

increased by 64% over the review period and now accounts for 10% of waste generated. About 90% of hazardous waste is treated domestically, approaching the target of 100%.[3] Further efforts are needed to assure appropriate treatment and better control of transboundary movements of hazardous waste.

Norway has made significant progress in diverting waste from landfills and improving their environmental performance. Nevertheless, the total amount of waste sent to landfills has slightly increased. Rates of recovery of household and industrial waste are in line with OECD averages. Transboundary transfers of waste have increased significantly. To some extent, Norway is trading combustible non-hazardous waste for the hazardous residue of waste incinerated abroad.

In most municipalities, waste collection charges are at, or close to, cost-recovery levels. More differentiated charges according to weight or waste fractions could provide further incentives to increase recycling and waste reduction. Extended producer responsibility regimes have been broadened and their effectiveness has been enhanced by the introduction of taxes connected with deposit-refund systems for end-of-life products. Norway is the first European country to provide free "take-back" for waste electrical and electronic equipment (WEEE), going beyond the requirements of the corresponding EU directive. The amount of WEEE collected per capita is eight times the level required by the directive.

International environmental co-operation remains a high priority

Norway has continued to play an active and innovative role in promoting international environmental co-operation, bilaterally (especially with Russia), regionally and globally. Particular emphasis has been given to the development of a sound scientific basis to support international environmental co-operation, *e.g.* in the development of a global convention on mercury and more ambitious global targets on persistent organic pollutants, and in preparing joint assessments of the marine environment in the Barents Sea and North-East Atlantic.

Norway initiated a binding regional agreement, and subsequently a 2009 agreement in the Food and Agriculture Organization (FAO), on port state measures concerning illegal, unreported and unregulated fishing. It has also continued to play a leading role in developing international conventions to reduce the environmental impacts of shipping, for example on ballast water and ship recycling. Further efforts are needed to accede to, and implement, agreements on preparedness for pollution incidents by hazardous and noxious substances and on-ship recycling.

The oil and gas industry has adopted measures that have led to a dramatic reduction of discharges of most harmful chemical additives to the sea. Nevertheless, reducing pollution from oil extraction, including shipping, is becoming more challenging as some fields are nearing depletion. In 2007, an accident in the Statfjord field in the North Sea resulted in the second largest oil spill on the Norwegian continental shelf. With the expected increase of activities in the Barents Sea and the Artic region, Norway will need to reinforce its efforts to protect the marine environment and establish robust pollution prevention and response mechanisms.

Since 2000, Norway's net official development assistance (ODA) has risen by 67% to reach USD 4 billion in 2009, or 1.06% of gross national income, the second highest percentage among OECD Development Assistance Committee (DAC) donors. Following the adoption of an action plan for the environment in 2006, environment-focused aid doubled to USD 677 million, equivalent to a quarter of bilateral ODA, a high share compared to other donors. However, there is a question on whether sufficient expertise exists in the relevant agencies to manage these resources cost-effectively. Climate change, reduction of deforestation (REDD), and clean energy are the main priorities. There is some risk of climate-related issues crowding out other important environment and development issues. Further efforts are needed to ensure that adequate environmental assessments are carried out on development co-operation programmes and projects, particularly in the energy and oil and gas sectors.

Notes

1. *i)* international co-operation to promote sustainable development and combat poverty; *ii)* climate change and long-range transboundary air pollution; *iii)* biodiversity and cultural heritage; *iv)* natural resource management; *v)* hazardous chemicals; *vi)* sustainable economic and social development; and *vii)* Sami perspectives on environmental and natural resource management.
2. *i)* equitable distribution; *ii)* international solidarity; *iii)* the precautionary principle; *iv)* the polluter pays principle; and *v)* joint efforts (*i.e.* by the whole population).
3. Some caution is needed in interpreting waste data due to the use of different national definitions and new estimation methods introduced during the review period.

PART I

Sustainable Development

PART I

Chapter 1

Developments since the 2001 Review

Showing strong signs of economic recovery following the 2008-09 global downturn, Norway continues to develop its capacity as a pioneer in various aspects of environmental policy. Since the 2001 OECD review, Norway has prioritised certain policies that aim to reduce environmental strains, notably in the areas of: climate change, biodiversity, marine environment, waste management and chemicals management. Even as a non-EU member country, Norway has influenced EU environmental policy, and in some areas has adopted requirements more stringent than those set out by the EU. However, there are continuing issues concerning the increase in greenhouse gas (GHG) emissions; the threat posed to certain species in forests, waterways, and agricultural landscapes; and the escalation in waste generation.

1. Key socio-economic developments

1.1. Economic structure and performance

Norway is one of the richest countries in the world. It ranks second to Luxembourg among OECD countries in terms of GDP per capita, based on purchasing power parities, at USD 47 703 (OECD, 2010). Since the discovery of oil in 1969, the economy has grown at about 3% per year in real terms (Table 1.1). Over the last 50 years, there has been a fundamental structural change, with a major shift from the primary and secondary sectors (including oil and gas) to the tertiary sector: these sectors now account, respectively, for 3%, 21% and 76% of employment and 1%, 41% and 58% of GDP. Although Norway was affected by the global economic and financial crisis, the recovery began earlier than in many other countries and positive growth was forecast in 2010 (OECD, 2010). The recovery has been supported by a fiscal stimulus that is now being withdrawn.

Oil and gas

Norway's economy has benefited enormously from oil and gas exploitation, with extraction accounting for about 20.4% of GDP and 46% of export revenue in 2009. It is estimated that Norway holds 0.7% of world oil reserves and 1.7% of gas reserves. At the current rate of extraction, calculated oil reserves would be exhausted in eight years' time and gas reserves in 26 years. In practice, production will continue longer as annual production decreases. Exploration may identify more reserves. Recognising that oil revenue would gradually decrease, the government established the Government Pension Fund – *Global* (the former Government Petroleum Fund), funded by oil revenue, which is not allocated in the national budget. The fund increased from NOK 48 billion in 1996 to NOK 2 759 billion at the end of 2009 (around NOK 570 000 per capita).

Energy and industry

Hydropower accounts for about 96% of Norway's electricity production. Norway has the second highest *per capita* consumption of electricity in the world, at 27 500 kWh, almost three times the OECD average (OECD-IEA, 2010). Historically, electricity has been provided at a low price and has underpinned the development of an energy-intensive manufacturing sector: metals, chemicals, shipbuilding and wood processing. In 2002, coal extraction began in Svalbard, reaching 4 million tonnes in 2007. The transport sector is also a major energy consumer.

Agriculture, forestry and fisheries

As the number of farms has decreased over the last 50 years, their average size has increased. The area they cover has remained constant at about 3% of the total land area. Between 1950 and 2007, employment in agriculture fell from 20% to 2.3%, and the sector now accounts for 1.2% of GDP. Forests cover 32% of the land area and account for 0.2% of GDP. Between 1950 and 2007, employment in fisheries decreased from 100 000 to 13 300. Norway is the world's 11th largest fishing nation by catch. In addition, production of farmed fish, particularly salmon, has grown dramatically since the 1970s. In 2008, the total quantity produced was 844 000 tonnes, compared with capture production of 2.4 million tonnes.

Table 1.1. **Socio-economic trends and environmental pressures**

	Norway 2000-09 % change	OECD 2000-09 % change
Selected economic trends		
GDP[a]	17.6	14.5
Private final consumption[a]	32.9	18.8
Agricultural production	–3.1	. .
Industrial production[b, c]	–7.1	10.3
Road transport[c, d]		
Freight transport*	24.2	. .
Passenger, private car**	12.1	. .
Vehicle stock***	18.6	15.0[e]
Energy		
Total primary energy supply	4.6	–1.2
Total final consumption of energy[c]	5.6	2.5
Energy intensity	–11.0	–13.7
Renewable energy supply	–7.9	22.2
Selected social trends		
Population	7.5	6.2
Life expectancy at birth[f]	2.3	. .
Ageing index[g]	1.4	18.9[e]
Standarlised unemployment rates[c]	–22.0	–2.1
Selected environmental pressures		
Pollution[c]		
CO_2 emissions from energy use[h]	12.1	1.2
Emissions of SO_x	–25.4	–28.1
Emissions of NO_x	–13.9	–18.4
Resource use		
Water abstraction	28.9[i]	–1.3
Municipal waste per capita[c]	33.9	5.5
Material intensity[j, k]	29.1	–8.2
Nitrogenous fertiliser use	2.3	–3.1
Pesticide use[e]	97.5	. .

a) Based on data in USD at 2005 prices and PPPs.
b) Mining and quarrying, manufacturing, and production of electricity, gas and water.
c) To 2008.
d) Based on values expressed in: *tonne/km; **passenger/km; ***passenger cars in use.
e) To 2007.
f) To 2006.
g) Number of persons over 65 years old per hundred persons under age 15.
h) Sectoral approach; excluding marine and aviation bunkers.
i) From late 90s to 2007. Data include estimates.
j) Domestic material consumption (DMC) per unit of GDP.
k) To 2005.

Source: OECD, Environment Directorate; OECD-IEA (2010), *Energy Balances of OECD Countries*; FAO, *FAOSTAT Database*.

StatLink http://dx.doi.org/10.1787/888932375034

In 2008, the fish farming industry was worth NOK 17.3 billion, compared with NOK 12.2 billion for traditional fishing. The total export value of fish and fish products was some NOK 39 billion in 2008. Exports of fish account for almost 5% of total export revenue. Exports of farmed fish represent about half of all fish exports.

1.2. Social context

The *population* of Norway was 4.9 million in September 2010, having increased by 0.4 million since 2001, mainly due to immigration. Norway is the least densely populated country in Europe after Iceland, with 15 inhabitants per square kilometre, but nearly 80% of the population live in urban settlements, where population density is over 100 times the national average.

The rate of *unemployment* in Norway is low, 3.3% in 2010 (OECD, 2010), compared to 10.1% in the euro area. This is linked to the relatively large share of the adult population, particularly women, in the workplace. *Income inequality* did not change significantly during the review period. Some 7% of the population receives a permanent disability pension.

Ageing of Norwegian society is broadly in line with that in other OECD countries. It reflects a population that is growing older, combined with low birth rates (despite a relatively high fertility rate[1]). The share of population aged 65 or over is 15% and is projected to reach 20% in 2030, slightly lower than the OECD average (OECD, 2009).

Three out of four Norwegians are members of at least one *non-governmental organisation* (NGO), and half the population belongs to two or more organisations. Volunteering and donations account for half of Norwegian NGO resources. Around one-third of Norwegian development assistance is provided through NGOs. Norway, together with other Nordic countries, is at the forefront of *access to the Internet and other information technology*: 87% of the population has access to a personal computer at home, and 83% to the Internet.

2. Key environmental pressures

Two-thirds of Norway is mountainous. The country includes a large number of islands and a long, indented coast. Its wide continental shelf and many fjords provide opportunities to exploit marine fish resources (Box 1.1).

Box 1.1. **Physical context**

Mainland Norway occupies an area of 324 000 km^2, bordered on the east by Sweden and, within the Arctic Circle, by Finland and Russia. This includes some 50 000 islands that lie off a *long, indented coastline* along the North Sea, the Norwegian Sea and the Barents Sea in the Arctic Ocean. Norway also exercises sovereignty over Svalbard (including Spitsbergen), an Arctic archipelago with an area of 61 000 km^2. *Climatic conditions* are considerably milder than those at similar latitudes elsewhere due to the warm waters of the Gulf Stream.

About two-thirds of Norway is mountainous. Some 12% is considered unspoiled or wild. About 32% of the land area is covered by *forests*, two-thirds of which are productive. Another 52% of *land cover* consists of open land with vegetation on mountain plateaus (30%) and unproductive areas in the mountains (22%). Agricultural land covers only 3% of Norway, of which two-thirds is permanent grassland and one-third arable and permanent crop land. The remaining 14% of the land area consists of wetlands, including bogs and moors (6%); freshwater and glaciers (7%); and built-up land, including roads (1%).

Norway has abundant *wildlife*. Reindeer, wolverines, bears, lynxes, lemmings and other alpine-arctic wildlife are found throughout the country, although, in the south, only in mountainous and forested areas. Most of the country's rivers and more than 160 000 lakes have a great variety of fish, including trout and salmon. Elk are common in large coniferous forests, as are red deer on the west coast. Foxes and many species of badgers are also common, and beavers thrive. Svalbard has polar bears. Species of conservation interest include Atlantic salmon, wild reindeer, Arctic fox and large predators such as bears, wolves, wolverines and lynxes. A long coastline with a wide continental shelf and countless fjords provide Norway with good conditions for exploiting *marine fish resources*, notably cod, capelin and herring.

Norway has substantial offshore *oil and gas resources*. Coal mining began in 2002 following the discovery of a large deposit in Svalbard. Norway is Europe's largest producer of *ilmenite* and has very large resources of titanium minerals, including a rutile deposit.* Iron ore mining has declined since peak production in the early 1980s.

* Rutile (titanium dioxide) also occurs naturally in Australia, the United States, India and South Africa. Synthetic rutile can be produced from naturally occurring ilmenite, which is a complex oxide with iron. Rutile is used as white pigment in paint, plastic and paper.

Climate change

In 2008, greenhouse gas (GHG) emissions were 8% above the 1990 level. This contrasts with the Kyoto target of 1% and a unilateral commitment of a 9% reduction. Transport, oil and gas extraction, and manufacturing account for the bulk of emissions. The CO_2 emission intensity of the economy overall, and in the main sectors, has decreased compared to 1990 levels but increased since 2000 (Figure 1.1).

Biodiversity

In 2006, more than 20% of 18 500 monitored species were considered threatened. Comparison of mammals, birds and freshwater fish suggests that the numbers of threatened species in these categories compare favourably with those in other OECD countries. Most threatened species are found in forests and, to a lesser extent, agricultural landscapes. Changing land use and infrastructure development are the main pressures. Conserving biodiversity in protected areas, combating threats from aquaculture and protecting marine areas are important challenges.

Waste management

Municipal waste generation has increased faster than the rate of economic growth (Figure 1.1).[2] Some manufacturing sectors, such as food processing, and services have experienced significant growth in waste generation. Municipal waste generation is higher than the OECD or EU15 average. Reported generation of hazardous waste increased by 64% over the review period and now accounts for 10% of all waste generated. Over 70% of combustible waste is exported to neighbouring countries. Norway imports significant quantities of hazardous waste for final disposal.

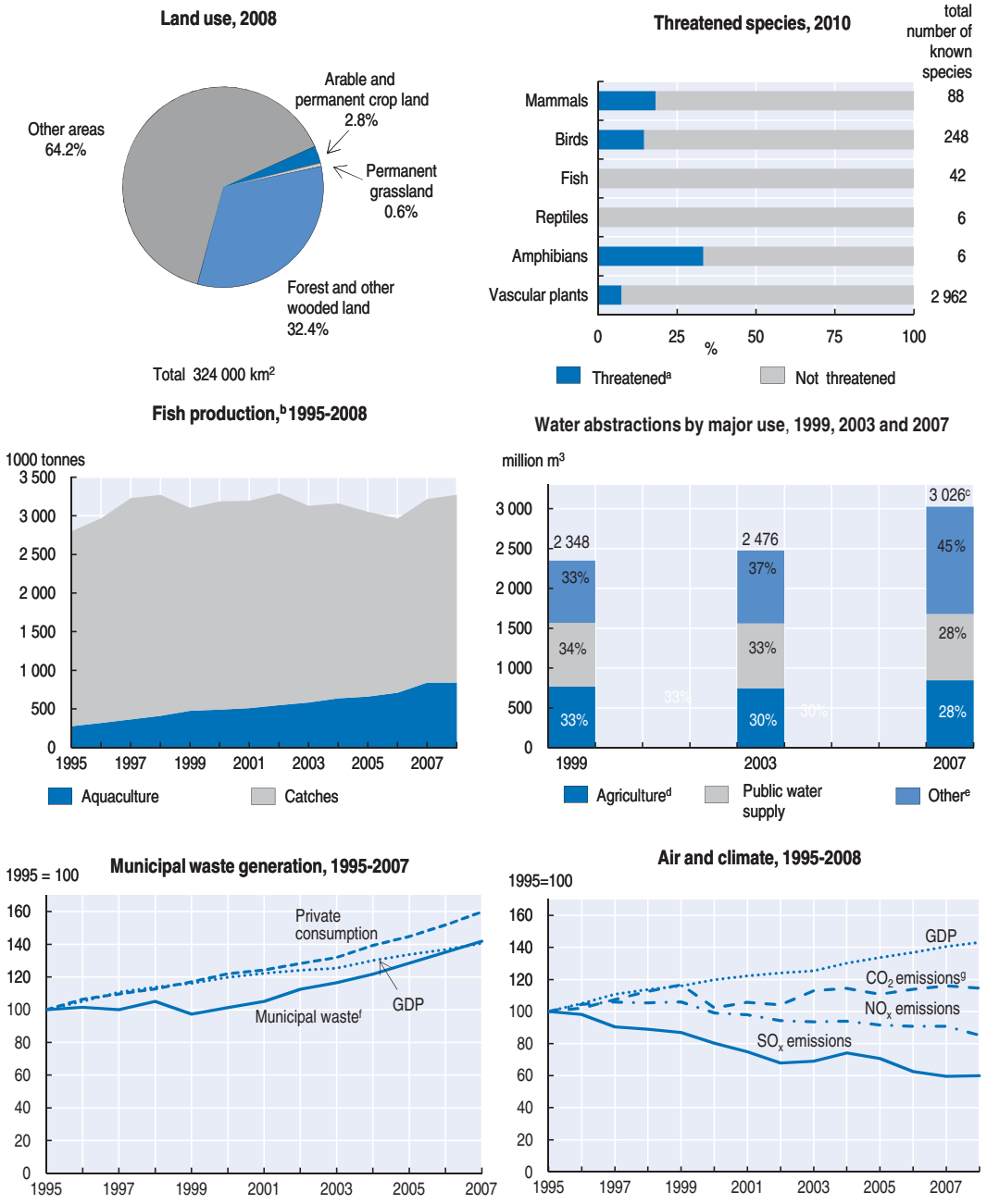
Air pollution

Emissions of SO_2 have continued to decrease, are well below the OECD average per unit of GDP and meet the Gothenburg target. Emissions of NMVOCs have been reduced since 2000 and Norway reached its NMVOC ceiling under the Gothenburg Protocol in 2008. Good progress has also been achieved in reducing NO_x, though further efforts are required to meet the Gothenburg commitment. Emissions of ammonia have been constant, just below the Gothenburg target. These trends, together with lower levels of these pollutants generated in other countries, have reduced acid deposition. Nevertheless, large areas of southern Norway are still exposed to acid deposition.

Water quality

In 2008, the Ministry of the Environment (MoE) determined that at least one-quarter of Norway's water bodies did not meet the ecological and chemical standards of the EU Water Framework Directive. Eutrophication is expected to be a continuing challenge, with municipal wastewater, agriculture, aquaculture and manufacturing the main sources. Most serious oil spills in Norway have originated from ship traffic near the coast. In 2007, an accident in the Statfjord field in the North Sea resulted in the second largest oil spill on the Norwegian continental shelf. As oil exploration and shipping extend to more fragile environments, the risks from these sectors are likely to increase.

Figure 1.1. **Selected environmental indicators**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species. Fish: 2 species are in the Norwegian 2010 Red List for Species, but the data are deficient.

b) Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans, molluscs and miscellaneous aquatic animals. Catches exclude marine mammals, crocodiles, coral, pearls, sponges and aquatic plants.

c) Includes estimates.

d) 2007: 2006 data. Includes fish farming.

e) Includes abstractions from mining, manufacturing and services.

f) Waste collected by or for municipalities,waste directly delivered and separate collection for recycling by the private sector. It includes production waste, household, bulky and commercial waste, and similar waste handled at the same facilities.

g) Emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.

Source: OECD, Environment Directorate; OECD-IEA (2010), *CO_2 Emissions from Fuel Combustion*; OECD (2010), *OECD Economic Outlook No. 87;* FAO, *FAOSTAT Database.*

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3. Framework for environmental and sustainable development

3.1. *Institutional framework*

Norway is not a member of the European Union. However, as part of the *European Economic Area* (EEA), it has agreed to transpose EU directives into national law, except in agriculture and fisheries. The agreement applies to the environment except in nature protection and some aspects of water management (Chapter 3). As a result, Norwegian environmental policy has been strongly influenced by the EU. Norway also has influenced EU environmental policy, and in some areas has adopted requirements more stringent than EU ones. Norway does not participate in EU institutions, but benefits from participation in the EU's single market. The EEA is overseen by the EFTA Surveillance Authority (European Free Trade Association). Norway, together with Iceland and Liechtenstein, provides a financial contribution to reduce social and economic disparities in Europe. From 2004 to 2009, these "EEA and Norway grants" amounted to EUR 1.3 billion.

In the national context, responsibility for co-ordinating work on *sustainable development* lies with the minister of finance, aided by state secretaries from various ministries. The Ministry of Finance co-ordinates policies on the economy, taxes, the budget and financial markets, and participates actively in structural and sectoral policy making. Sustainable development is seen as a core, long-term policy framework in which co-ordination and integration of economic, environmental and social policies are fundamental. The main objective is to make sustainable development central to policy making.

The *Ministry of the Environment* (MoE) is responsible for initiating, developing, implementing and monitoring measures to protect the environment. It seeks to influence sectoral ministries, and is responsible for co-ordinating the government's environmental policy objectives. The current minister is responsible for both environment and international development, underlining the important links Norway sees between these two policy areas. The MoE is supported in its work by five subordinate agencies:

- the Directorate for Nature Management;
- the Norwegian Polar Institute;
- the Directorate for Cultural Heritage;
- the Climate and Pollution Agency;
- the Norwegian Mapping Authority.

The *Climate and Pollution Agency* (KLIF) serves as the regulatory authority, conducts inspections, monitors the state of the environment, advises the ministry on key environmental challenges, supervises and monitors the environmental activities of counties, and participates in international environmental co-operation projects.

There was a marked decentralisation of environmental responsibilities during the review period. The responsibilities of the 19 counties and 430 municipalities increased (Chapter 3). The information and analytical base to support policy making was strengthened. Provisions for access to information, public participation and access to justice in environmental decision making were also strengthened.

The *Petroleum Safety Authority* (PSA), created as an independent government regulator of the oil and gas sector in 2004 under the Ministry of Labour, has regulatory responsibility for the sector's safety, emergency preparedness and occupational health and safety. The

PSA co-ordinates its actions with those of Climate and Pollution Agency (KLIF) regarding environmental impacts of offshore and inland oil and gas operations and associated pipeline systems.

Water resource management, including hydropower, is the responsibility of the *Ministry of Petroleum and Energy* (MPE) and a subordinate agency, the Norwegian Water Resources and Energy Directorate.[3] Responsibilities include protecting watercourses, licensing small hydropower stations, planning for emergencies and assuring watercourse safety. The *Ministry of Agriculture and Food* (MAF) supervises forest management.

In 2002, the government set up *Enova*, a public agency under the MPE, to provide incentives for renewable heating, wind power and energy efficiency. *Enova*'s budget (NOK 1.75 billion from 2010) is financed through the government's basic energy fund, a levy on electricity use and direct budget allocations. *Enova* enjoys considerable freedom with regard to the choice and composition of its strategy and policy measures. It has committed to ensuring that its projects yield new, environment-friendly energy production and energy saving of 18 TWh a year by the end of 2011 (from a base year of 2001).

In 2008, the government set up a public agency called *Transnova* under the Norwegian Public Roads Administration to administer grants (NOK 50 million a year) for projects to reduce CO_2 emissions from transport. Priority is given to the introduction of alternative fuels, such as second-generation biofuel, electricity and hydrogen.

3.2. Key initiatives

Sustainable development has continued to provide an overarching framework for environmental policy and its integration with economic and other policy areas. Environmental policy priorities have included climate change, biodiversity, marine environment, waste management and chemicals management. Environment has also been an important feature of foreign policy, and Norway has launched important international initiatives since the last review was published in 2001. It has also taken steps to implement the recommendations made in that review. These are summarised in Reference II of this report.

Sustainable development

The Norwegian government presented its first *National Sustainable Development Strategy* to the Johannesburg summit in 2002. The strategy was revised in October 2007. It focuses on how Norway contributes to sustainable development globally and assures sustainable development nationally. It identifies seven priority areas: *i)* international co-operation to promote sustainable development and combat poverty; *ii)* climate change and long-range transboundary air pollution; *iii)* biodiversity and cultural heritage; *iv)* natural resource management; *v)* hazardous chemicals; *vi)* sustainable economic and social development; and *vii)* Sami perspectives on environmental and natural resource management.

Climate change

Following debate on a white paper, the government unilaterally adopted a target for 2008-12 of reducing GHG emissions by 9% below the 1990 level (MoE, 2008). This is more ambitious than Norway's Kyoto Protocol commitment of 1% above the 1990 level. In addition, a target for 2020 was set at 30% below the 1990 level, more ambitious than the

EU's 20% target.[4] Norway has also made a political pledge to become carbon neutral by 2050[5] (taking into account its contribution to emission reductions abroad), going beyond the 80% reduction target endorsed by the European Council in 2009.[6]

The white paper proposed climate targets and action plans for the main sectors responsible for GHG emissions: oil and gas and energy; transport; manufacturing; primary industries; and waste management. A new white paper on climate change is expected in 2011. A white paper on agriculture and climate challenges (MAF, 2009) forms part of the basis for reassessment of climate policy and instruments in 2011.[7] An inter-agency project, Climate Cure 2020 (*Klimakur 2020*), investigated measures and instruments that can help achieve the national target for GHG emissions in the most cost-effective manner (KLIF, 2010).

Biodiversity

Specific goals for biodiversity were set in 2007 (MoE, 2007). The *Nature Diversity Act* (2009) introduced three key principles for biodiversity protection: the precautionary principle, the ecosystem approach and the polluter pays principle. The Act applies both on land and at sea. The *Planning and Building Act* (2009) seeks to better protect the shore zone from construction and to safeguard nature and open spaces for outdoor recreation. The Act introduces the concept of zones requiring special consideration, where restrictions on land use can be imposed. It also provides for climate-related concerns to be addressed in municipal land use planning (*e.g.* environment-friendly transport in connection with new development).

Marine environment

In the last decade, Norway has developed a comprehensive marine policy aimed at ecosystem-based management of the Norwegian seas that integrates the various human activities. It is based on a precautionary approach. Goals and principles were approved by the Council of State in 2002 (MoE, 2002). The government adopted integrated management plans for the Barents Sea-Lofoten area in 2006 and for the Norwegian Sea in 2009.

Chemicals

A white paper on hazardous chemicals (MoE, 2006) reiterated the precautionary principle as a key element of chemicals management policy. The white paper also identified 20 toxic chemicals and established a target of substantially reducing their release by 2010, from 1995 levels, or eliminating them entirely. Priority was given to surveys and monitoring of toxic substances in the High North. Norway has played an active role in the finalisation and implementation of the EU REACH Directive (Registration, Evaluation and Authorisation of Chemicals), which entered into force in 2007 (EC 1907/2006).

Waste management

Several pieces of waste legislation were integrated and streamlined in the 2004 Waste Regulations. In 2006, targets for final waste disposal were tightened and a commitment was made to reduce generation of each category of hazardous waste. Building on its pioneering role in the recovery of waste electrical and electronic equipment, Norway has introduced several new extended producer responsibility regimes. Taxes on landfilling and incineration were reformed in 2003 to enhance their environmental effectiveness.

International environmental co-operation

Norway has played a leading role in international environmental initiatives, including: the development of a global convention on mercury and the adoption of more ambitious global targets on persistent organic pollutants (POPs); joint assessments of the marine environment in the Barents Sea, North-East Atlantic and the Arctic; an agreement with the Food and Agriculture Organization (FAO) on port state measures to combat illegal, unreported and unregulated fishing; and international conventions on ship ballast water management and on-ship recycling. In 2006, Norway adopted an action plan that led to a doubling of its environment-related aid. In 2007, the government launched the Climate and Forest Initiative at the UN climate conference in Bali to promote early action on reducing emissions from deforestation and forest degradation in developing countries. This initiative is being supported by substantial financial assistance.

Notes

1. 1.9 children per woman, compared to the OECD average of 1.6.
2. Some caution is needed in interpreting waste data due to the use of different national definitions and new estimation methods introduced during the review period.
3. However, the MoE is responsible for implementation of the EU Water Framework Directive.
4. Norway's target may rise to 40% and the EU's to 30% if other major emitters agree to take on their fair share of a global reduction effort.
5. Norway would bring this target forward to 2030 if other developed countries also took on major obligations.
6. The EU target would rise to 95% if other world powers signed up for similar action.
7. Agriculture accounts for approximately 9% of Norway's GHG emissions.

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter included the following. Also see the list of websites at the end of this report.

FAO (Food and Agriculture Organization of the United Nations) (2010), *FAOSTAT Database*, FAO, Rome, *http://faostat.fao.org*.

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MoE (2006), "Working Together Towards a Non-Toxic Environment and a Safer Future", Report No. 14 (2006-07) to the Storting, MoE, Oslo.

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Statistics Norway (2009), *Natural Resources and the Environment 2008*, Statistics Norway, Oslo.

PART I

Chapter 2

Towards Sustainable Development

Norway has set ambitious objectives for environmental policy. With a strategy aimed at promoting sustainable development in policy design, these objectives are backed by a strong analytical framework for considering environmental, social and economic issues. This is complemented by a focussed approach to the management of human, natural, produced and financial capital. A further look at the cost-effectiveness of environmental policies will be necessary to ensure further progress for the environment, as will getting a grip on fiscal policy, with respect to certain taxes and subsidies. More investment in R&D could also bolster the sustainable growth agenda.

Assessment and recommendations

Norway has put in place an advanced strategy to promote sustainable development that is increasingly shaping practical policy formulation. It focusses on how Norway can contribute to sustainable development globally and assure sustainable development nationally. The concept of sustainability nationally is framed in terms of good management of the total national capital – comprising human, natural, produced and financial capital – and the evidence indicates the total capital stock is gradually increasing, together with the income that it generates. Regarding the other sustainable development indicators that Norway has selected, current trajectories for the large majority seem consistent with the targets set.

To support this focus on national capital, the country has established a strong analytical framework for integrating environmental, social and economic considerations. This builds on Norway's long tradition of broad participation in policy formulation, as well as the increasing use of cost-benefit analyses and macro- and microeconomic modelling of policy options. These arrangements have helped Norway to set ambitious targets for environmental policy.

However, in spite of this well-developed setting for policy formulation, and ambitious environmental policy targets, a number of the environmental policy instruments that have been implemented entail higher costs than need be, especially when taking into account how they interact with other policy instruments. Further consideration should be given to addressing this apparent paradox, and to increasing the cost-effectiveness of environmental policies. This could include consideration of how concern about the social impacts of environmental policies may affect the design of environmental policies.

Economic recovery has started. After providing a substantial fiscal stimulus, there is now a need to gradually tighten fiscal policy as the economy strengthens. Removing environmentally harmful subsidies and increasing environmental taxes would contribute to achieving both fiscal and environmental policy goals. This is evident in a number of sectors that have important environmental impacts, notably energy, transport, agriculture, forestry and fisheries.

An important part of the government's follow-up to its sustainable development strategy is how best to shape future climate policy. Norway has adopted a challenging level of ambition for domestic mitigation, considerably more ambitious than its international emission reduction obligation. The environmental and economic impacts of this level of ambition, as well as the identification of appropriate instruments to achieve it, merit careful consideration. In particular, and as examined further in the chapter on climate change, instruments applied in conjunction with the EU emissions trading scheme should provide co-benefits or effectively address other market failures.

Transport taxation has been designed to reflect some external environmental costs, but there is scope for improvements. For example, there is little justification from an environmental point of view to tax diesel less than unleaded petrol. The current differentiation in the CO_2 component of the purchase tax provides (in isolation) much stronger abatement incentives at the margin than the incentives provided to other emission sources (in addition to the incentives stemming from the motor fuel taxes). Abatement of CO_2 emissions from the transport sector could perhaps better be addressed through fuel taxes, with tax rates reflecting the CO_2 content of each fuel, possibly with a more modest CO_2-related differentiation in vehicle purchase taxes, if there is evidence that consumers do not take fuel use properly into account in their purchasing decisions. Norway should further consider introducing a broad-based road-pricing system to address other external costs of transport (*e.g.* air pollution, noise and congestion). The current subsidies provided to promote electric vehicles seem disproportionally large.

Direct payments to Norwegian farmers as a share of farm receipts remain among the highest in the OECD. New environmental payments were established over the review period. However, there are still possibilities for further greening of Norway's agricultural sector, including a shift towards less distorting forms of support, such as income support and payments targeting specific environmental outcomes. Production-linked support creates incentives to increase pesticide use, which runs counter to the objective of the (well-designed) pesticide tax. Price regulation of forest property sales, introduced to avoid conversion to other land uses, hampers structural adjustment of the forestry sector. About 80% of the productive forest area is owned by small forest holdings. Achieving economies of scale in forest management should be pursued at the river basin level as it would enhance the provision of forest ecosystem services.

Increased felling in Norwegian forests, and increased use of the biomass as an energy source, has largely been considered to be CO_2-neutral. However, as increased felling will reduce the carbon storage capacity of the forests at least for many decades, a question has recently been raised on this issue. Further analysis is needed as the cost-effectiveness of alternative policy measures could vary significantly.

The shift of support to fisheries from cost-reducing transfers to general services is a step in the right direction; support to general services does not provide direct incentives to overfish.

Norway's good economic performance contrasts with its poor performance on conventional innovation indicators, such as patents per capita. The share of research and development (R&D) in GDP is below the OECD average, reflecting the relatively low share of manufacturing in the economy. There is broad political agreement that efforts should be made to foster more R&D-intensive, "knowledge based" industries so as to maintain high, sustainable growth, particularly after oil and gas production decreases. These efforts should include designing environmental policies in a way that stimulates cleaner technological development. The development of technologies for carbon capture and storage (CCS) remains a priority in Norway's R&D strategy and receives substantial funding.

Recommendations

- Continue to improve decision making for implementing *the sustainable development strategy*, building further on the impressive analytical capacity established for this purpose.
- Further support environmental policy objectives by removing inappropriate exemptions in *environmentally related taxes* and (other) environmentally harmful subsidies.
- Consider introducing a *broad-based road-charging system*, *e.g.* to address transport-related air pollution, noise and congestion externalities.
- Consider further *greening Norway's agricultural sector*, including a shift towards less distorting forms of agricultural support, such as income support and payments targeting specific environmental outcomes.
- Reassess and clarify *the objectives of the carbon capture and storage programme* (domestic emission reduction, commercialisation, development co-operation); broaden collaboration, particularly targeting partners in countries where coal-fired power plants are under construction or planned.

1. The National Sustainable Development Strategy

Supported by the development and implementation of a considered strategy, sustainable development is shaping practical policy formulation in Norway. Sustainable development is seen as a core, overall long-term policy framework in which co-ordination and integration of economic, environmental and social policies are central to policy making.

The Norwegian Government presented its first National Sustainable Development Strategy (NSDS) to the Johannesburg summit in 2002. To transform the strategy into a more concrete and policy-oriented guide, an action plan for sustainable development called *National Agenda 21* (*NA 21*) was developed. The government presented *NA 21* to the *Storting* (Parliament) in its main economic policy document, the national budget, in the autumn of 2003.

The current government, having decided to follow the same conceptual, measurement and governance procedures, presented a revised NSDS to the *Storting* in October 2007. It focuses on how Norway can contribute to sustainable development globally and assure sustainable development nationally. It identifies seven priority areas: *i)* international co-operation to promote sustainable development and combat poverty; *ii)* climate change and long-range transboundary air pollution; *iii)* biodiversity and cultural heritage; *iv)* natural resource management; *v)* hazardous substances; *vi)* sustainable economic and social development; and *vii)* *Sami* perspectives on environmental and natural resource management. The new strategy is the result of extensive stakeholder dialogue and a broad hearing process. Swedish and Ugandan experts contributed to a peer review of Norwegian policy on sustainable development in general, resulting in analyses and suggestions for improvement. Many of the suggestions from the hearings and peer review were followed up in the new strategy, which was published as part of the 2008 national budget (MoF, 2007).

The National Sustainable Development Strategy (NSDS) sets out five key principles against which to judge policy action: *i)* equitable distribution; *ii)* international solidarity; *iii)* the precautionary principle; *iv)* the polluter pays principle; and *v)* joint efforts (*i.e.* by

the whole population). In addition, the strategy makes clear that, once these principles have been applied, policy options should be subject to a test of cost-effectiveness. The principles set out in the strategy represent probably the most explicit and developed incorporation of sustainable development considerations into declared economic policy aims in any OECD country (OECD, 2010a).

The NSDS frames the concept of sustainability at the national level in terms of whether Norway manages its resource base – the national wealth – so as to ensure that it is maintained over time. Key questions are: *i)* whether national wealth components – financial, real, natural, environmental and human capital – are being built up; and *ii)* the extent to which it can be expected that the reduction in Norway's oil and gas reserves, due to continued extraction, is compensated by increases in other sorts of capital. The strategy includes a core set of 18 sustainable development indicators to aid in judging progress (Table 2.1).

Table 2.1. **Sustainable development indicators**

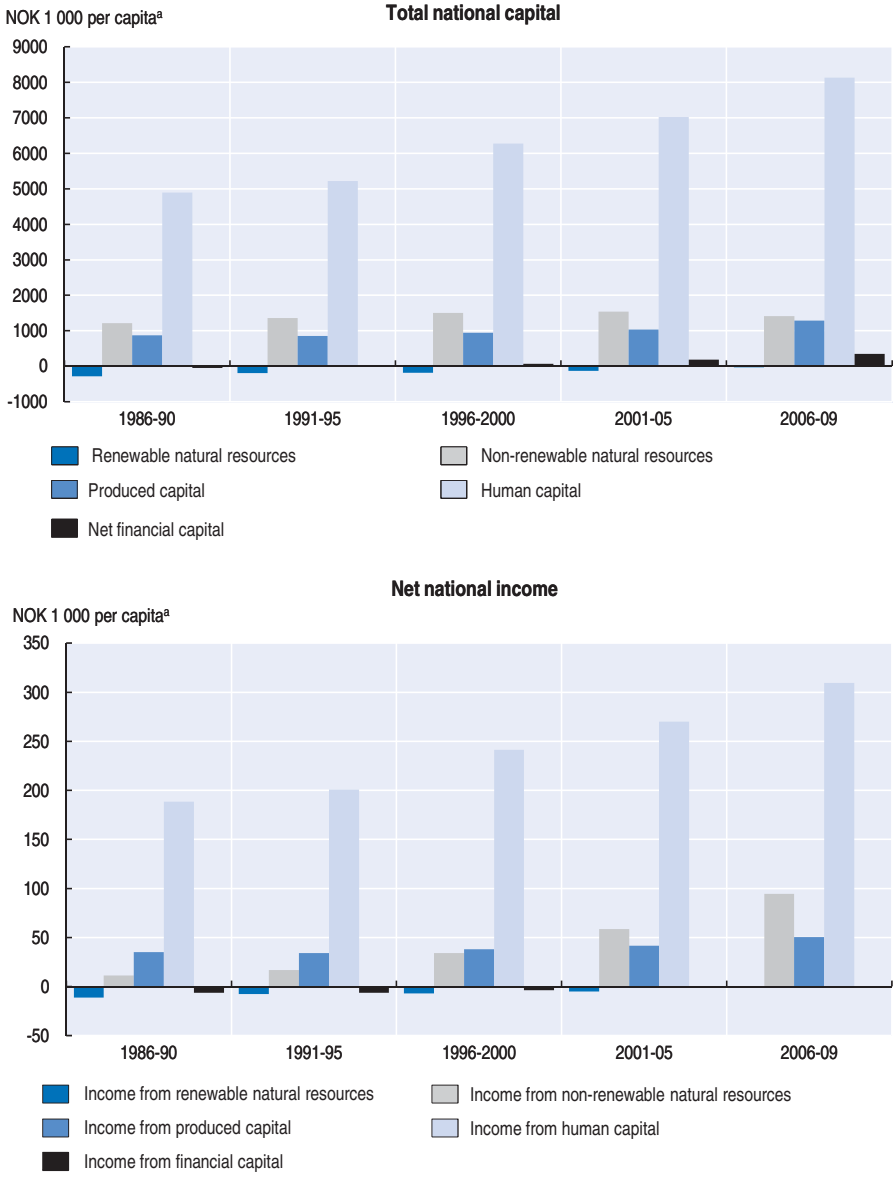
Indicator	Policy area	Components of national wealth				
		Financial assets	Fixed assets	Human capital	Natural resource capital	Env. capital
Official development assistance as a share of gross national income[a]	Global poverty reduction					
Trade with Africa[a]	Global poverty reduction					
Greenhouse gas emissions and Kyoto target	Climate change					✓
% of land above critical acidification load	Biodiversity				✓	✓
Nesting wild bird populations	Biodiversity				✓	✓
% of rivers/lakes with good ecological status	Freshwater quality				✓	✓
% of coastal localities with good ecological status	Coastal water quality				✓	✓
Maintenance of protected buildings[b]	Cultural heritage		✓			
Energy intensity	Energy		✓		✓	✓
Spawning stock and International Council for the Exploration of the Sea target	Fisheries				✓	
Irreversible loss of ecosystems[b]	Biodiversity				✓	✓
Human exposure to hazardous substances[b]	Chemicals			✓		✓
Net national income per capita	Economy	✓	✓	✓	✓	✓
Oil and gas savings	Economy	✓	✓			
Tightening public finance as a share of GDP[c]	Economy	✓				
Level of education	Social			✓		
% of adult population unemployed	Social			✓		
Life expectancy at birth	Social			✓		

a) Contributes to sustainable development globally.
b) Indicator in progress (needs further development).
c) Generational accounts.
Source: MoF, 2007.

Developments in these indicators are subject to independent assessment in annual publications from Statistics Norway.[1] In addition to describing the current state of the indicators and developments in them, these publications discuss explanations of observed trends and provide additional information. The government provides its own assessments of the developments in a separate chapter in the national budget, the most important annual policy document presented to the *Storting*.[2]

Developments in the sources of total national capital and net national income from 1986 to 2009 show that, even in a country rich in natural resources like Norway, the major part of the net national income stems from human capital (Figure 2.1).[3] Statistics Norway (2010a) estimates that oil and gas reserves represent 12% of total national capital while human capital represents 73%. The total capital per capita has increased over time, indicating that, from this point of view, developments have been on a sustainable track despite the gradual depletion of the reserves.

Figure 2.1. **Total national capital and net national income, by category 1986-2009**



a) At constant 2009 prices.
Source: Statistics Norway, (2010a).

StatLink http://dx.doi.org/10.1787/888932374407

However, fiscal policy has been quite expansive in recent years in order to address the international economic crisis. As a consequence, calculations in the national budget for 2011 indicate that it will be necessary to strengthen public budgets by 9.5% of GDP in mainland Norway (*i.e.* not including the oil and gas sector) in order to reach a "generational balance" over time (Box 2.1). This relatively high number is partly due to extraordinary circumstances surrounding the financial crisis. Compared to the calculations in the previous budget, it is an improvement by one percentage point. This reflects new revenue and expenditure estimates and the suggested tightening of the budget in 2011.

Box 2.1. **Generational accounting and the "fiscal rule"**

One of the 18 main Norwegian sustainable development indicators is the estimated need to tighten fiscal policy *over time*, calculated using "generational accounting"; see Auerbach *et al.* (1993) for an early description. This indicator shows whether the current fiscal stance can be maintained *over a long period* given, for example, rules on pensions and other social benefits, standards on public services, etc. For that to be the case, the present value of public expenses over an infinite time horizon must equal the sum of: *i)* the present value of public incomes; and *ii)* the value of the accumulated net public wealth, given current tax rates and welfare mechanisms.

Norway has also established a "fiscal rule" which states that the structural public deficit over the business cycle, excluding the oil and gas sector, should on average equal 4% of the value at the start of the year of the Government Pension Fund – *Global*. While this rule addresses the annual budget balances, generational accounting is more of a long-term indicator. However, if the country manages to comply with its fiscal rule, without increasing tax rates or scaling back public services, the conditions for a long-term balance are also met (Statistics Norway, 2010a).

The assumption in the calculation of generational accounting regarding constant standards for public services seems critical, as there historically has been clear improvement in such standards over time. If that were to continue, the need for fiscal consolidation would increase.

As an important part of its work to further promote the incorporation of sustainable development and climate policy considerations in public decision making, the government in May 2008 appointed a committee of experts to give an assessment and propose modifications. There was a particular focus on decisions concerning climate change, loss of biodiversity and global emissions of hazardous substances (Box 2.2). The committee presented its recommendations in June 2009 (NOU, 2009).

The recommendations highlighted areas in which the policy-setting process under the National Sustainable Development Strategy could be strengthened. On climate change, for example, the recommendations emphasised the need to avoid costly overlap of policy instruments and to develop cost-effective climate policy. The committee recommended that a projection for a CO_2 price should be included in the guidelines for cost-benefit analysis from the Ministry of Finance, and that the projection should take as its point of departure, the price in EU Emission Trading System (EU ETS). The committee concluded that setting specific targets for domestic emission reductions is not cost-effective (Box 2.3). If it is decided nevertheless to apply a specific domestic emission reduction target, the committee recommended, a common "price" should be put on all domestic CO_2 emissions (Chapter 5).

Box 2.2. **Strong analytical traditions**

Relative to its size, Norway has a large number of public and private research institutions with high academic standards in environmental economics. Examples include Statistics Norway, the University of Oslo, the Institute for Research in Economics and Business Administration in Bergen, the Centre for International Climate and Environmental Research in Oslo, the Norwegian University of Life Sciences at Ås and the consultancy firm *Econ Pöyry*. There is long-standing and close co-operation between many of these institutions and relevant ministries.

Norway also has long traditions in applying macro- and microeconomic models to assess economic, social and environmental impacts of a broad spectrum of policy proposals. In addition, a well-developed framework for conducting cost-benefit analyses of policy proposals is in place (including a detailed user's guide from the Ministry of Finance), and the use of broad public consultations in policy formulation is widespread.

In spite of this impressive analytical starting point, the cost-effectiveness of policies to achieve the often ambitious environmental targets can seem relatively low. In an ongoing research project, Statistics Norway, in co-operation with some of the other institutions mentioned above, aims to uncover reasons for this apparent paradox. It is conducting interviews with members of parliament and other studies to better understand the considerations behind policy decisions (Statistics Norway, 2010b).

Box 2.3. **Interactions between the EU Emission Trading System and other policy instruments**

In general, a costly overlap of policy instruments should be avoided. A good example of the potential policy issues that arise is provided by the interactions between cap and trade systems for CO_2 reduction, such as the EU Emission Trading System, and other policy instruments such as emission taxes, renewable energy targets and energy efficiency standards. Where emission sources are directly or indirectly covered by a cap, further reductions in CO_2 emissions would not be achieved by adding further policy instruments, as long as the cap remains unchanged. In principle, such additional instruments are required only if they provide co-benefits (such as reduced air pollution and improved health outcomes) or effectively address other market failures (*e.g.* technology spillover, market power in relevant markets, information barriers). Moreover, the additional instruments should be applied only if the benefits of doing so exceed the costs (without any benefits regarding CO_2 emission reductions being assumed). Furthermore, any subsidies given should be well targeted to the relevant market failure and time bound.

In a sustainable development context, it should be kept in mind that any cost-ineffective instrument use would entail a loss of welfare for someone in society.

The committee noted that, while cost-benefit analyses are extensively used in policy formulation, there is no central quality-assurance mechanism for them. Pointing to examples of double-counting in past analyses, the committee suggested that the Ministry of Finance should be given a quality-assurance role.

In other key areas, the committee recommended that biodiversity policy could be strengthened with the elaboration of comprehensive plans to manage ecosystems in the most important categories, in line with the process under way for Norwegian ocean areas

and river basins. In the case of hazardous substances that are to be phased out over time, and those that do not require a complete phase-out, the use of environmental taxes was recommended (Chapter 7).

The revised national budget for 2010 (MoF, 2010), presented to the *Storting* in May 2010, included a summary of the main comments received on the proposals during a broad public consultation. There were some diverging views regarding the climate policy recommendations. For example, environmental organisations did not agree with the recommendation not to set a specific domestic emission reduction target, while industry organisations disagreed with the recommendation to use a common carbon price for all if such a target was set. There was a follow-up by the government in the national budget for 2011.

Regarding most of the other sustainable development indicators, assessments by Statistics Norway indicate that current trajectories are consistent with the targets set (Box 2.4).

Box 2.4. **Monitoring progress in sustainable development**

In its most recent review, Statistics Norway drew the following conclusions regarding the sustainable development indicators that Norway has selected to focus on:

International co-operation for sustainable development and combating poverty

In 2009, Norwegian aid represented more than 1% of gross national income, which is the government's declared objective. Between 2008 and 2009, Norwegian imports from developing countries sank for the first time in many years. Imports from the least developed countries, however, continued to increase, though they constituted a very small share of Norwegian imports.

Climate, ozone and long-range transboundary air pollution

Norwegian emissions of greenhouse gases fell significantly in 2009, partly because of the effects of the financial crisis. Not since 1995 have emissions been so low. Several other types of air emissions were also reduced significantly.

Biodiversity and cultural heritage

It appears that bird populations in the mountains and in the cultural landscape have declined in recent years. There is no clear trend for forest stocks. The quality of the water environment is mainly good, compared to many other countries in Europe.

Natural resources

Norway uses less and less energy per unit of value added. However, total energy consumption, of which a significant part is based on fossil fuel, increased. The share of renewable energy in total energy use is not substantially higher today than 30 years ago. Important fish stocks are at very high levels, and they are harvested sustainably. Loss of cultivated and arable land is resulting in loss of the most biologically productive areas.

Health and hazardous substances

Emissions of hazardous substances were at about the same level in 2008 as in 2003.

Sustainable economic and social development

Total national capital per capita is increasing, and human capital is a particularly important component. The education level in Norway has increased significantly in the last 30 to 40 years. While Norway in international terms has low unemployment, the proportion of the population on permanent disability pensions is high. Life expectancy continues to increase. Although increased longevity is a positive development, it also represents major future challenges in terms of pensions and health care.

Source: Statistics Norway, 2010a.

2. Economic recovery and environmental policy

The economic downturn of 2008-09 was short and modest in Norway compared with the rest of the OECD. Economic recovery has started, with a large fiscal and monetary stimulus boosting consumption and sustaining employment. The national budget for 2011 expects GDP in mainland Norway to have grown 1.7% in 2010 and expects 3.1% growth in 2011.

In January 2009, the government announced a NOK 20 billion economic stimulus package amounting to 0.8% of GDP. Around NOK 3.5 billion (17%) was termed "green" expenditure, including investment in and maintenance of railways; measures to improve energy efficiency, particularly in buildings; construction of footpaths and cycle paths; and better management of protected areas and maintenance of the cultural heritage. The stimulus package also supported climate-related activity, including research on ocean-based wind turbines, biofuel development and infrastructure improvement for electric and hybrid cars. The stimulus spending entailed a significant increase in the budget of *Enova*, the government's renewable energy and energy efficiency agency. The stimulus package also included nearly NOK 1 billion to cover increased costs for the carbon capture and storage project at the Mongstad combined heat and power plant on the west coast.

An additional stimulus amounting to 0.6% of GDP was built into the 2010 budget. In particular, the budget for transport and communications was increased by 21% compared to the funding provided in the 2009 budget.

Many of the stimulus measures in 2009 and 2010 were designed to address employment rather than environmental concerns and may not be the most efficient way to achieve environmental objectives. More in-depth cost-benefit analyses of some of these projects could have been useful, in particular taking into account interactions with other policy instruments, such as the EU ETS for CO_2 emission allowances. It would also be a positive step in giving further weight to the findings of cost-benefit analyses in final decision making.

The accumulation of fiscal stimulus measures has led to a significantly higher use of money from the Government Pension Fund – *Global* than the 4% of the capital which the fiscal rule indicates should be the average over the business cycle.[4] Thus, there is a need to tighten fiscal policy as the economy develops (OECD, 2010a). Due to a combination of new information on revenue and expenditure and a fiscal tightening of 0.20% of trend GDP for mainland Norway, the national budget for 2011 estimates that the structural deficit will be about 4.25% of the capital. With constant use of oil revenue measured in fixed prices, the deficit for 2012 is estimated to be 4% of the capital.

Despite Norway's relatively favourable fiscal position, given that generational accounting estimates point to a significant need for fiscal consolidation in future years (Box 2.1), additional environmentally related taxes should be considered (Table 2.2). For example, the tax rate on diesel should be increased to at least the level of the tax rate on petrol. In connection with the revised national budget for 2010, it was decided that the tax levied on measured emissions to air of a number of important pollutants from waste incinerators would be discontinued. The decision to remove this tax, whose rates were based on careful estimates of the damage of each pollutant, was related to concern for the

competitiveness of Norwegian incinerators *vis-à-vis* Swedish operators (Chapter 7). Reintroduction of this tax should be considered, along with the possibility of broadening its coverage to include other large sources of similar emissions where continuous emission measurement is already in place.

Table 2.2. **Revenue from environmentally related taxes,[a] 2000-09**

Tax	Created	2000	2009	Comment
Energy sector		25 943	30 331	
Petrol	1931	9 762	7 703	Applies to transport.
Auto diesel	1993	4 803	7 770	Applies to transport. Replaced excise duty on distance travelled.
CO_2 in oil	1991	3 520	4 431	Applies to fossil fuel for energy purposes (light fuel oil, heavy fuel oil, domestic use of natural gas and LPG from 2007, coal until 2003) and transport fuel (unleaded petrol, auto diesel, kerosene).
Sulphur in oil	1970	117	65	Applies to heavy fuel oil with sulphur content above 0.05%.
CO_2 from oil and gas activity	1991	3 047	2 215	Applies to offshore activity (oil and gas extraction on the continental shelf).
Electricity consumption	1993	4 205	6 790	In 1993-97, was applied together with a production tax on hydroelectricity. The latter was phased out in 1997.
Basic tax on oil	2000	489	1 232	Applies to use of oil for heating. Replaces an energy tax that had existed since 1970 and was phased out in 1993 following introduction of the CO_2 tax. Reintroduced to avoid a shift from electricity consumption to oil consumption following an increase in the electricity consumption tax.
NO_x emissions	2007	. .	125	Applies to mainland (60%) and offshore (40%) activity. Applies to propulsion machinery (> 750 kW); engines, boilers and turbines (> 10 MW); and flaring at offshore and onshore installations.
Transport sector		15 947	24 715	
Registration	1955	9 629	15 875	Applies to vehicles registered for the first time in Norway, including passenger cars, delivery vans, minibuses and trucks, except heavy cargo trucks and buses longer than 6 metres with more than 17 seats.
Motor vehicle (annual)	1917	4 636	8 320	Applies to vehicles of less than 7 500 kg (passenger cars, minibuses, small delivery vans).
Motor vehicle (annual)	. .	273	346	From 2006, applies to vehicles of more than 7 500 kg (before 2006, applied to vehicles of more than 12 tonnes) .
Tax on air transport of passengers		1 298	–	Discontinued in 2003.
Tax on boat motors		111	174	Marine engine tax.
Waste		907	1 811	
Waste treatment	1999	484	491	Applies to municipal and industrial waste.
Beverage containers	1974	176	463	Applies to plastic, metal, glass and paper containers.
Non-refillable beverage containers	1994	159	769	Applies to all beverage containers that cannot be reused in their original form.
Lubricating oil	1988	88	88	Levied on importers and wholesalers of lubricating oil.
Chemicals		60	295	
Pesticides	1988	55	56	Applies to agriculture. Levied at retail.
Trichloroethylene (TRI) and tetrachloroethylene (PER)	2000	5	3	Levied on imports and domestic production of TRI/PER, including recycled TRI/PER, and to TRI/PER included in other products.
Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs)	2003	. .	236	Levied on imports and domestic production of HFCs/PFCs and to HFCs/PFCs included in other products.
Total		42 857	57 152	
% of total tax revenue		*6.75*	. .[b]	
% of GDP		*2.89*	*2.37*	

a) Includes taxes on production, social contributions and taxes on income and wealth (including taxes on oil and gas extraction).
b) 5.65% in 2008.
Source: OECD/EEA Database on Instruments Used in Environmental Policy, 2010.

Removing environmentally harmful subsidies (Table 2.3) and exemptions in environmentally related taxes would also contribute to achieving both fiscal and environmental policy goals. There is scope for gradually scaling back many concessions in environmentally related taxes, as they hamper the cost-effectiveness of efforts to reach given environmental policy targets (NOU, 2009).

Table 2.3. **Environmentally harmful subsidies,[a] 2008**
(NOK million)

Ministry	Measure	Amount	A	B	C	D	E	F
Trade and Industry		1 750						
Seafarer employment	Tax refunds for passenger ships flying the Norwegian flag on the Bergen-Kirkenes route	1 710	xx	xx	xx	xx		
Space activity		37	x	x(x)	x(x)			
Svalbard tourism		2	x	x	x	x	x	x
Restructuring measures		1	x	x		x		(x)
Fisheries and Coastal Affairs		76						
Fisheries development	Industrial projects in fisheries	54	x	x				
Fisheries development	Structural adjustment	22			x			(x)
Agriculture and Food		9 300						
Agricultural development	Forestry measures	39	x	x			(x)	(x)
Agricultural agreement	Market regulation	166	xx	xx	xx	xx	xx	xx
Agricultural agreement	Price support	2 090	xx	xx	xx	xx	xx	xx
Agricultural agreement	Direct payments	6 956	xx	xx	xx	xx	xx	xx
Reindeer agreement		49	x	x			xx	
Transport and Communications		2 349						
Air transport	Purchase of domestic air routes	501	xx	xx				
Subsidies to regional airports		13	xx	xx				
State Road Administration	Purchase of highway ferry services	1 547	xx	xx	xx			
Special transport measures	Purchase of water transport services on the Bergen-Kirkenes route	288	xx	xx	xx			
Environment	Compensation for loss of livestock by predators	104					xx	
Petroleum and Energy		30						
Norwegian Water Resources and Energy Directorate	Equalisation of transmission tariffs for electricity	30	x	x	x	x	x	x
Total		13 609						

x: small negative impact; xx: large negative impact.

a) Budgetary transfers to the private sector; excludes central government operating expenses and investment as well as transfers from the state budget to local governments.

A) Climate.
B) Air pollution and noise.
C) Chemicals.
D) Water and sea pollution.
E) Biodiversity.
F) Cultural heritage.

Source: MoF, 2008.

3. Linking the National Sustainable Development Strategy and key sectors

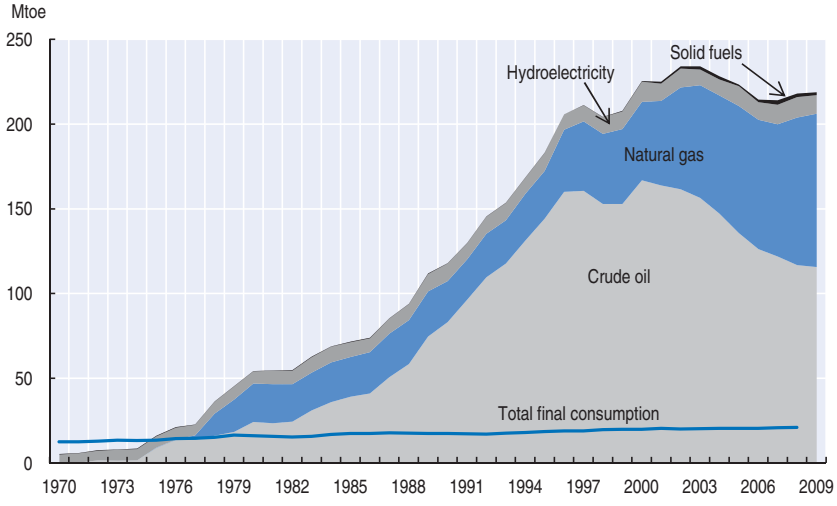
The National Sustainable Development Strategy (NSDS) provides the macro framework within which Norwegian policy on a wide range of environmentally related sectors is developed, implemented and evaluated. The vision, principles and priorities of the NSDS are reflected in the policies governing key sectors, and the same types of policy challenges arise at sectoral level as at macro level. This section provides an integrated assessment of Norway's progress in meeting its environmental objectives in key sectors, including energy, transport, agriculture, forestry and fisheries.

In 2008, the Ministry of Finance commissioned the consultancy firm SWECO to screen a set of subsidies with potential environmentally harmful effects (Table 2.3). The SWECO report did not analyse the regulations and institutional framework that Norway has put in place to offset negative effects from the subsidies. The report can therefore only furnish a warning, as it allows no conclusions to be drawn on the actual environmental effects of the subsidies.

3.1. *Energy*

Norway is a major producer, and net exporter, of energy products. Since the first oil discovery in the North Sea in 1969, oil and gas extraction has become by far the largest export industry.[5] While oil production peaked in 2001, natural gas production is rising, and the government expects to increase natural gas exports considerably in the years to come (Figure 2.2).

Figure 2.2. **Indigenous production of energy, 1970-2009**



Source: OECD-IEA (2010), *Energy Balances of OECD Countries.*

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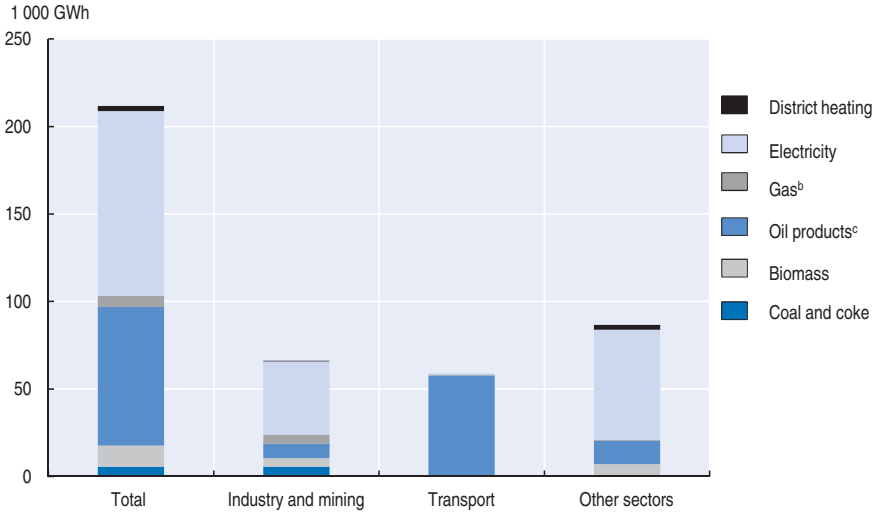
Total final consumption (TFC) of energy has increased since 2000, with a 7% decrease in industrial production being more than offset by rises of 33% in private final consumption, 24% in road freight transport and 12% in passenger transport by road. Industry, the residential and commercial sector, and transport account for most of TFC (Figures 2.3 and 2.4).

Figure 2.3. **Total final consumption of energy,[a] by sector, 2009**



a) Energy used as input material is included. Enegy used in international air transport is included.
b) Biofuel use is included.
c) Including blast furnace gas, methane, refinery gas and fuel gas.
Source: Bøeng (2010).

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Due to a strong decrease from 2008 to 2009, the total primary energy supply (TPES) was relatively stable between 2000 and 2009, increasing by only 2.5%, with TPES per unit of GDP decreasing considerably (Figure 2.4). Norway's relatively high energy intensity compared to the OECD average is largely due to energy-intensive industries such as aluminium, ferroalloys, and pulp and paper.

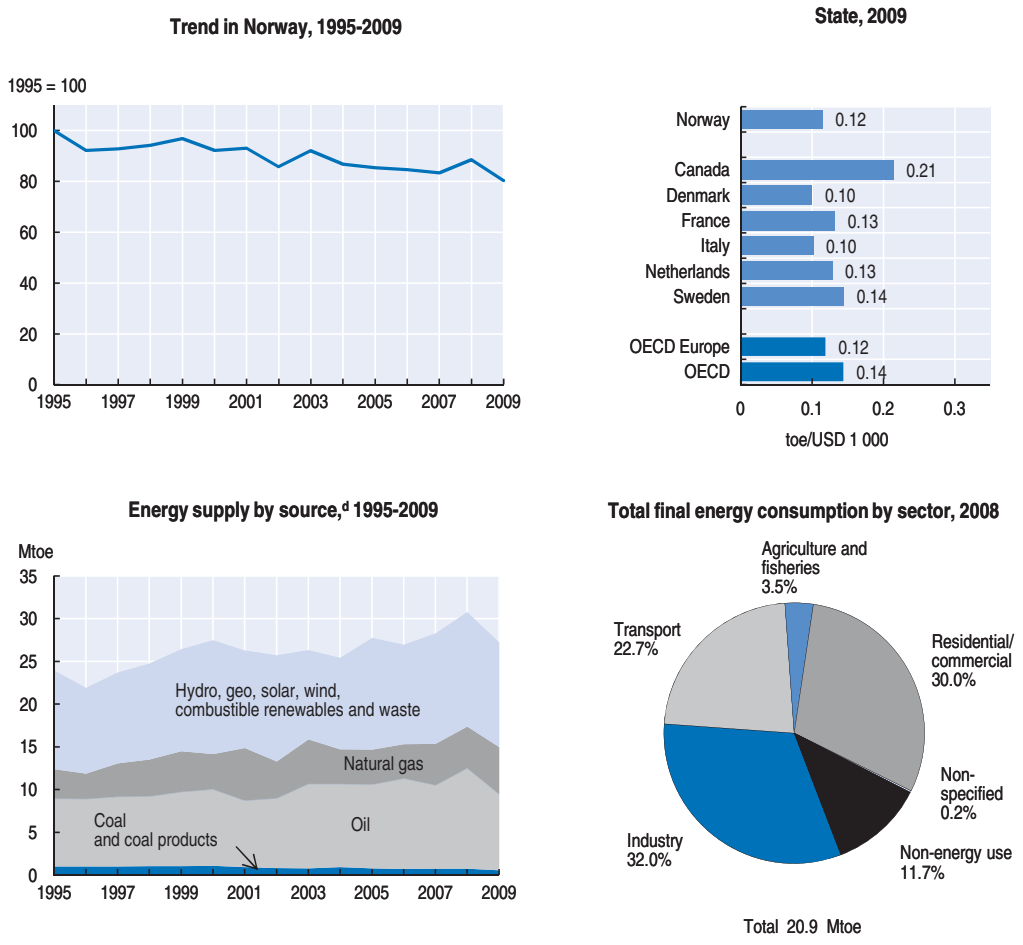
End-use energy prices and trends in energy consumption

Given the growing integration of electricity markets in Europe, electricity prices in Norway are increasingly determined by European market conditions. Nevertheless, the prices are still relatively low for both firms and households (Table 2.4). In contrast, prices for fuel oil (including for transport fuel) are among the highest in the OECD when expressed at current exchange rates. Using purchasing power parities (PPPs), prices for fuel oil are higher than the OECD average and the OECD Europe average.

The percentage of taxes in energy prices is high in Norway, compared with most other OECD countries. Most Norwegian energy tax rates are much higher than the EU minimum (Table 2.4).[6] Over the review period, tax rates were steadily increased for heating fuels, but remained relatively unchanged for electricity (Table 2.5).[7] Given that electricity generation is covered in the EU ETS, the rationale for taxing electricity use is lower than it would be otherwise.

The electric power market has been deregulated since 1991 and electricity wholesale prices are market based. The market price varies, reflecting changes in consumption, generation and transmission conditions in the Nordic power market.[8] The Nordic market is tied to the rest of Europe and is thus increasingly affected by price signals for Europe. Electricity is traded through bilateral contracts and on the Nordic power exchange, *Nord Pool Spot*.[9] Natural gas has historically been sold on long-term contracts linked to the price of oil.[10]

Figure 2.4. **Energy structure and intensity**[a]



a) Excludes international marine and aviation bunkers.
b) Total primary energy supply.
c) GDP at 2005 prices and purchasing power parities.
d) Breakdown excludes electricity trade.
Source: OECD-IEA (2010), *Energy Balances of OECD Countries*; OECD (2010), *OECD Economic Outlook No. 87.*

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End-users are free to choose any domestic electricity supplier in Norway.[11] They can switch between suppliers without cost. As is the case for water and waste services (Chapter 3), the national regulatory authority in the Norwegian electricity market[12] sets an income cap for each grid company, which allows full cost recovery.

Statkraft, a state-owned electricity company, some years ago entered into long-term supply contracts with energy-intensive industries, such as aluminium and ferroalloys. When the contracts were made, under terms set by the *Storting*, they were thought to reflect market prices, but it has become clear that they are lower than that. The last such contract expires in 2011, and future contracts are to be commercially based. In September 2010, the government announced a new commercially based guarantee for long-term electricity supply contracts (lasting from 7 to 25 years) between any electricity supplier within the European Economic Area (EEA) and some 80 to 90 firms in selected energy-intensive sectors with annual electricity use exceeding 10 GWh (Prime Minister's Office, 2010).

Table 2.4. **Energy end-use prices and taxes, 2009**

Prices	Electricity		Heating fuel (light fuel oil)		Motor fuel	
	Industry[a]	Households	Industry	Households	Diesel[b]	Unleaded petrol[c]
	(USD/kWh)	(USD/kWh)	(USD/1 000 l.)	(USD/1 000 l.)	(USD/l.)	(USD/l.)
At current exchange rates						
Norway	0.059[d]	0.133	911.6	1 139.5	1.363	1.889
Sweden	0.083	0.194	562.3	1 363.7	1.206	1.594
Norway price/OECD Europe (%)	*42*	*71*[e]	*133*	*141*	*112*	*116*
Norway price/OECD (%)	*55*	*88*	*171*	*150*	*142*	*217*
At purchasing power parities						
Norway price/OECD Europe (%)	*31*	*53*[e]	*110*	*122*	*86*	*91*
Norway price/OECD (%)	*39*	*67*	*129*	*122*	*107*	*155*
Taxes	(NOK/kWh)	(NOK/kWh)	(NOK/1 000 l.)	(NOK/1 000 l.)	(NOK/l.)	(NOK/l.)
Excise tax	–	*0.108*[f]	*1 440*[g]	*1 440*[g]	*4.070*[h]	*5.300*[i]
VAT	*0.074*	*0.167*	–	*1 434*	–[j]	*2.376*
Total	*0.074*	*0.275*	*1 440*	*2 874*	*4.070*	*7.676*
Minimum level of taxation in EU[k]	*0.004*	*0.009*	*184*	*184*	*2.887*	*3.141*
% of taxes in prices	*20*	*33*	*25*	*40*	*47*	*65*
% of taxes in prices in Sweden	*1*	*38*	*15*	*56*	*47*	*65*

In 2009, NOK 8.73 = EUR 1; NOK 6.29 = USD 1.
a) Excluding energy-intensive industries and the pulp and paper industry.
b) Automotive diesel for commercial use (*i.e.* excluding VAT).
c) Premium unleaded (95 RON) petrol (including VAT).
d) Excluding grid rent.
e) 2008.
f) Consumption tax.
g) Basic tax (870) plus CO_2 tax (570). An additional excise tax applies to industry. It is levied on each 0.25% sulphur content and is refunded if the sulphur is removed before the fuel is consumed.
h) Energy tax (3.50) plus CO_2 tax (0.57).
i) Energy tax (4.46) plus CO_2 tax (0.84).
j) VAT applies to non-commercial use (NOK 2.144/litre in 2009).
k) Directive 2003/96/EC.
Source: OECD-IEA, 2010.

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Table 2.5. **Energy and transport related taxes,[a] rates and exemptions, 2000, 2009 and 2010**

NOK million

Tax	Unit	2000	2009	2010	Exemptions
Energy sector					
Petrol	NOK/litre				Until 2002, "other petrol" referred to leaded petrol. Reduced rate according to the % of ethanol blended. This tax is also referred to as an energy tax and is in addition to the CO_2 tax.
Sulphur-free petrol < 10 ppm		4.34	4.46	4.54	
Other petrol		4.59	4.50	4.58	
Auto diesel	NOK/litre	3.74	3.50	3.56	Reduced rate for biodiesel (1.78 NOK/liter) and according to the % of biodiesel in the blend. This tax is also referred to as an energy tax and is in addition to the CO_2 tax.
Sulphur free diesel < 10 ppm		3.99	3.55	3.61	
Other diesel					
CO_2 in fossil fuels					
Coal	NOK/kg	0.47	–	–	Fisheries and international navigation and aviation are exempt. Natural gas used for purposes other than heating in buildings is exempt. Reduced rate (by around half) for fish processing and wood processing industries. 2010 rates in equiv. NOK/tonne CO_2 are: heavy fuel oil (185); light fuel oil and auto diesel (218); unleaded petrol (371); kerosene (267); natural gas (218); LPG (217)
Heavy fuel oil	NOK/ kg	0.47	0.57	0.58	
Light fuel oil, auto diesel	NOK/litre	0.46	0.57	0.58	
Unleaded petrol	NOK/litre	0.94	0.84	0.86	
Kerosene	NOK/litre	. .	0.67	0.68	
Natural gas	NOK/m^3	–	0.49	0.51	
LPG	NOK/kg	–	0.64	0.65	
Sulphur in oil	Øre/litre	7.0	7.4	7.5	Fisheries and international navigation and aviation are exempt. The tax is levied on each 0.25% sulphur content band (by weight).
CO_2 from oil and gas activity					
Heavy fuel oil	NOK/kg	0.70	0.46	0.47	2010 rates in equiv. NOK/tonne CO_2 are: heavy fuel oil (150); light fuel oil and diesel (177); natural gas (201)
Light fuel oil	NOK/litre	0.70	0.46	0.47	
Natural gas	NOK/m^3	0.70	0.46	0.47	

Table 2.5. **Energy and transport related taxes,[a] rates and exemptions, 2000-10 (%)** *(cont.)*

(NOK million)

Tax	Unit	2000	2009	2010	Exemptions
Electricity consumption	Øre/kWh				Applies to households and commercial activities. Industry, mining and district heating pay a reduced rate set at the EU minimum level (2003/96/EC) – they were exempt in 1994-2004. Power-intensive industries (metal, cement, chemicals) are exempt. In the north of Norway, business activities pay a reduced rate and households are exempt.
General rate		8.60	10.82	11.01	
Reduced rate		0.00	0.45	0.45	
Oil (general)	NOK/litre				Fisheries, navigation and oil and gas extraction are exempt. This tax is also referred to as a "basic tax" and come in addition to the CO_2 tax. Reduced rate for fish processing and wood processing industries.
Heavy fuel oil		0.194	0.870	0.886	
Light fuel oil		0.190	0.870	0.886	
Gas					
For heating					
Natural gas	NOK/m^3	. .	0.05	0.05	
LPG	NOK/kg	. .	–	–	Energy tax.
For other purposes					
Natural gas	NOK/m^3	. .	0.10	0.10	
LPG	NOK/kg	. .	0.37	0.37	
NO_x emissions	NOK/kg	–	15.85	16.14	Fisheries in foreign seas and international navigation and aviation are exempt.
Transport sector					
Registration					
Weight	NOK/kg				
First 1 150 kg		34.75[b]	35.04	35.67	
Next 250 kg		69.50[b]	76.37	77.74	
Next 100 kg		139.00[b]	152.76	155.51	
Rest		161.66[b]	177.65	180.85	
Engine size	NOK/cm^3				
First 1 200 cm^3		10.26[b]	–[c]	–	On a normal petrol- or diesel-driven passenger vehicle, tax is levied according to the vehicles' weight, its engine power, *and* its estimated CO_2 emissions. Electric cars and hydrogen fuelled cars are exempt. Deduction for vehicles with CO_2 emissions < 120g/km (–500 NOK per gram under 120g/km though total registration tax cannot become negative). Overall tax deduction for vans (22%) and minibuses (40%). Deduction of NOK 10 000 for vehicles that can run on fuels with at least 85% of ethanol. In 2007, the CO_2 component replaced the component on engine size.
Next 600 cm^3		26.86[b]	–	–	
Next 400 cm^3		63.18[b]	–	–	
Rest		78.93[b]	–	–	
Engine power	NOK/kW				
First 65 kW		134.22[b]	127.44	55.10	
Next 25 kW		489.54[b]	531.00	481.00	
Next 40 kW		979.38[b]	1 274.39	1 297.33	
Rest		1657.36[b]	2 654.98	2 702.77	
CO_2 emissions	NOK per g/km				
First 120 g/km		–	0	0	
Next 20 g/km		–	526.00	725.00	
Next 40 g/km		–	531.00	731.00	
Next 70 g/km		–	1 486.78	1 704.00	
Rest		–	2 500.00	2 375.00	
Motor vehicle (annual)	NOK per vehicle				
Diesel vehicles without particle filter		2 310[d]	3 185	3 245	Lower rate for electric cars (NOK 390 in 2009).
Petrol vehicles and diesel vehicles with particle filter		2 310[d]	2 740	2 790	
Motor vehicle (annual weight based)	NOK per vehicle				The weight component is differentiated according to weight, suspension system and axle number. Lowest: 7.5 to 12 tonnes, air suspension, 2 or more axles; Highest: above 40 tonnes, suspension other than air, 2 + at least 3 axles.
Weight component		. .	. .	399 to 10 076	
Environmental component		. .	. .	318 to 11 916	The environmental component is differentiated according to weight and emission standards. Lowest: 7.5 to 12 tonnes, EURO V; Highest: above 20 tonnes, no EURO.

a) Excluding VAT.
b) 2005 data.
c) The component on engine size still applies to vehicles with unknown CO_2 emissions (with higher rates for petrol vehicles than for diesel vehicles).
d) 2002 data.

Source: OECD/EEA Database on Instruments Used in Environmental Policy, 2010; see *www.oecd.org/env/policies/database*.

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Oil and gas extraction and hydropower production are subject to resource rent taxes, in addition to the ordinary income tax of 28%. The marginal tax rate on income is 78% in the oil and gas sector and 58% in the hydropower sector.[13]

In 2008, when the national emission trading system was connected to the EU ETS, CO_2 emissions from oil and gas extraction were included in the Norwegian ETS. To limit double regulation of this sector, the CO_2 tax rate was reduced by 35 øre from 2008, based on an expected allowance price of NOK 160 (EUR 20) per tonne of CO_2. However, the sector still faces significantly stronger abatement incentives than other Norwegian sectors. Given that additional abatement efforts in the sector will free up emission allowances within the EU ETS, causing increased emissions elsewhere in the system, it is difficult to see how this policy could be cost-effective.[14]

Support to energy supply, energy efficiency and renewable energy

Public support to energy efficiency and renewable energy through the state-owned agency *Enova*[15] has been significantly increased, reaching NOK 1.75 billion in 2010. *Enova*'s budget comes from a dedicated energy fund,[16] direct government budget allocations and a levy on electricity use.[17]

About a third of *Enova*'s budget is devoted to encouraging production of renewable-based electricity. *Enova* grants subsidies to wind power and renewable heating projects.[18] The subsidies are given as investment support for the most cost-effective projects, not as support per kWh over a given period. The system differs from feed-in tariffs in that funding per kWh for different forms of energy production is not standardised, but varies by project.

The government has set a target of 30 TWh in new electricity and heat production from renewable sources and energy efficiency by 2016, compared with the 2001 level (an ambitious target compared with the 2011 target of 18 TWh over 2001) (Box 2.5).[19] Subtargets were set for some easily quantifiable areas. The supply of waterborne heat based on new, renewable energy sources, waste heat and heating pumps was to be increased by at least 4 TWh a year by 2010 from the 2001 level, and wind power production by at least 3 TWh a year. The latter target has not been achieved (Chapter 5).

Norway also set a target of expanding annual biomass production to 14 TWh by 2020. There may be reason to further assess the net impact on CO_2 emissions of reaching such a target.

Box 2.5. **Adoption of the EU Renewable Energy Directive**

Negotiations are under way concerning Norway's adoption of the 2009 EU Directive on Promotion of the use of Energy from Renewable Sources (European Commission, 2009). According to the definitions in the directive, the share of renewables in Norway is already very high compared to other countries (58% in 2005, 62% in 2008). Using the EU's own method of calculation without any adjustments, the share would have to increase to 72.4% by 2020. If the transport sector continued to use about 25% of all energy in Norway, and if the share of renewables in that sector could be increased to 10% (from around 3.5% now), the share of renewables in other sectors would have to reach 93% by 2020, which would be a major challenge.

Source: Bøeng, 2010.

About 60% of Norway's hydropower potential has been developed or is under construction or licensing (Statistics Norway, 2009). Micro hydro plants with combined capacity of 1.3 TWh are being built and the development of a further 1 TWh is licensed. A number of Norwegian watercourses are protected from hydropower exploitation by the River Protection Plan.

In December 2010, Norway and Sweden agreed to launch a common market for green certificates.[20] The joint system is to be operational from 1 January 2012. Some have argued that such a market would be costly and not achieve its intended objective (Bye and Hoel, 2009).

Two-thirds of *Enova*'s budget is allocated primarily to energy efficiency and district heating.[21] Energy-saving projects in new buildings are entitled to a subsidy of up to 40% of the additional cost incurred. Subsidies are needed to improve district heating[22] because, by law, the price of district heating cannot exceed the price of electric heating in a given supply area, preventing full cost recovery.

Assessment

Energy-related policies have a pervasive effect throughout the Norwegian economy, bringing a wide range of costs and benefits to all sectors. Therefore, it is important for the integration of economic and environmental considerations in energy (and climate) policy to be as well designed as possible. Otherwise, inadvertent costs are imposed on the whole economy.

The context within which Norwegian energy-related policies are formulated and implemented changed significantly with the establishment in 2005 of a national cap on CO_2 emissions from a number of sectors, and again when Norway aligned with the EU ETS in 2008. For emissions directly or indirectly covered by the cap, further reductions in CO_2 emissions will not be achieved through additional instruments, such as emission taxes, renewable energy targets or energy efficiency standards, as long as the cap is unchanged. In principle, additional instruments are required only if they provide co-benefits or effectively address other market failures (Box 2.3). Buying and cancelling EU ETS allowances would be more environmentally effective and economically efficient than supporting renewable electricity and many forms of energy efficiency measures (Chapter 5).

The tax on electricity consumption has no impact on EU-wide CO_2 emissions from electricity generation, which are capped, but it does create incentives to reduce the negative impact on nature and landscape of hydropower infrastructure (Box 2.6).[23] However, between 30% and 40% of total net electricity consumption in Norway is tax exempt,[24] which reduces such incentives.

Box 2.6. **Environmental externalities related to electricity distribution**

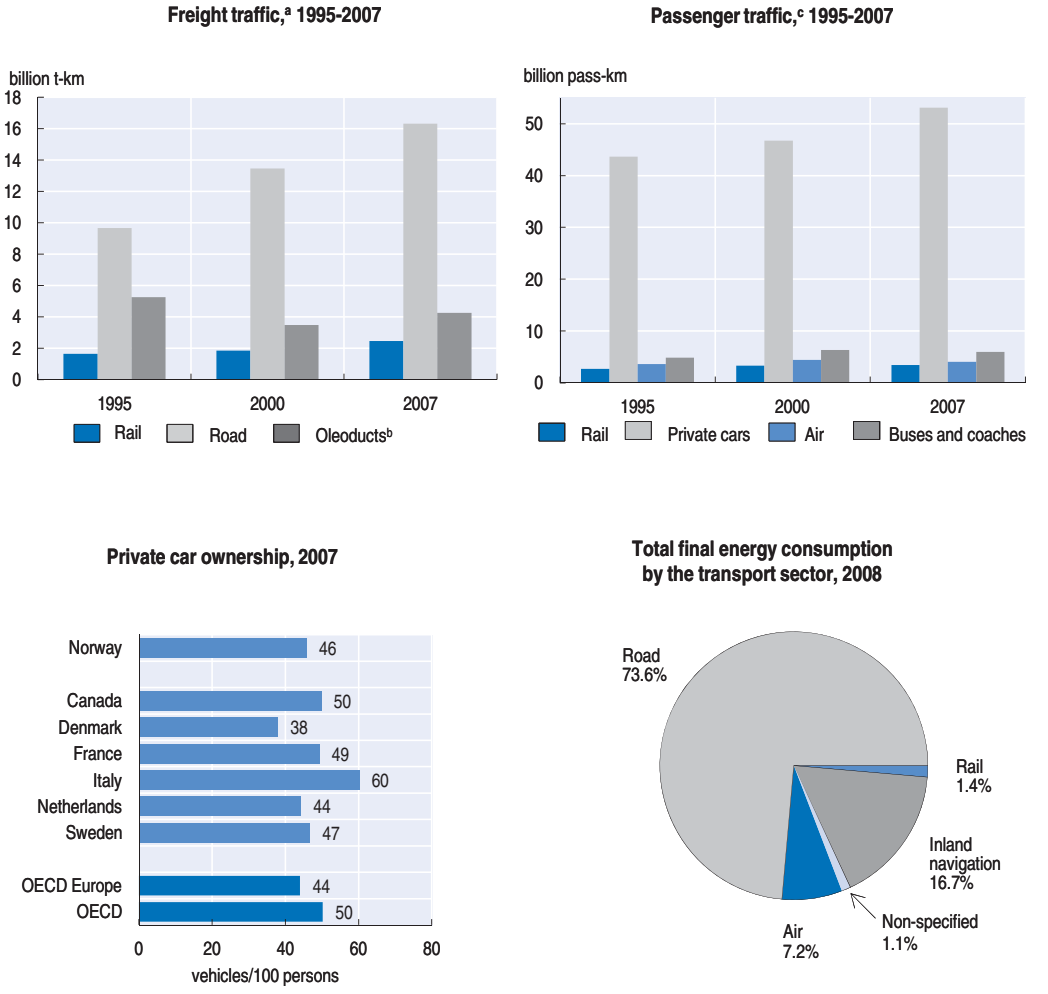
It is not only production and use of energy that can cause environmental externalities; 2010 has seen heated discussion in Norway about whether to build new high-voltage transmission lines to improve electricity supply to the area around Bergen on the west coast. There are two options for transmission of electricity in the scenic Hardanger Fjord area: either through overhead lines or a combination of overhead lines and sea cable. The latter would be expected to entail the least loss of scenic value, but probably at a considerably higher cost and with technological challenges. In the summer of 2010, the Norwegian Water Resources and Energy Directorate granted permission for an overhead line. After significant public protests, the government confirmed the option but announced that four studies would further assess the technical, economic, environmental and security of supply aspects of the sea cable alternative. Such studies could provide a better foundation for decisions on controversial issues.

The energy tax on gas was set at a much lower rate than the basic tax on oil, which is consistent with the lower externalities associated with natural gas (no SO_x, no particles, 80% less NO_x than oil, 30% less CO_2).

3.2. Transport

Private car ownership in Norway, at 46 vehicles per 100 persons, is similar to that elsewhere in OECD Europe. Both passenger and freight traffic increased over the review period, and in both cases the bulk of the increase was on the road (Figure 2.5), which accounts for more than 70% of total final consumption of energy by the transport sector.

Figure 2.5. **Transport sector**



a) Values expressed in tonne-kilometres.
b) Oleoducts goods traffic.
c) Values expressed in passenger-kilometres.
Source: OECD, Environment Directorate; OECD-IEA (2010), *Energy Balances of OECD Countries.*

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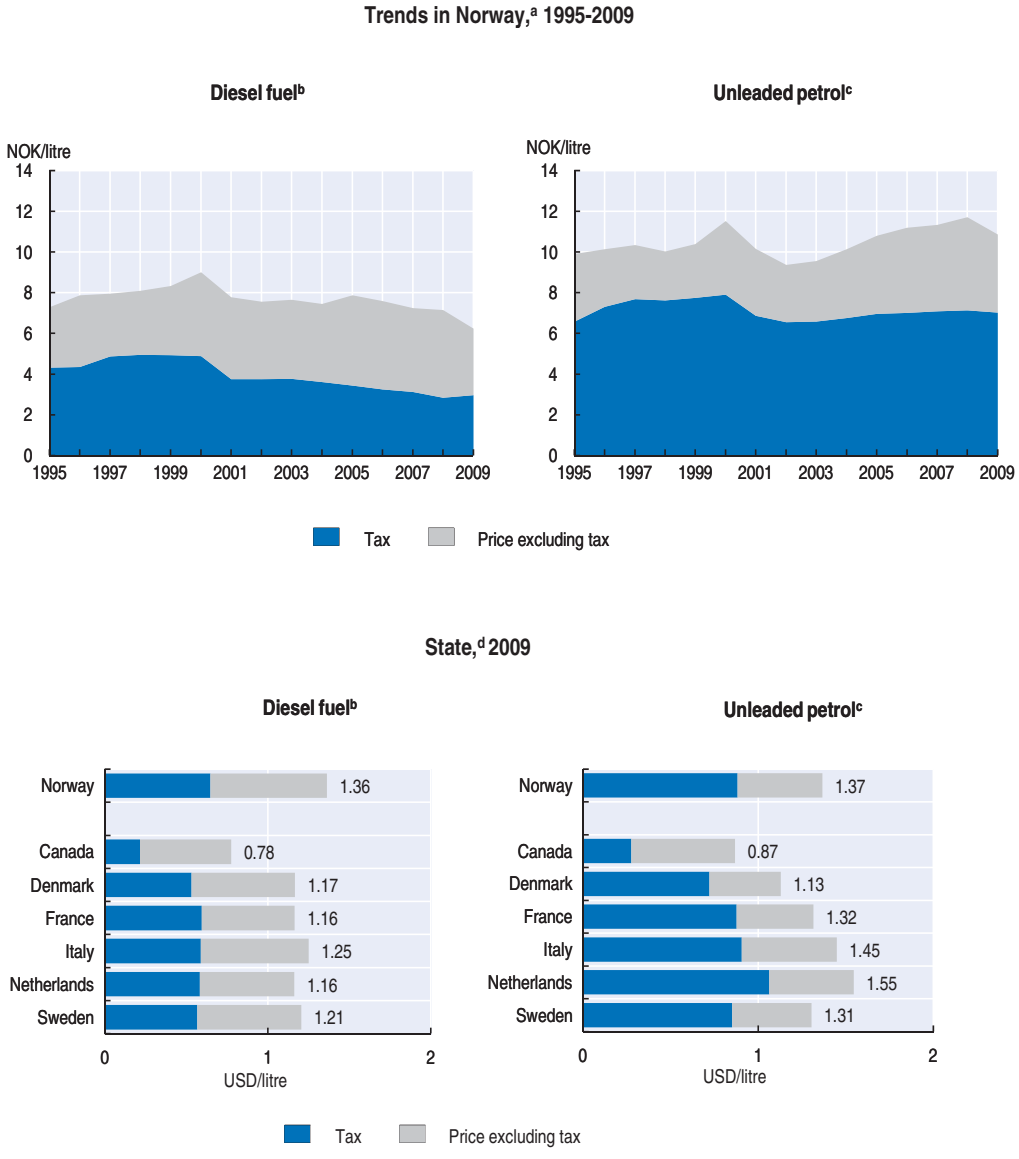
Taxation of road fuels and vehicles and charging for use of road transport infrastructure

Fuel taxes constitute a major portion of the price of unleaded petrol (65%) and commercial diesel (47%). Taxes on both fuels are at about the same level as in other OECD Europe countries (Figure 2.6). Over the review period, tax rates remained relatively unchanged for motor fuels (Table 2.5).

Figure 2.6. **Road fuel prices and taxes**



a) At constant 2005 prices.
b) Automotive diesel for commercial use.
c) Unleaded premium (RON 95).
d) Diesel fuel: at current prices and exchange rates; unleaded petrol: at current prices and purchasing power parities.
Source: OECD-IEA (2010), *Database of end-use prices.*

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Since 1991, both petrol and diesel have been subject to the CO_2 tax on oil products, but with a differentiation that does not reflect the level of emissions per litre. Since 2000, the petrol tax and the tax on diesel have also been differentiated according to sulphur content.

A requirement that all-road transport fuels contain at least 2.5% biofuel was introduced in March 2009 and the level was increased to 3.5% in April 2010. The government has stated its intention to increase the share to 5% by 2011.[25] Petrol-ethanol and diesel-biodiesel blends are granted a fuel tax reduction according to the percentage of biofuel used. The diesel tax is halved for pure biodiesel. In addition, flexi-fuel vehicles benefit from a lower purchase tax.

In 1996, the purchase tax was reformed to encourage the purchase of small cars, in terms of weight, engine size (cm^3) and power (kW). In 2007, a CO_2 component replaced the one on engine size, to encourage imports of vehicles with lower CO_2 emissions.[26] These measures reduced average CO_2 emissions from new cars from 177 g per km in 2006 to 151 g per km in 2009.

The annual tax on motor vehicles (which applies to passenger cars) is not related to the CO_2 emissions of the vehicle. Older vehicles therefore "only" face CO_2 abatement incentives via the motor fuel taxes. Since 2008, the annual motor vehicle tax has been differentiated according to whether diesel vehicles have originally installed particle filters. The change was made to limit the external costs of local particle pollution in the context of increased sales of diesel passenger cars. But this differentiation does not affect how many kilometres a diesel-fuelled vehicle, with or without particle filter, is driven each year.

The annual weight-based tax on motor vehicles (which applies to lorries) has two components. The first is designed to reflect wear and tear on the roads: it includes the weight, suspension system and number of axles. The second is designed to address local air pollution and is differentiated according to weight and emission standards. The emission standards follow the EURO classification, which has emission limits for NO_x, particles and carbon monoxide.

Norway has used road tolls since the 1930s. The main purpose is to finance bridges, tunnels and road construction.[27] In addition, several large cities have toll rings, where all vehicles entering the city centre have to pay a fee. The government wants to further promote the use of road tolls in cities, conditional on local approval. To this end, a reward programme was created in 2004 to encourage local authorities to increase the level of service in public transport and move to restrict automobile use (*e.g.* through congestion charges, local fuel taxes, reduced parking, building regulations). To be eligible for the rewards, large cities must enter into agreement with the state. In 2009, the budget for the rewards was NOK 323 million, which was double the 2008 level. The National Transport Plan 2010-19 seeks to double the 2009 budget between 2010 and 2013. In 2010, the budget was NOK 333 million and the budget proposal for 2011 is NOK 431 million.

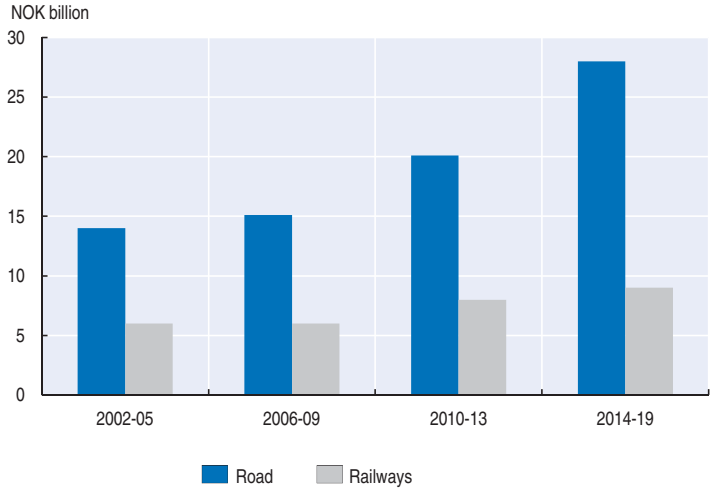
Policy measures have been put in place to promote the use of electric vehicles. They include exemptions from the first-time registration tax, VAT and road tolls; reduction of the annual motor vehicle tax; and the ability to use lanes otherwise reserved for public transport. Substitution of electric vehicles for fossil-fuel vehicles will entail a reduction in CO_2 emissions, regardless of how the electricity is generated (see the discussion above of interaction between the EU ETS and other policy instruments), and there are valid arguments for some policy measures to promote the diffusion of environment-friendly technology on market failure grounds (*e.g.* high fixed costs of entry). However, care is

required to ensure that such policies are cost-effective. *Econ Pöyry* (2009) estimated that subsidies to electric vehicles in Norway exceeded EUR 2 500 per tonne of CO_2 emissions avoided, indicating that the incentives provided are considerably higher than those in other sectors, and raising questions as to whether the benefits of the package exceed the costs.[28]

Support to transport infrastructure and public transport

Overall public expenditure in the transport sector has continuously increased since 2000. It consists of: *i*) state allocations to aviation and road transport, and special transfers for transport and railways; *ii*) spending by municipalities and counties on transport infrastructure and public transport; and *iii*) spending on infrastructure funded by road tolls. In 2009, the state allocations amounted to NOK 30.1 billion and the amount from roads toll was NOK 5.7 billion.[29] Data from Statistics Norway indicate that municipal and county investment and net consumption on transport in 2009 was NOK 18.7 billion. Transport tax revenue (excluding fuel taxes) largely covers the state allocations (Table 2.2). There is no earmarking of transport-related tax revenue to finance transport expenditure, however. Roads continue to get the lion's share of the expenditure and will continue to do so (Figure 2.7).[30]

Figure 2.7. **Planned investment in roads and railways**



Source: MTC (2009), *National Transport Plan 2010-19.*

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Public transport receives about NOK 12 billion, most of which (NOK 10 billion) goes to railways. According to a publication of Finland's Ministry of Transport and Communications in 2007, in the Oslo region, ticket revenue covers 62% of public transport operating costs – a higher share than in most European cities (Finland MTC, 2007).

A study commissioned by the Ministry of Finance found that environmentally harmful subsidies to the transport sector amounted to NOK 2.3 billion in 2008 (Table 2.3). That amount includes state purchases of transport services[31] as well as budgetary transfers to regional airports, both of which have the effect of increasing travel and therefore greenhouse gas (GHG) and air pollutant emissions.

The *Storting* decided in connection with its debate on the National Transport Plan 2010-19 to consider building long-distance high-speed rail lines, including between Oslo, Bergen and Trondheim, and Gothenburg in Sweden. The idea was to help shift traffic away from road and air. However, the consultancy firm *Econ Pöyry*, in a 2008 cost-benefit analysis for the Ministry of Transport and Communications, concluded that the two connections it had looked at, Oslo-Trondheim and Oslo-Gothenburg, would be socially unprofitable, even without costing such factors as the significant negative consequences for nature or the CO_2 emissions that building the lines would entail. *Econ Pöyry* (2008) said the number of passengers likely to travel the routes would be too low, and the per-passenger benefits too small, to outweigh the very high investment cost. The conclusion was found to be robust for a wide range of assumptions. The ministry has asked the Norwegian National Rail Administration to carry out a more in-depth study of long-distance high-speed rail lines and offer its recommendations by February 2012.

Assessment

Overall, transport taxation has been designed to reflect some external environmental costs: SO_x and CO_2 for fuel taxes, CO_2 for the registration tax, particles for the annual car tax, NO_x, CO and particles for the annual lorry tax. However, it is not clear whether this assures consistency in addressing the external environmental costs and whether it is the most cost-effective approach.

There is no justification, from an environmental point of view, for taxing diesel less than unleaded petrol. The CO_2 tax differentiation between unleaded petrol (NOK 0.86 per litre) and auto diesel (NOK 0.58 per litre) should in fact be the other way round, as the CO_2 emissions per litre of diesel are 12% higher than those for petrol.[32] Differentiation of taxation between diesel and unleaded petrol is even larger when the petrol tax and diesel tax are added to the CO_2 tax.[33] Moreover, in addition to this differentiation, changes in the purchase tax have led to a considerable increase in the share of diesel vehicles on the passenger car market, so that now three-quarters of new passenger cars sold are diesel fuelled.

The exemption from the diesel tax for biodiesel (pure biodiesel and diesel-biodiesel blends) was halved in 2010 and was to be phased out in 2011. However, this was not followed up in the 2011 national budget. Taxes on the carbon content of all fuels would be more efficient than subsidies for biofuel use, as they would directly target CO_2 emissions. Also, more fuel-efficient vehicles offer large GHG emission reduction potential and would be more cost-effective than replacing fossil fuel with biofuel (OECD, 2007). The negative externalities associated with biofuel production (*e.g.* tropical deforestation, impacts on forests' carbon storage capacities in general and increases in fertiliser use) need to be taken into account when devising policies related to biofuel use.

When translated into emissions over the lifetime of the vehicle, the motor vehicle registration tax provides very strong incentives to abate CO_2, more than NOK 7 000 per tonne in some cases (OECD, 2009).[34] As other components of the registration tax are also very progressive,[35] a further differentiation in the CO_2 component is questionable. Abatement of CO_2 emissions might be more cost-effective if addressed instead through fuel taxation.

With the exception of climate change, most of the external costs of transport (air pollution, noise, congestion) are borne by the population and the environment of the territory where the transport takes place. The best pricing instruments for fairly and efficiently assigning these costs to users are broad-based road use charges, taking into account local air emission characteristics and the timing of driving.[36] Currently, road tolls in Norway are not designed to reduce congestion or local air pollution. For example, fees for entering big cities are differentiated between small vehicles (less than 3.5 tonnes) and large ones, but not according to time of day or week. A change would seem all the more urgent since, in the four largest cities, rush hours are getting longer and rush-hour delays are worsening (MTC, 2009). Road tolls applied to the full primary network could generate as much as NOK 60 billion per year (MTC, 2009). Part of this could be used to make public transport more competitive, thereby helping reduce air pollutant emissions – although there are disadvantages to any formal earmarking of the revenue. Differentiation of the annual tax on motor vehicles according to vehicle emission standards (particles for passenger cars, NO_x, CO and particles for lorries) is a step in the right direction. However, it should be seen as a transition towards distance- and emission-based charges. With a system of well-designed road pricing in place, fuel taxes should only reflect the global carbon externality.

It would also seem advisable to reconsider the current tax exemptions and other subsidies for electric vehicles, as they seem far out of proportion to the costs of achieving emission reductions elsewhere in the economy.

3.3. Agriculture

Budgetary transfers to agriculture

Over the review period, direct payments to farmers remained in the range of NOK 11-12 billion per year (Table 2.6). While this represented a lower share of farm receipts, the share is still among the highest in the OECD.

New environmental payments were established over the review period while several others were abolished[37] and the funding was made available to counties to establish new environmental measures. All national environmental payments fall under the National Environmental Programme (NEP), established in 2004. In 2008, NEP payments amounted to NOK 2.5 billion, or 21% of total payments to agriculture. The NEP also provides guidelines for the regional environmental programmes (REPs).

Most NEP payments are not targeted for specific environmental outcomes. They are associated with agricultural production or are granted just for complying with environmental regulations. Some payments are directly linked to environmental practices, such as grass cutting of biodiversity-rich fields that are no longer part of the agriculture area under use. The REPs are linked to environmental practices or to areas that need maintenance of farming for environmental reasons (*e.g.* grazing or grass cutting). Most REP payments are per hectare or per livestock head.

Overall, many policy incentives make farmers more likely to take decisions based on production, rather than environmental, criteria. These include payments linked to quantities produced and, to a lesser extent, payments per hectare or per head. These potentially environmentally harmful payments amounted to NOK 5 billion in 2008 (Table 2.6).[38] That year, total potentially environmentally harmful subsidies to the agricultural sector amounted to NOK 9.3 billion, according to a study commissioned by the Ministry of Finance (Table 2.3).

Table 2.6. **Direct payments to farmers,[a] 2000-08**
(NOK million)

Basis of support	Purpose of payment	2000	2008	Comment
Commodity output		2 830	1 543	Payments linked to quantities produced
Input use		1 137	1 226	
	Fuel tax concession	412	437	Applies to road fuel
	Agricultural Development Fund	204	320	Preferential loans
	Transport subsidy	139	159	Transport of food grain
	Compensation[b]	48	69	For losses of livestock to predators (started in 1994)
	Other	334	235	Including interest concession
Current production		7 354	6 390	
	Acreage/headage payments	5 395	3 371	Payments per hectare or per head
	Vacation and temporary substitute programme	1 282	1 083	Provides farmers with possibilities for holidays equivalent to those enjoyed by other occupational groups in society
	Support for grazing animals[c]	0	403	Aims to protect the pastoral landscape for its habitat for wild flora and fauna and its aesthetic value (started in 2007)
	Regional environmental programmes[c]	0	386	Each of the 18 counties must establish an environmental programme based on regional priorities for achieving the NEP national goals (started in 2005)
	Organic farming[c]	35	86	Started in 1991
	Other	642	1 061	Including income tax deduction
Historical production		0	2 676	
	Cultural landscape[c]	0	1 649	To receive funds, farmers must complete required maintenance of the landscape and use environmentally sound production practices (environmental cross-compliance; started in 2003)
	Income support	0	1 027	For milk production (started in 2003)
Total		11 321	11 835	
% PSE[d]		*67*	*62*	

a) Excluding market price support.
b) Payments for losses of livestock were increased to NOK 116 million in 2009 and NOK 117 million in 2010. Additional payments have been made available for losses of domesticated reindeer (NOK 35 million in 2008 and NOK 19 million in 2009).
c) These payments fall under the NEP, which set goals for preservation of land and cultural landscape acreage, biological diversity, cultural monuments and the cultural environment, and outdoor life and pollution prevention.
d) Producer Support Estimate (% of gross farm receipts).
Source: OECD, 2009.

Taxation of farm inputs

Pesticides have been subject to taxation since 1988. Until 1999, the same tax rate applied to all pesticides. The tax was levied as a percentage (11%) of the retail price. In 1999, three tax classes were differentiated by toxicity to encourage farmers to switch to pesticides with lower health and environmental risk.[39] An evaluation in 2003 of the National Plan for Pesticide Risk Reduction (1998-2002) revealed that farmers were shifting to less environmentally harmful pesticides. Later, the Action Plan for Pesticide Risk Reduction (2004-08) increased the number of tax classes from three to five for better differentiation by health and environmental risk. The pesticide tax rates were increased by about 25% in 2005, with no further changes since. Proceeds go to the state budget.

A tax on mineral fertiliser (nitrogen, phosphorus, potassium) was also introduced in 1988. It was removed in 2000 out of concern for competitiveness to reduce the costs imposed on Norwegian agriculture (Sweden, Austria and Finland have also abolished their fertiliser taxes).[40] The effect of the fertiliser tax in Norway was negligible because the rate was rather low, 15% (compared to 20% in Sweden).

Assessment

Greening Norway's agricultural sector should include a further shift towards less-distorting forms of support, such as income support[41] and payments based on non-commodity criteria (*e.g.* going beyond environmental regulation). For example, production-linked support creates incentives to increase pesticide use, which runs counter to the objective of the well-designed pesticide tax. In addition, energy tax concessions on road fuels[42] and transport subsidies should be phased out or reduced, as they contribute to emissions of CO_2 and air pollutants.[43] Instead of compensating farmers for losses of livestock to predators, efforts to protect populations of large predators should focus on better preserving their habitats (Chapter 6).

The adoption of an environmental plan at the farm level, as required under the NEP, is a positive step that should make farming more environmentally accountable. All direct payments to farmers should be made conditional on proper implementation of the plan. This approach would also serve to target measures more effectively, based on local and county[44] priorities for achieving the NEP national goals.

3.4. Forestry

Forests cover some 32% of the Norwegian land area. About 80% of the productive forest area is in private ownership[45] – largely by farmers who use forestry to supplement farm income – and only around 1.7% is protected by the state (Chapter 6). There are about 125 000 small forest holdings, averaging around 50 hectares each. To avoid conversion to other land uses, the sale of private forest property is subject to price regulation.

Since 1965, when the Forest and Forest Protection Act was passed, small forest owners[46] have been required to place at least 4% of timber sales[47] into a forest trust fund. This money must be reinvested in the forest area where it originated, typically in long-term investment projects such as new tree planting. There is one trust fund for each forest holding. Deposits to the fund remain with the holding,[48] however, it does not receive the interest earned. Instead there are tax incentives[49] that make investment from the fund economically beneficial for the forest holding.

Public spending on forestry has been NOK 150-160 million a year in recent years and plans call for it to increase to NOK 180 million from 2010 (Table 2.7). Nearly 30% (NOK 44 million in 2009) is allocated for building or maintaining forest roads.[50] In 2009, only NOK 3 million was devoted to environmental measures.

In addition, public spending on forest biomass has been NOK 35-40 million a year. Norway has large untapped forest resources that in principle could be used to develop wood fuel as a renewable energy source. Meeting the 2020 target of expanding biomass production to 14 TWh would require increased reliance on timber, as well as extended use of household waste, agricultural waste and forest residue. Increased reliance on timber could perhaps be envisaged on top of current harvests without compromising forest management sustainability (*e.g.* as regards protection of threatened species), but further consideration of the CO_2 neutrality of forest biomass might be warranted (Box 2.7).[51]

Table 2.7. **Public expenditure on forestry**[a]

NOK million

Measures	Funding	2009	2010[b]	2011[b]
Forest management				
Managed at municipal level		68.2	62.0	68.0
Silviculture	FM[c]	57.1		
First-time thinning	FM[c]	3.5		
Environmental measures	FM[c]	2.8		
Other	FM[c]	4.7		
Managed at central level		49.2	60.0	62.0
Forest roads	FM[c]	43.6		
Logging by cable and horses	FM[c]	5.6		
Subtotal		117.4	122.0	130.0
Forest planning		20.4	33.0	32.0
County level	FM[c]	19.4	30.0	30.0
Central level	MAF[d]	1.0	1.0	1.0
Capacity building	MAF[d]	–	2.0	1.0
Other measures at central level		21.7	28.8	20.0
Training	MAF[d]	10.0	10.0	10.0
Overall road planning	MAF[d]	0.2	–	–
Tree cutting along roads[e]	FM[c]	6.1	8.8	–
Forest plantations in coastal areas[f]	FM[c]	5.4	10.0	10.0
Total		159.5[g]	183.8	182.0

a) Excluding biomass.
b) Planned allocation.
c) Development and adaptation funds (Utviklings-og tilretteleggingsmidler).
d) Ministry of Agriculture and Food.
e) To improve road safety.
f) Most plantations are in the coastal districts of western and northern Norway and were established in the 1960s and 1970s.
g) Expenditure was NOK 155 million a year in 2007 and 2008.
Source: Agricultural Development Funds (LUF), 2010.

Box 2.7. **CO_2 neutrality of biomass use**

It is common to assume that the use of biomass from sustainably managed forests for energy purposes is CO_2 neutral, because the CO_2 emitted when the biomass is combusted is "compensated" by the carbon absorbed by the trees when growing. Measures to promote increased use of biomass were given significant attention in the recent *Klimakur 2020* report (Chapter 5). Debate has since arisen over whether the assumed CO_2 neutrality is valid. Holtsmark (2010b) argues that increasing felling could significantly reduce forests' carbon storage capacity, at least throughout the remainder of this century. The Intergovernmental Panel on Climate Change (IPCC) states that a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks while producing an annual sustained yield of timber, fibre or energy from the forest will generate the largest sustained mitigation benefit in the long term (IPCC, 2007). Other experts argue that forests' carbon storage capacity is dependent upon sustainable forest management, including increased felling of mature trees. At least three conditions affect the net climate effect: the tree stand's growth condition and maturity, the use of the biomass (substitution effect) and time preference (weighing benefits and costs at different times) (Solberg *et al.*, 2010). While a higher level of CO_2 in the atmosphere and higher temperature may stimulate forest growth, the risk of global warming destabilising land carbon sinks is also gaining attention (IPCC, 2007).

It would seem important to settle this issue as soon as possible, both in regard to the cost-effectiveness of Norwegian climate policy measures and in the context of international climate policy negotiations.

Assessment

The forest trust fund system requires the reinvestment of revenue from timber sales, and trust fund deposits remain with the forest holding so that the fund cannot be separated from the property by sale, transfer or mortgage. The trust funds are a major source of financing for forest management. However, it is debatable whether using such funds to finance new forest roads is environmentally sustainable. More generally, flexibility in the use of the funds could be increased, *e.g.* to allow investment in projects based on cost-benefit analysis.

Price regulation of property sales hampers structural adjustment of the forestry sector. Achieving economies of scale in forest management should be pursued at the river basin level, as this would enhance provision of forest ecosystem services.

New methods of monetary valuation of non-market goods and services related to forest resources, such as biodiversity and recreational and aesthetic values, have been developed in recent decades. In practice, however, political decisions relate to forest conservation. The legal framework and financial instruments are mainly based on more qualitative consideration of economic, social and environmental values (MAF, 2003).

Support to forest roads should not be at the expense of increasingly scarce "wilderness-like" areas (Chapter 6).

When developing forest biomass as an energy source, care must be taken not to deviate from sustainable forest management by putting high pressure on the more easily accessible forest ecosystems. Also, using wood as fuel should not come at the expense of uses with higher added value and more lasting carbon capture impacts, such as construction and furniture making. Priority should be given to using forestry residue.[52] It also seems important to reach robust conclusions in the emerging debate regarding the net CO_2 impact of a higher felling rate in Norwegian forests (Box 2.8).

3.5. Fisheries

Initially, in the 1960s, the purpose of budgetary transfers to the fisheries sector was to ensure that fishers would reach income levels similar to those of the average industrial worker; this involved transfers of NOK 1.4 billion in 1990. The General Agreement between the Norwegian Government and the Norwegian Fishermen's Association was signed in 1964 and terminated on 1 January 2005.[53] Most government support to fisheries is now directed at general services. In 2002-07, transfers for general services were close to NOK 1 billion per year, mostly to finance the Coast Guard and research.

Decommissioning support initially led to increased fishing capacity through renewal of the fishing fleet. The aim has now shifted to reducing fleet capacity: the fund for decommissioning vessels less than 15 metres in length was terminated in 2008[54] and grants for new vessels are no longer given.

Assessment

The shift of support from cost-reducing transfers to general services, removes direct incentives to overfish. But fishermen still receive environmentally harmful fuel tax breaks, which should be revoked so as to encourage energy conservation. However, progress in this regard is likely to be contingent on similar decisions in neighbouring countries.[55]

Limits on fish catches, enforced in tandem with Russia and, somewhat less successfully, the EU, have contributed to a revival of fish stocks (Chapter 6).

4. Innovation

4.1. *Introduction*

Norway's good economic performance contrasts with its poor performance on conventional innovation indicators, such as patents per capita. This apparent "Norwegian puzzle", as it is known, is related to the exceptional productivity generated by non-R&D-based (non-technological) innovation in the services sector. At the same time, Norway has experienced fast productivity growth in the services sector – fuelled by high-skill levels in the workforce – which implies quite robust innovation (OECD, 2008a).

R&D intensity, at 1.8% of GDP in 2009, is below the OECD average of 2.3%. Business R&D (including by research institutes serving firms) represents more than half of total spending, but the share of manufacturing is low by international standards, in line with the relatively small share of R&D-intensive industries in Norway's resource-based economy. In contrast, R&D spending in the services sector is high and represents 45% of business R&D.

There is broad political agreement that efforts should be made to foster more R&D-intensive, knowledge-based industries so as to maintain high, sustainable growth even after oil and gas production decreases – but it is difficult to identify which sectors will grow in the future. Norway's long-term goal is to increase total R&D expenditure to 3% of GDP and government budget appropriations for R&D to 1% of GDP.

The Strategic Council for Environmental Technology, launched in December 2008 with representation from industry, academia and environmental organisations, is helping the government prepare a national environmental technology strategy. The government has signalled that it intends to adopt a strategy and a corresponding programme for environmental technology at NOK 500 million over 2011-13.

4.2. *Eco-innovation priorities*

Norway is focusing its eco-innovation efforts on particular technologies, notably carbon capture and storage (CCS) and, more recently, offshore wind energy. CCS and renewables are priorities in the 2010 budget for environmental technology (MER, 2009). Since 2001, *Enova* has supported the development of renewable forms of energy.[56] In 2008, the government set up another public agency, *Transnova*, to spread environmental technology in the transport sector, particularly CO_2 emission reduction technology.

Norway has a long and unique experience in geological storage of CO_2 and puts considerable effort into developing technology to reduce the cost of capturing and storing CO_2 at gas-fired power plants (Box 2.8). In 2009, the government provided NOK 1.9 billion to support CCS development. For the time being, pending development of the technology on a commercial scale, CCS is a very expensive way to abate CO_2 emissions from gas-fired power plants. Current policy requires all new gas-fired power plants to include CCS. As noted above, as long as the cap of the European Union Emissions Trading System (EU ETS) is unchanged, the use of CCS at a power plant will not reduce net CO_2 emissions in the countries covered by the ETS. However, a major breakthrough in CCS technology could certainly have a significant impact on how future caps would be set, and there are valid "technology spillover" arguments for promoting the technology. For now, CCS projects are publicly funded, but the government intends to phase out the public funding as the CCS market develops. The ultimate goal is to encourage extensive use of the technology worldwide. There is potential for exports of CCS technology once it is developed, particularly if it is adapted to coal-fired power plants.

Box 2.8. **Carbon capture and storage (CCS)**

The CCS process can be divided into the capture of CO_2, its transport and its storage.

Norway has extensive experience in storing CO_2. Since 1996, more than 10 million tonnes of CO_2 have been separated in gas production at the Sleipner West field in the North Sea and stored in a geological formation 1 000 metres below the seabed. Sleipner was the world's first facility to store large quantities of CO_2 under the seabed. Monitoring of the storage reservoir shows no sign of seepage. The Snøhvit field in the Barents Sea provides gas to the world's first liquefied natural gas plant with CCS, located in Melkøya. Since 2008, CO_2 has been separated[a] at Melkøya (onshore) and piped back to Snøhvit (offshore), where it is stored 2 600 metres below the seabed. At full production, 700 000 tonnes of CO_2 will be stored annually.

Building on these two projects, Norway aims to develop CCS in two stages at the Mongstad industrial site on the west coast. The first step is the Technology Centre Mongstad, for which the investment decision was made, and construction began, in 2009. The technology centre will start operating early 2012, and will capture CO_2 from two different flue gases with two different capture technologies. Step two is full-scale CCS from the combined heat and power (CHP) plant at the Mongstad refinery.[b]

In 2007, the first gas-fired plant in Norway (with installed capacity of 450 MW) started operating at Kårstø, but CCS is not installed.[c]

It has become clear that it will take longer than previously expected to develop the necessary CCS technology. In May 2010, the government announced a decision to extend the planning phase for large-scale carbon capture at Mongstad, and an investment decision was postponed until 2014.

a) To meet sales specifications, CO_2 must be removed from natural gas before liquefaction.
b) When fully operational, this CHP plant is expected to emit 1.3 million tonnes of CO_2 per year.
c) Since 2007, the power plant had not been running full time and thus the procurement process for the assignment of contracts to construct the CCS facility was stopped in 2009.

The country's first large-scale offshore wind power project, *Havsul I*, began in 2009, using turbines fixed to the seabed. Norway has also developed a type of floating wind turbine and plans to install five of them offshore by 2012 in a demonstration project expected to produce up to 4 MW. In addition, Norway will finance construction of a 10 MW turbine prototype.[57] The country has two research centres on offshore wind and a new technology development centre is to be established in Oslo. The *Storting* approved a strategy on offshore renewable power in 2010.[58]

To reduce CO_2 emissions in the transport sector, priority is given to alternative fuel, such as second generation biofuel, electricity and hydrogen. For instance, *Transnova* has subsidised about 1 900 electric vehicle charging stations across the country. As is noted above, replacing petrol and diesel vehicles with electric ones would lead to reduced CO_2 emissions, but there are estimates indicating that the current level of subsidies for such vehicles may be too high. *Transnova*'s budget was NOK 100 million in 2009 and NOK 50 million in 2010 (MoE, 2009). *Transnova* is a three-year test project; it remains to be decided whether it becomes a permanent body.

4.3. Eco-innovation policy

Energy and environment represent some 20% (NOK 7.7 billion) of Norway's total R&D expenditure, with oil and gas extraction accounting for more than half (Figure 2.8). Through different programmes, the Research Council of Norway and Innovation Norway grants about

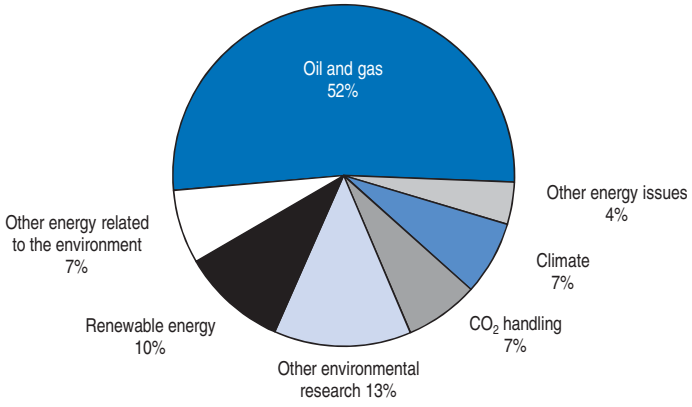
NOK 1.8 billion per year to environmental research and innovation. Each year, the Ministry of the Environment (MoE) receives around NOK 450 million in R&D appropriations, an amount that represents less than 3% of total government R&D appropriations.

Besides R&D, eco-innovation in Norway has been promoted with other policy measures, such as regulations, economic incentives, negotiated agreements, public procurement[59] and eco-labels. For example, discharges of oil and of hazardous and noxious substances from offshore oil and gas exploration have almost entirely stopped since a zero-discharge target was set in 1997.[60] The Norwegian oil and gas industry is now one of the world's least polluting, and CO_2 taxation and carbon trading have provided strong incentives to develop CCS projects in the industry. A formal agreement between the industry and the government in 2008 has boosted diffusion of NO_x emission reduction technology – but a NO_x tax without exemptions might have had a similar impact.

The Norwegian Public Procurement Act (2001) aims to minimise the life-cycle environmental impact of procurement while taking procurement costs into account. Under the Norwegian Action Plan for Environmental and Social Responsibility in Public Procurement (2007-10), requirements for 15 priority product groups[61] were introduced in 2008.

Norway has experience with eco-labels. The Nordic Swan label now applies to 71 product groups; for instance, nearly all paper and detergent products carry it. A recent survey showed that over 90% of adults in Norway knew the label and preferred to buy labelled products. The EU's Flower eco-label is also present in the Norwegian market. Together with other countries in the Eurpoean Economic Area, Norway has introduced an energy label for home appliances, such as refrigerators and washing machines.

Figure 2.8. **R&D on energy and environment, by sector,[a] 2007**



a) Percentage of current expenditure (NOK 7.7 billion in 2007).
Source: NIFU STEP (2009), *Science and Technology Indicators 2009.*

StatLink http://dx.doi.org/10.1787/888932374540

Assessment

Tighter fiscal constraints and, in the longer term, decreasing oil and gas revenue reinforce the need for innovative solutions to enhance productivity and contain costs in the public sector. A cost-effective strategy for environmental technology should be released without delay.

The targets of increasing total R&D expenditure to 3% of GDP and government budget appropriations for R&D to 1% of GDP could be steps in the right direction. However, focus should, ideally, be more on outputs of R&D activity and their diffusion in Norwegian society than on the budgetary resources allocated to such activity.

Fundamental R&D, mostly undertaken and funded by the government,[62] provides the foundation for future innovation. Funding basic research also minimises the risk involved in picking winners and locking in inappropriate technologies.

Norway's income tax structure favours entrepreneurship (OECD, 2008b).[63] However, using only income tax incentives to encourage the supply of innovation for the environment will not be sufficient (OECD, 2010c). If there is no cost to polluting, there are few incentives for firms to adopt environmental innovations, however technologically advanced or cheap they may be. Putting a price on environmentally harmful activities – through environmentally related taxes or emission trading systems – will stimulate demand for eco-innovations.

Norway should carefully assess the environmental and economic impacts of its green public procurement policy and of eco-labels, including whether they create unintended barriers to trade.

Notes

1. The latest edition, Statistics Norway (2010), presents developments until 2009.
2. The finance minister co-ordinates the NSDS follow-up, aided by a group of state secretaries.
3. Human capital is calculated as a residual – based on income streams that cannot be allocated to the other forms of capital. These estimates are hence uncertain, but capture the amount and quality of labour input, as well as the efficiency of institutions, etc. Work continues at Statistics Norway to improve the quality of these estimates (Statistics Norway, 2010a; Liu and Greaker, 2009).
4. The fund was established in 1990 as way to transmit wealth from petroleum taxes and royalties to future generations. The fiscal rule is that, on average over a business cycle, 4% of the fund's capital – a figure based on the fund's expected long-term real returns – should be used to finance the non-oil budget deficit.
5. In 2007, Norway accounted for 3% of total world output of oil and natural gas.
6. The tax rates on natural gas and LPG are lower than the EU minimum.
7. In general, all taxes are adjusted yearly for inflation.
8. Norway is part of the Nordic grid, a common wholesale power market with Denmark, Finland and Sweden.
9. High precipitation since 2000 has resulted in Norway exporting, on average, 3.4 TWh, or 2.7% of its production.
10. The Norwegian Water Resources and Energy Directorate (NVE) is the national regulatory authority for the non-integrated downstream natural gas market in Norway.
11. In an effort to harmonise the Nordic electricity market further, participating countries wish to introduce a common end-user market by 2015.
12. The NVE, under the Ministry of Petroleum and Energy. Its objectives are to control monopoly operations, safeguard consumer rights and ensure that the operation, use and development of the grid are efficient, pursuant to the 1990 Energy Act.
13. A direct comparison of income tax rates between the oil and gas sector and the hydropower sector is not relevant, as the rules regarding the tax bases differ.
14. The fact that the sector accepts double regulation could partly be linked to the resource rent tax, which means that public authorities suffer 78% of the related income loss.

15. Enova has been in operation since 2002 to promote energy efficiency and more heat and electricity production from renewable sources. Until then, the NVE and electricity distributors shared responsibility for promoting green energy production and more efficient energy consumption.
16. The Basic Fund for Renewable Energy and Energy Efficiency, established in 2007 with capital of NOK 10 billion. Another NOK 10 billion was deposited in 2009 and an equal sum is expected by 2012. In 2010, the annual yield from the fund was estimated at NOK 880 million.
17. All end-users of electricity pay a levy of 1 øre per kWh on their electricity tariffs.
18. Hydropower is not eligible for subsidies in the present system.
19. Norway's annual electricity production since 2000 has been around 125 TWh (there is considerable year to year variation).
20. The idea was first discussed in 2006.
21. District heating has a low penetration rate in Norway, meeting only about 2% of energy needs for heating.
22. Norway wants to use district heating generated from waste and biomass to replace oil-fired district heating.
23. Chiefly due to damming or lowering of water level, changing of water flow and building of roads and power lines.
24. This includes 95% of electricity consumption in the pulp and paper industry (*i.e.* for pulp and paper plants using approved energy-saving measures).
25. For EU countries, the Biofuel Directive (2003/30/EC) set an indicative target of 2% by 2005 and 5.75% by 2010.
26. Now the tax also applies to imported secondhand vehicles.
27. In 2002, revenue from toll roads financed 27% of the total road construction budget.
28. In addition to reducing CO_2 emissions, replacing fossil fuel vehicles with electric vehicles would help reduce NO_x, VOC and particle emissions as well as noise, among other benefits. The benefits will not materialise, however, if electric vehicles are simply added to the existing fossil fuel fleet.
29. According to the budget proposal of the Ministry of Transport and Communications for 2010.
30. This partly reflects the need to maintain a public road network that at 93 000 km is much more extensive than the railways (4 000 km).
31. Including transport by air, ferry (ferry services that are part of the national road system) and ship (subsidies to the Norwegian Coastal express on the Bergen-Kirkenes route).
32. When expressed in NOK per tonne of CO_2, the 2009 rate of the CO_2 tax was much higher for unleaded petrol (NOK 363 per tonne) than for diesel (NOK 214 per tonne).
33. In 2010: NOK 5.4 per litre (unleaded petrol) *versus* NOK 4.14 per litre (auto diesel) for sulphur-free fuels.
34. While there is a subsidy of NOK 609 per gram of CO_2 for vehicles emitting less than 120 grams per km, the tax rate is NOK 1 704 per gram emitted per km over 180 grams per km and NOK 2 735 per gram per km over 250 grams per km. If a vehicle drives 200 000 km over its lifetime, a car that emits 100 grams per km will in total emit 20 tonnes of CO_2, while a car that emits 120 grams per km will emit 24 tonnes of CO_2. The subsidy in the motor vehicle purchase tax for a car emitting 100 grams per km (about EUR 1 400) is thus equal to about EUR 350 for each tonne saved, compared to what a vehicle emitting 120 grams per km would have emitted. This is very high, compared to the costs of other measures to abate CO_2 emissions.
35. NOK 36 per kg for small vehicles, NOK 181 per kg above 1 500 kg; NOK 55 per kW for small engines; NOK 2 700 per kW above 130 kW.
36. Unlike fuel taxes, tolls can vary according to vehicle emission standards; unlike registration taxes or time-based taxes on motor vehicles, they can depend on the intensity, location and time of use.
37. Payments from the Agricultural Development Fund for extensive grazing, mountain farming and changing cultivation practices.
38. Down from more than NOK 8 billion in 2000.
39. Different tax rates apply to pesticides "banded" according to toxicity.

40. Upon accession to the EU in 1995 for Austria and Finland; on 1 January 2010 for Sweden.
41. Income support was established in 2003 for milk producers.
42. The agricultural sector pays the CO_2 tax on fossil fuels, but not the much higher energy tax.
43. As local air emissions from agricultural use of fossil fuel, for example, usually take place in areas with lower population density than emissions from motor vehicles in general, there are some valid arguments for having somewhat lower fuel taxes for vehicles in the sector.
44. Implementation of the NEP provides a large role for counties.
45. State and community forests (12%) and private companies' forests (4%) make up most of the rest.
46. Known as non-improved private forest owners, for lands with average annual harvesting potential below 3 000 m^3.
47. Gross sales value of harvested roundwood.
48. This means the fund cannot be separated from the property, whether by sale, transfer or mortgage.
49. Lower income tax, property tax and inheritance tax.
50. Since 2007, forest roads have also been financed via forest trust funds.
51. The annual increment is 25 million m^3 and the standing volume 40 million m^3.
52. Some 3-5 TWh could come from harvest residue. That is, 30-60% of 8.5 TWh from an estimated 1.6 million tonnes of harvest residue.
53. Some elements of the agreement were prolonged, though they totalled less than NOK 50 million in 2007.
54. Established in 2003 and funded through a fee on the landing value of every Norwegian fishing vessel.
55. Otherwise vessels could simply refuel in foreign harbours.
56. As has been noted, public support for renewable energy is expected to rise to NOK 0.5 billion per year, or a third of Enova's budget in 2010. Also as noted above, it is important to consider carefully how this support interacts with other policy instruments, and to assess whether the net benefits exceed the costs.
57. In 2010, Enova pledged NOK 137 million to that purpose.
58. As in several other cases mentioned above, it is important to consider carefully whether technology spillover and other benefits of developing wind technology exceed the costs, given the interaction between such support and the EU ETS cap. But, somewhat as with CCS technology, a breakthrough in wind technology can have an impact on how future caps are set.
59. Total public procurement amounts to some NOK 270 billion annually, or more than 10% of GDP.
60. The deadline for meeting the target was 2005 for fields in existence in 1997. Since then, all new installations have had to reach the zero-discharge target.
61. The groups include buildings, vehicles, information and communications technology equipment, textiles, health products, paper and office furniture.
62. Nearly 80% of basic research in Norway is performed by higher education and 15% by government. The remaining 5% is in business, which continues to rely on public research and knowledge spillovers.
63. Personal income tax is high, while capital gains and corporate taxes are lower.

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PART I

Chapter 3

Implementation of Environmental Policies

A number of initiatives including simplification of regulation, decentralisation of environmental responsibilities and the intelligent use of economic instruments has facilitated the successful application of many environmental policies in Norway. Enforcement is better targeted, risk based and deterrence oriented. New requirements have expanded the coverage and scope of projects subject to environmental impact assessment, and introduced better consultation arrangements with the general public. Supporting this is an extensive system of environmental indicators used to monitor policy and communicate results. With a number of areas requiring closer attention such as air pollution, water and wastewater infrastructure, and river management, making use of the strong policy base is critical to progress.

Assessment and recommendations

By virtue of its membership of the European Economic Area (EEA), Norway's environmental management system is strongly influenced by the EU. With a few exceptions, Norway's environmental policies are now fully compliant with the requirements of EU legislation that is covered by the EEA Agreement. In some areas, such as environmental impact assessment (EIA) and the provision of information about health impacts of pollution and products, Norwegian requirements are more stringent. Positive steps have been taken to simplify regulatory procedures, such as those for environmental permitting, and to reduce administrative burdens on the regulated community. Enforcement is better targeted, risk based and deterrence oriented. The pioneering use of economic instruments has been extended, *e.g.* through taxes on NO_x emissions and on landfilling and emissions from incineration. Negotiated agreements with industry have also played a useful role. The application of some environmental policy instruments has contributed to environmentally favourable innovations, *e.g.* in reducing NMVOCs and hazardous emissions from waste incineration.

There has been a significant decentralisation of environmental responsibilities to the county and municipal levels. Counties are now more involved in linking national policies with action at regional and local level. Municipalities have more responsibility for implementation. These changes are intended to better adapt environmental policies to local needs and requirements. However, decentralisation has created burdens, particularly for smaller municipalities, that some find difficult to bear. More active involvement of counties and intermunicipal co-operation have helped address these new challenges, and have yielded positive results in waste management, water supply and sanitation. They should be continued, together with efforts to support local capacity development further.

Norwegian environmental policy has been underpinned by the further development of a comprehensive, policy-relevant and user-oriented system for environmental information and supporting analytical capacity. The system of environmental indicators is a valuable tool for monitoring policy implementation and communicating results. Policy proposals are normally based on solid scientific and economic analysis. The 2004 Environmental Information Act strengthened public participation and access to justice, and contains provisions that go beyond the *Aarhus Convention* regarding access by the public to environmental information from public authorities and the private sector. New requirements have expanded the coverage and scope of projects subject to environmental impact assessment, and introduced better institutional and consultation arrangements. The scope of activities subject to strategic EIA was extended to cover land use planning and zoning, and impacts of major developments in the oil and gas sector.

Norway has decoupled emissions of conventional air pollutants (SO_x, NO_x, ammonia, NMVOCs and CO) from economic growth in absolute terms. These emission reductions have helped reduce the acidification and eutrophication effects of air pollution. Reductions of SO_x were achieved by switching from fossil fuels to electricity in processing industry and from high- to low-sulphur fuels in transport. Significant reductions in NMVOC emissions followed co-operation with industry and regulatory instruments that stimulated technological change in loading and storing of crude oil offshore. Reductions in CO emissions were mainly achieved through expanded use of catalytic converters in cars. Air quality improvement plans for large agglomerations guided local air pollution reduction efforts, usually by focusing on reducing emissions of particulate matter from wood burning and urban traffic. Emissions of toxic pollutants (heavy metals and dioxins) continued to decrease.

Although Norway's 2010 targets under the Gothenburg Protocol were met for SO_x, NMVOCs and ammonia, targets for NO_x are not likely to be met before 2012. Achieving this target will require further efforts to reduce NO_x emissions, particularly from shipping, oil and gas extraction and land transport. An early assessment of the impact of the NO_x tax could provide indications on how this might best be achieved. Despite emission reduction through several measures, the combination of emissions of particulate matter from wood burning, exhaust emissions from cars, damage to roads from studded tyres, and unfavorable winter weather still leads to exceedances of national urban air quality targets, and episodes of ozone pollution which adversely affect human health.

Important progress was made in water management. Discharges of nitrogen and phosphorus to inland and coastal waters were reduced from municipalities and from industry and agriculture. Only 25% of all watercourses are now considered at risk. Norway has begun implementing the EU Water Framework Directive ahead of schedule. The country's coverage of drinking water supply was high (95%) and drinking water quality improved, including in Oslo, which had experienced water quality problems in the past. Sewerage and wastewater infrastructure also expanded, covering 95% of the population in the southern part of the country. Treatment efficiency has improved and is very high for phosphorus in sensitive areas of the North Sea catchment.

Nevertheless, 50% of inland lakes are at risk of pollution due to insufficient treatment of household and commercial wastewater and effluents from fertiliser use and livestock. Only 30 subdistrict river plans have been drafted (out of 250) and the institutional arrangements for river basin management are not yet complete. The water supply and wastewater pipeline networks are ageing, resulting in high water leakage rates and incidents of contamination of drinking water which lead to outbreaks of waterborne disease. There is room to better link water and wastewater tariffs to the use of water so as to better contribute to cost recovery and expand and improve water supply and sanitation infrastructure. Emissions from agriculture were stable but emissions from aquaculture increased; they now account for the highest share of anthropogenic pollution of Norwegian Sea coastal waters.

Recommendations

- Strengthen *support for regional and local authorities* to enable them to fully meet their responsibilities for implementing environmental policies, particularly for environmental impact assessment, enforcement and compliance, and land use planning.
- Reinforce efforts to *reduce urban air pollution peaks in winter*, including through accelerated renovation or replacement of wood burning stoves and reduction of emissions from road traffic.
- Assess the experience gained from the NO_x *tax* and associated agreements with the private sector and adjust, as necessary, the policies required to meet the NO_x reduction target.
- Expedite the *replacement of ageing water supply and wastewater pipes* and the modernisation of sewerage systems to separate waste and storm water, using charges and applying the polluter pays principle.
- Accelerate the *development and adoption of river basin management plans and complete institutional arrangements for river management* that assure adequate dispute resolution, co-ordination of decision making among water users and appropriate funding of pollution reduction and water management efforts.

1. Environmental policy instruments

1.1. Institutional and regulatory framework

Institutional arrangements

The *Ministry of the Environment* (MoE) continues to be responsible for developing policies related to pollution control (regarding air quality, water quality, waste management, climate change and the marine environment) and to nature conservation and physical planning. In addition to initiating and developing draft legislation, white papers and action plans, the MoE co-ordinates government environmental policy objectives, assures follow-up and monitors results. Since 2007, the minister of environment has also been responsible for *development co-operation* so as to better integrate the two policy areas (Chapter 4).

Policy implementation is supported by *agencies under the MoE*. The Climate and Pollution Agency (KLIF) has executive responsibility for monitoring air and water pollution, issuing permits and enforcing their terms to reduce industrial pollution and waste, and managing chemical substances and products.[1] The Directorate for Nature Management is the MoE advisory and executive body for nature management (Chapter 6).[2]

The *Ministry of Petroleum and Energy* (MPE) administers energy resources, chiefly oil, gas and hydropower. Water resource management, including managing watercourses and their safety, licensing water use and small hydropower stations, and planning for flood emergencies, is carried out by the *Norwegian Water Resources and Energy Directorate* under the MPE.[3] While the MPE's Norwegian Petroleum Directorate is responsible for managing oil and gas activities, the *Petroleum Safety Authority* (PSA), created in 2004 as an independent agency under the Ministry of Labour, has regulatory responsibility for safety, emergency preparedness and occupational health and safety in the sector. The PSA co-ordinates with KLIF on the environmental impact of offshore and inland oil and gas operations as well as associated pipeline systems. The *Ministry of Agriculture and Food* supervises forest management and promotes sustainable agriculture.

The role of the 18 *regional environmental administrations* – Departments of Environmental Affairs in the counties – increased during the review period to ensure that national environmental goals are translated into regional and local goals and measures. This devolution included increasing county-level environmental permitting of small- and medium-sized industrial operations and licensing of non-hazardous waste treatment and temporary storage of hazardous waste by specialised firms. County governors became responsible for enforcing requirements concerning wastewater treatment plants in larger urban areas.[4] Devolution of environmental management followed a general approach to regional development that the central government introduced in 2002, which involved a shift from selective, centrally administered, grant-based assistance in favour of allowing bottom-up initiatives which reflect local needs and requirements (OECD, 2007).[5]

Municipal responsibility for environmental management increased in the review period to include enforcing environmental regulations on local air and water quality and on noise. Municipalities continue to be responsible for water supply, sanitation and waste management in their jurisdictions, except for industrial waste, which has been the responsibility of industry since 2004. The only permits issued by municipalities relate to activities concerning polluted soil, under planning regulations. The growing scope of municipal responsibilities has improved response to local needs and simplified procedures, but also made it more difficult, especially for small municipalities, for local authorities to perform all their tasks effectively. Virtually all of Norway's 434 local authorities employed a full-time environmental officer in 2000, but less than 10% do today. The main reason appears to be the incorporation of national funding previously earmarked for environment into the general budget.

Responding to the limitations on local management capacity, since 2004 the Ministry of Local Government and Regional Development has supported projects to develop *intermunicipal co-operation* as a condition for financial support from the central government, including discretionary grants.[6] Several local authorities now delegate certain tasks and responsibilities to a "host" municipality. The model does not imply establishing a new public body; rather, it entails co-operation based on a legally binding agreement between two or more municipalities, with the financing of delegated tasks subject to negotiation between the host municipality and the others.[7] One example is that of the "co-municipality" of Innherred, between Levanger and Verdal (North Trondelag): the two municipalities exercise joint authority for environment, agriculture, planning and building services, land management, and health and social services (OECD, 2007).

Reform of the regulatory framework

Legislation on pollution prevention and natural resource management was strengthened during the review period at *two levels*: through acts of the *Storting* (Parliament) and through regulations adopted by the MoE and other government agencies. The changes were prompted by a need to streamline regulations to address existing and emerging domestic environmental problems as well as by requirements of the EU regulatory framework, to which Norway adheres under the European Economic Area (EEA) Agreement.[8]

New acts introduced early in the review period included the 2003 Environmental Information Act, strengthening public access to environmental information and promoting public participation in environmental and related decision making; the 2004 Greenhouse Gas Emission Trading Act, which aimed to limit emissions of greenhouse gases cost-effectively; and the 2005 Forestry Act, integrating forest values related to local and national economic development with functions to secure biological diversity and outdoor recreation. In 2009, two

important acts were adopted: the Nature Diversity Act and the Planning and Building Act.[9] The former, which goes beyond requirements of the EU Habitats and Birds Directives, introduced new concepts of priority species and selected habitat types, as well as the user pays and precautionary principles in nature conservation (Chapter 6). The Planning and Building Act improves tools for protecting coastal zones from construction and safeguarding nature and open spaces for outdoor recreation.[10] It also facilitates incorporation of climate considerations into municipal plans, expands provisions for environmental impact assessment (EIA) of land use plans and provides for public participation in their development.

Some *regulations under previously promulgated acts* were revised and new ones adopted. For example, in 2004-06 several pieces of legislation related to waste management and pollution were unified as the Waste Regulations and the Pollution Regulations under the 1981 Pollution Control Act. The aim was to simplify use of the Act by the regulated community. The Water Management Regulations introduced in 2007 under the 2000 Water Resources Act implemented requirements of the EU Water Framework Directive with a view to achieving "good" status (close to what would be found under undisturbed conditions) for rivers, lakes, groundwater and coastal waters. Several new product regulations, related to restrictions on manufacturing, trade and use of chemicals and other products hazardous to health and the environment, were adopted under the 1976 Product Control Act. A new EIA regulation under the 1981 Pollution Control Act took effect in 2009, setting supplementary requirements for assessment of plans and projects that might have significant effects on the environment, natural resources or communities.

Norway's regulatory framework is now *fully compliant with the requirements of EU legislation* under the EEA Agreement, except for some rules on dangerous substances and biocides. However, certain areas regulated at EU level are not covered by the EEA Agreement, including directives on nature protection (Habitats and Birds Directives) and certain water protection directives (on bathing water, shellfish water, surface freshwater and fish water). Progress on harmonisation is carried out by the EFTA (European Free Trade Association) Surveillance Authority.[11]

1.2. Enforcement and fostering compliance

Environmental permitting and inspections

Even though the provisions of the EU directive on integrated pollution prevention and control (IPPC) had already been incorporated in the regulatory framework before 2000, the *environmental permitting system* was further strengthened during the review period.[12] The 2004 revisions to the Pollution Regulations integrated further environmental permitting procedures, introduced the "best available technique" (BAT) concept and the use of EU BAT reference documents (BREFs) as guidance for establishing emission limit values. In addition to specifying maximum emission limit values, current permits include requirements for internal environmental management and auditing and energy efficiency measures. Permit conditions are linked to plant operating capacity rather than design capacity, which provides an incentive to minimise pollution even when production is reduced. The new regulations simplified environmental permitting and reduced the administrative burden on the regulated community.

The issuance of an environmental permit is subject to a *permit fee* ranging from NOK 18 000 to NOK 102 000, the higher levels corresponding to higher risk. Modifying the permit costs between NOK 4 800 for the lowest risk category and NOK 42 000 for the highest. The regulatory authority keeps a small part of the fee to cover processing costs (MoE, 2008).

To promote further reduction in the regulatory burden on enterprises, increasing consideration has been given to development of *common regulations for lower-risk industrial operations* that can be applied instead of environmental permits. Known as general binding rules (GBRs), such regulations are well established in other OECD countries, such as the Netherlands and Finland. They set environmental requirements for industrial sectors characterised by minor environmental impact, large numbers of installations and stable technologies. The approach requires operators to submit notifications to county authorities and allows administrative efforts to be devoted to verifying conformance with the norms and actual compliance. Meanwhile, the Pollution Control Act gives authority to KLIF for surveillance of compliance with environmental regulations: on a mere suspicion of violation, KLIF can inspect any installation (IMPEL, 2007).

KLIF prioritises its enforcement activities at permitted industrial operations by dividing them into four *risk categories* ranging from the potentially most environmentally harmful operations, classified as Risk Category 1, to the least harmful Risk Category 4 installations (IMPEL, 2007). Operations in Category 1 are inspected more frequently, with in-depth inspections every other year. Inspections focus on management procedures and the operation and maintenance of equipment rather than on emissions as such. The inspection frequency is further adjusted on the basis of inspection results; KLIF inspectors explicitly recommend more frequent inspections if a violation is detected. In addition to inspections, regulated facilities undergo extensive environmental audits (every three years for Category 1, every six years for Category 2).

Each year, *KLIF and county offices make some 2 000 inspections and audits*. Of these, KLIF inspectors carry out around 100 inspections and 40 audits (IMPEL, 2008). Co-operation between KLIF and counties has developed over time, with the number of inspections by counties gradually increasing. KLIF and county authorities also conduct environmental compliance promotion campaigns focusing on matters such as treatment of dangerous waste at small- and medium-sized enterprises, the prohibition on selling timber impregnated with chromium and arsenic, and arrangements for retailers and manufacturers to take back discarded electrical and electronic equipment.

Out of around 1 500 land-based businesses licensed under the Pollution Control Act, around 600 are considered as having a potentially high impact on the environment must deliver *self-reports* (IMPEL, 2007). The reports must contain precise information on emissions, waste generation, production and energy consumption, and indicate any violation of environmental requirements. Since 2006, companies have been able to use an electronic format that simplifies the reporting. The reports are legally binding: a firm may be punished on the basis of information in a report. Failure to report violation of environmental regulations, or conscious misreporting, is a considered a serious crime. Self-reporting indicates much the same pattern of violation as the inspection data: around 60% of all self-reports are judged to indicate violations while around 15% indicate serious violations.

Every year, KLIF provides *regular reports on the results of its operations to the MoE and the Storting*. The reports are used to reprioritise budgets and activities throughout the year. County governors report to KLIF three times a year. Frequent meetings between KLIF and county environmental officers allow the agency to review results and priorities and to provide expertise and assistance. KLIF has permanent staff working full time on contacts with county governors.

Non-compliance response

Types of *administrative non-compliance response* available to national and county enforcement authorities include warning letters, recommendations for more frequent inspections, fines and withdrawal of permits. The use of administrative sanctions does not rule out criminal sanctions. In practice, KLIF often waits to file formal accusations until informal and administrative sanctions are exhausted. This means that if a criminal sanction is imposed, the firm may already have paid administrative fines.

The inspection results confirm that KLIF recommendations of more frequent inspections are strictly followed, and non-compliant firms are inspected more extensively and earlier than other firms in their risk category. As *firms must cover the inspection costs, which can be considerable,* this has the effect of creating an economic incentive to comply even without prosecution: the fee for a one-day inspection of a Category 1 site is NOK 18 200, and the cost can reach some NOK 193 000 for a system audit lasting several days (KLIF, 2010a).[13] In addition, in responding to an inspection or a warning of a fine, a firm must provide adequate documentation, which is expensive (external consultants may need to be hired). Finally, inspection reports are publicly available, so information on non-compliance usually affects public perceptions of non-compliant firms.

Box 3.1. **Product Register**

The Product Register, operated by KLIF, contains information about 25 000 chemical substances listed in Norwegian regulations on classification and labelling of dangerous chemicals. It refers to substances that are produced, imported and/or placed on the market for commercial or private use in volumes of more than 100 kg per year. The register also contains information about microbiological products, biocides and biocide products. Voluntary declarations of products that do not meet obligations for the register are possible. About 500 substances are added to the register per year.

Data from the Product Register are used to support control and inspection of warning labelling of chemical substances, to carry out risk assessment of particular types of substances or products, and to provide statistics that can be used by the authorities in controlling the flow of chemicals that are subject to international agreements. Product data are also used by the Norwegian Poison Information Centre in responding to cases of acute poisoning. Other institutions that use information from the register include the Labour Inspection Authority, the National Institution of Occupational Health, the Norwegian Institute of Public Health, the Petroleum Safety Authority, Statistics Norway and the Directorate for Civil Protection and Emergency Planning.

Manufacturers and importers of dangerous chemicals must provide information to the Product Register, including product composition, type and place of use. The declaration of the product is confirmed by a declaration number used on the safety data sheet. It is uniquely associated with a single company and a single product. The MoE provides strict confidentiality and electronic security of the Product Register through the Security Board. The Product Register has security authorisation from the National Security Agency.

Public information about chemicals is available from the Product Information Bank website (*www.pib.no*), which enables efficient communication between manufacturers and importers of chemicals, professional users, ordinary users and public bodies, as well as making health and environmental information about chemicals more easily available.

Violators failing to respond adequately to inspections and warnings, for example by delaying response to recommendations of inspections or increasing non-compliance over time, are met by more formal and direct sanctions, such as *coercive fines*.[14] The fines are not considered penal since they are not collected in cases of return to compliance. Prolonged non-compliance results in a cumulative fine (except in cases involving dangerous substances, which must be addressed immediately). While the number of coercive fines issued for integrated pollution prevention and control (IPPC) installations is relatively small, those related to chemical management are frequently applied under national legislation on product and chemical safety. The Norwegian Product Register is an important tool in assuring compliance with chemical safety regulations (Box 3.1). In 2008, out of 120 coercive fine warnings for all types of inspected entities, 112 recipients subsequently complied and only eight cases were reported to police for further investigation (IMPEL, 2007).

KLIF reports 10 to 15 severe violations a year to the police. These are subject to *criminal sanctions*. The maximum criminal penalty for violation of environmental regulations is 15 years of imprisonment. In a criminal trial, criminal fines may also be imposed upon persons or corporations, and profits gained through non-compliance may be confiscated. A criminal penalty (*i.e.* imprisonment or fine) requires police investigation, prosecution and court conviction. Where imprisonment is not considered, the case is usually settled through a fine in lieu of prosecution.[15] Serious violations are handled by Norway's environmental crime investigation unit, *Økokrim*, which investigates and prosecutes a small subset of high-profile cases of significant impact and/or high deterrent effect (Økokrim, 2010; Box 3.2).

Clear guidelines are available to KLIF on the *selection of non-compliance response*. There are annual meetings between KLIF and the police to review experience and draw up further guidelines that also involve county inspectors. KLIF seeks feedback from the prosecuting authorities on both successful and unsuccessful prosecutions. All police districts have a co-ordinator for environmental crime, and all police units have an environmental officer. The National Police Academy organises special training courses on combating environmental crime.

1.3. *Compliance promotion*

Use of *environmental certification* in Norway is growing. The number of companies certified as meeting the ISO 14001 standard increased from 227 in 2000 to 618 in 2007 (ISO, 2008). Companies certified under the EU Eco-Management and Audit Scheme (EMAS) or ISO 14001 have their inspection fees reduced by up to 50%. Small companies are certified through the Eco-Lighthouse programme, which emerged from a Local *Agenda 21* pilot project in Kristiansand in 1996 and developed into a nationwide initiative. Eco-Lighthouse certification requires companies to establish an environmental management system under which environmental analyses are carried out and a plan of action is prepared to meet specified environmental, health and safety requirements developed under the programme for 60 industries. It provides a good basis for other forms of certification. By 2009, most local authorities in central and southern Norway were running Eco-Lighthouse programmes, under which 1 300 private enterprises and public-sector entities were certified (MFA, 2009). The certification has to be renewed every three years.

Norwegian authorities have substantial holdings in the Norwegian private sector through *publicly owned companies and ownership interests in listed companies*. By the end of 2009, the market value of the Government Pension Fund was equivalent to one year of Norway GDP (Chapter 2) (MoF, 2010).[16]

Box 3.2. **Økokrim**

The National Authority for Investigation and Prosecution of Economic and Environmental Crime, *Økokrim*, is Norway's central unit for fighting serious economic and environmental violations. Its actions aim to create a deterrent effect by demonstrating that anyone breaking the rules is liable to be penalised.

Økokrim, established in 1989 under the Ministry of Justice, is both a police unit and a prosecuting authority. Headed by the chief public prosecutor, it has about 150 employees organised in multidisciplinary teams. Each team has a specific field of expertise, such as corruption, tax fraud, money laundering, computer crime or environmental crime. Members of the environmental team have police training as well as a background in the natural sciences and in legal, economic and financial matters.

The main tasks of *Økokrim* are to uncover, investigate and bring to trial a limited number of high-profile cases which are serious, complicated and may help develop a particular type of case law. Many cases have an international dimension. Upon request from police districts or enforcement agencies such as KLIF, *Økokrim* assists in investigating cases and thus helps develop agencies' expertise, increasing their ability to handle a wider range of cases independently.

Environmental crimes handled by *Økokrim* deal with pollution (*e.g.* illegal handling of dangerous waste, causes of industrial accidents), nature protection and biodiversity (*e.g.* illegal hunting and trapping, illegal activities in protected areas), cultural heritage (*e.g.* removing or damaging protected monuments or sites, violations of the Planning and Building Act) and occupational health and safety (*e.g.* inadequate work-related safety procedures, use of dangerous equipment in a work environment).

Out of 33 new cases launched by *Økokrim* in 2008, 12 were environment related; 6 out of 26 new cases in 2009 had an environmental dimension. Examples from 2009 include the following:

- Five importers of electrical and electronic products were convicted of failing to register their operations with an approved recycling company. They were fined a total of NOK 570 000, with close to NOK 2 million in profit confiscated, for contravention of the Pollution Control Act and the Waste Regulations.
- *Økokrim* took the lead in a crackdown on illegal lobster fishing in Østfold, Vestfold, Telemark and Agder districts. A joint operation with police led to 231 cases being brought to court. The campaign was widely covered in the national media with an awareness-raising message about the endangered status of lobster stocks.
- The Vest Tank company accepted a fine of NOK 2 million in connection with an explosion and fire in two tanks containing oil mud at the company's facility in Gulen in May 2007 that resulted in discharge of hazardous substances. The chairman of the board, the general manager and an expert adviser on chemistry were charged with violating the Pollution Control Act. The board chairman was also charged with financial crimes.
- Five individuals were issued fines and confiscation orders totalling some NOK 3 million for illegal transport and handling of industrial waste on several occasions between 2000 and 2004. Their operations led to contamination of farmland in eastern Norway by waste consisting mainly of shredded paper and plastic that should have been delivered to an approved waste handling facility.
- Norway Statoil and Ekeberg Oil Store were fined NOK 800 000 each for violating the Fire and Explosion Prevention Act, the Work Act and the Pollution Control Act. The violations had led to a leak of at least 100 m^3 of oil in underground fuel storage at Sjursøya, near Oslo.

In 2004, the fund became one of the first state-owned pension funds to adopt ethical guidelines. They were revised in 2009 and new guidelines for responsible investment have been adopted. Helped by recommendations from the Council on Ethics,[17] the Ministry of Finance can exclude companies from the fund if they are in breach of the guidelines. Since 2004, 48 companies (mainly in the weapon and tobacco industries) have been excluded from the pension fund – eight of them for causing severe environmental damage. In the 2010 national budget, the government proposed NOK 4 billion in investment based on environmental criteria.

As a representative of the pension fund, *Norges Bank* (the country's central bank, a shareholder in more than 8 300 companies) seeks to improve companies' management of risk related to children's rights, climate change and water. It requires them to disclose policy, strategies, targets and progress in these areas. The first compliance report relating to climate change management, in 2009, showed compliance to be low overall, though better in the power generation and oil and gas industries than in transport and chemicals (NBIM, 2009).

In 2009, the government approved a *strategy on corporate social responsibility* (MFA, 2009) that aims to clarify the roles of the authorities, the private sector and other actors in integrating social and environmental concerns in company operations. Norway is restructuring its national contact point under the OECD Guidelines for Multilateral Enterprises, increasing its financial resources and strengthening its independence. Since 2000, three of the six instances considered by the national contact point have related to the guidelines on environment (OECD, 2010). Recent instances concern the potential for environmental harm of mining and fish farming by Norwegian companies abroad. Norway's Guarantee Institute for Export Credits has developed its own social responsibility policy.

1.4. Other instruments

Environmental impact assessment

The *Regulations on Environmental Impact Assessment* (EIA), first developed in 1990, were revised in 2005 and 2009 to conform with the EU directives on EIA and strategic environmental assessment (SEA). The revisions expanded the scope of projects subject to EIA, in some cases going further than international obligations. Examples include: hydropower plants over 10 MW; golf courses; treatment facilities for household and commercial waste; holiday houses over a certain size; and construction on the sea shelf up to one nautical mile from shore (KLIF, 2005). The revised regulations also include an expanded list of types of plans and policies for which SEA should be carried out.

The regulations *decentralised the EIA process further*, making municipalities responsible for EIA in most cases. Stronger emphasis was placed on participation by the public and by relevant authorities in early stages of the process, with procedures detailed for specified types of projects and policies. The provisions cover assessment of impact, not only on the environment but also on natural resources and communities, including interests of the Sami population, human health, accident emergency preparedness and accessibility. EIA procedures for land use planning were strengthened in 2009 with adoption of the new Planning and Building Act. It requires EIA to be carried out for county master plans, the land use part of municipal master plans, municipal subplans, and zoning and building development plans.

Every year, around 50 projects are subject to EIA. The *project types most frequently involved* are ore extraction, light industry/public buildings, and roads. Recently the number of wind farm projects has increased. Evaluation studies of EIA in Norway show that assessment contributes to an orderly planning process, enhances the role of the public in planning and decision making, and produces a broader knowledge base for decision making. However, alternative and mitigation measures are still weak and should be subject to greater scrutiny by the relevant authorities.

The 1985 Petroleum Act established requirements for *EIA for oil and gas exploration and operations on the continental shelf*. The resulting EIAs, usually prepared separately for each new project, came under increasing criticism from environmental and fishery authorities for insufficient evaluation of the cumulative environmental impact of all oil and gas activities in a region. A revision of the Petroleum Act in July 1997 established a new legal requirement for regional environmental impact assessments (REIAs) (MoE, 2003). The basic objective of the new system is to improve and simplify EIA work for the sector through preparation of REIAs based on existing, planned and expected activity in a given region and assessing the overall regional environmental impact, including the cumulative impact. New methods of evaluating the cumulative impact of emissions to air and discharges to water were developed. Statoil, together with the authorities, played an important role in the development of the new offshore EIA system, on behalf of operators. Nevertheless, the system needs to be further developed, as does EIA methodology in the sector.

Land use planning

Since the promulgation of the Planning and Building Act in 1985, Norwegian *land use planning has taken place at three levels*: national, with the Ministry of the Environment, Ministry of Local and Regional Affairs, and Ministry of Labour and Administration providing regulatory frameworks; regional, with county councils assuring integration and co-ordination of planning; and local, where the actual physical planning is carried out by municipal councils. The system reflects the traditional approach in Norway, in which municipalities enjoyed considerable discretion in land use and planning decisions. Over the review period, many municipalities established one or more intermunicipal boards or companies dealing with specific planning needs related to public transport and provisions for water supply, sewerage and waste management.

The changes in planning practices stimulated the adoption of the *new Planning and Building Act* in 2009. The Act aims to streamline and simplify the planning system and strengthen co-ordination of planning among various levels, giving counties a stronger role in co-ordinating planning decisions across municipal boundaries. Its provisions also strengthen the integration of environmental concerns in land use planning. For example, the Act introduced a concept of zones requiring special consideration and protection, linked with environmental values, where construction may be restricted. Provisions also limit the scope for exemptions for building in coastal areas, introduce new requirements for EIA in land use planning and zoning, and facilitate the incorporation of climate considerations into municipal plans and operations (MoE, 2008).

Green public procurement

Every year the public sector purchases goods and services worth around NOK 275 billion, with the central government responsible for around NOK 100 billion. Since 2001, the *Public Procurement Act* has required public procurement operations to "have

regard to the resource implications and environmental consequences of the procurement". The Regulations on Public Procurement specify further options concerning life-cycle impacts and eco-labelling criteria.

Recognising an important potential for reducing the environmental impact of goods and services purchased by the public sector, in 2005 the MoE established a three-year advisory panel on developing green public procurement policy.[18] In June 2007, *the Action Plan for Environmental and Social Responsibility in Public Procurement* was adopted (MoE/MCE/MGAR, 2007). The Agency for Public Management and e-Government (DIFI), established under the Ministry of Government Administration and Reform in 2008, is responsible for following up the action plan. Guidelines and standard procurement criteria have been developed and capacity-building assistance has been provided to assist procurement officers at the central level. They set specific requirements for procurement in 15 priority product groups, such as buildings, vehicles, information and communications technology equipment, textiles, health and hygiene consumer material, printed matter and paper, and office furniture and supplies.

Collaborative initiatives were also launched to encourage *sustainable procurement at the municipal level*. For example, the Liveable Communities programme, launched in 2006 in collaboration with the Norwegian Association of Local and Regional Authorities, included a focus on public procurement and dissemination of good practice. A network of focal points at the county level was established for providing advice, giving courses to local procurement officers and sending feedback to DIFI. The target groups are local authorities and national government institutions with regional and local offices. An Internet-based infrastructure is being built for sharing templates and examples between DIFI and national and local procurement officers.

However, although various environmental criteria were applied for some 70% of procurement operations, questions can be raised about the *effectiveness of procurement in genuinely minimising environmental harm*, as well as doubts about clarity of requirements for suppliers. DIFI is developing tools to make it easier and more automatic for procurers to set environmental standards and for suppliers to provide specific, consistent and meaningful documentation. To increase "market pull", sustainable procurement practices should become mandatory at the central and local level and better monitored. Actively rewarding central government agencies and municipalities would encourage greater innovation and competitive spirit.

2. Environmental democracy

Access to information and public participation

Norway has continued to develop a comprehensive, policy-relevant and user-oriented system for *environmental information collection and provision*, supported by environmental indicators and robust analyses of the cost and impact of pollution on human health and ecosystems. More emphasis has been placed on cost-effectiveness of information and relevance to economic and sectoral decision making. The Ministry of the Environment (MoE) website contains systematic information and links to other sources. The latter include MoE subordinate agencies, which give extensive environmental information under topics or headings such as news, public consultations, and legislation. In most cases, contacts for further information are listed. The *Miljøstatus i Norge* website (State of the Environment Norway, *www.miljostatus.no*) provides one-stop, comprehensive access to

updated information on the state of the environment, environmental trends and environmental pressures. In 2010, a new website called *Er det Farlig* (Is It Dangerous?) was launched with information about hazardous substances in consumer products (*www.erdetfarlig.no*).

The *right of access to environmental information*, already well rooted in regulations and practices before the review period, was further strengthened in 2003 when Norway ratified the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the *Aarhus Convention*). The ratification was followed by the adoption of the Environmental Information Act in 2004. The Act extended citizens' right to obtain information about the environmental consequences of decisions by state, county and municipal entities and required authorities to respond to information requests within 30 days. In addition, the new Planning and Building Act strengthened access to information about environmental consequences of land use planning. MoE evaluation of the Environmental Information Act has shown that so far it is functioning well, but it needs to be further publicised.

The Act also expanded requirements for *the private sector to publicly disclose environment-related information*. The Norwegian provisions go further than the requirements of the *Aarhus Convention*. Citizens can demand information not only on production processes but also on the content of products, including imports. The Act requires limited liability companies to include in their annual reports information about practices that may affect the environment, and extends the coverage of business sectors to agriculture and forestry. People living near industrial facilities have the right to information about pollution releases and their effects on the environment. The Norwegian Pollutant Release and Transfer Register helps fulfil this requirement: it makes available to the public data from around 600 licensed installations. At the same time, the Environmental Information Act introduced safeguards to protect confidential business information and instituted appeal provisions in case the government rejects a company's argument for withholding information.[19]

Norway's long tradition of *encouraging public participation in environmental decision making* allows civil society organisations to influence public policies. The Public Administration Act specifies that legal and private entities whose interests are particularly affected must have an opportunity to express their opinions. Public consultations are held at various levels before important policies or regulations are adopted. Non-government organisations (NGOs) can openly criticise the government during public debates at seminars, before expert committees and so on, but their input is usually constructive – giving advice to the government, commenting on draft legislation, proposing alternative actions or pointing to Norway's international obligations and commitments. NGOs inform the government of the results of their investigations, missions, etc., and provide new services that could eventually be taken over by the government or by commercial actors. Norwegian NGOs can bring cases to court, providing that the action is consistent with the organisation's status. In 2008, the government established a forum for dialogue on sustainable development, co-ordinated by the Ministry of Finance, in which 19 NGOs currently participate.

The *NGO sector* is large, dynamic and innovative, covering a broad range of issues and including many "umbrella" co-ordination organisations. Many NGOs combine professional staff with active volunteers. Three out of four Norwegians are members of at least one

NGO, and half the population belongs to two or more. Volunteering and donations account for half of Norwegian NGO resources, while public funding accounts for 20%. Around one-third of Norwegian development assistance is provided through NGOs. For example, Norwegian support to civil society in 12 countries of Central and Eastern Europe, through the EEA Grants Programme, amounts to EUR 85 million. The Norwegian Agency for Development Cooperation (*Norad*) evaluates NGO activities to assure effectiveness in meeting development goals.

3. Review of progress in air and water management

3.1. Air management

Trends in air emissions and air quality

Emissions of main pollutants were significantly reduced over the review period. The most remarkable achievement was more than halving *emissions of non-methane volatile organic compounds* (NMVOCs) between 2000 and 2008. This was due mostly to a 78% reduction in emissions from loading and storage of crude oil on the continental shelf (Table 3.1). NMVOC emissions from road traffic were reduced by 29% in the same period, though the overall reduction was offset by large emissions resulting from problems with the start-up of a liquefied natural gas (LNG) plant on Melkøya Island in Finnmark county (Statistics Norway, 2009). Nevertheless, Norway reached its NMVOC emission ceiling under the Gothenburg Protocol (195 000 tonnes by 2010) in 2008, and emissions were expected to be further reduced to 160 000 tonnes in 2009 (Figure 3.1).[20]

Following significant reductions of *sulphur oxide* (SO_x) emissions in the 1990s, the trend continued in the review period. The largest reduction (–32%) was achieved in the industrial sector, including iron, steel and ferroalloy production, which generated around 50% of total SO_x emissions in 2008. Progress was due to a switch from fossil fuel to electricity, and reduction of the sulphur content in oil products and raw materials (Table 3.1). Norway met its 2010 Gothenburg Protocol target for annual SO_2 emissions (22 000 tonnes) in 2006 (Figure 3.1).

Table 3.1. **Atmospheric emissions by source, 2000 and 2008**

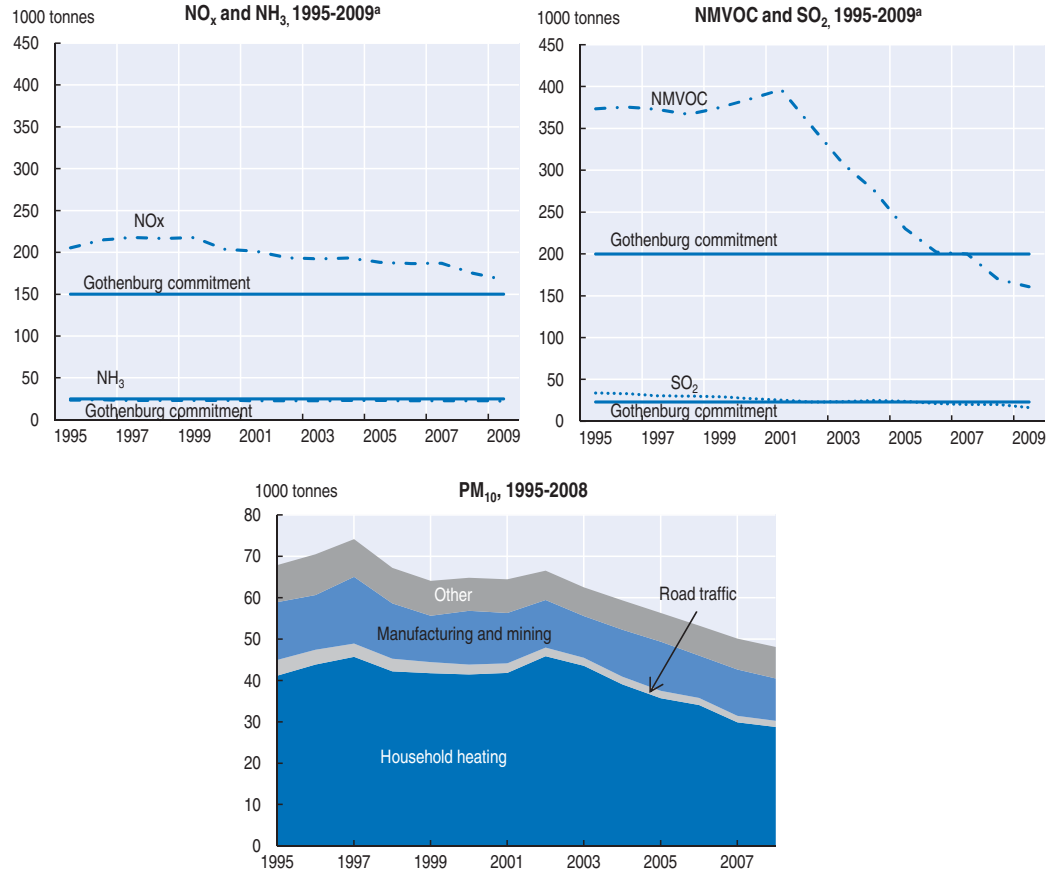
1 000 t

		SO_2	%	NO_x	%	NMVOCs	%	CO	%
Power stations	2000	1.5	5.5	1.3	0.6	0.5	0.1	0.8	0.1
	2008	1.0	5.0	1.6	0.9	0.9	0.5	3.7	1.0
Industrial combustion	2000	3.6	13.3	44.9	22.1	2.3	0.6	14.2	2.5
	2008	2.7	13.3	49.2	28.0	2.3	1.4	15.2	4.0
Non-industrial combustion	2000	1.2	4.3	2.4	1.2	8.4	2.2	163.4	28.9
	2008	0.8	3.8	2.3	1.3	8.6	5.1	126.6	33.1
Industrial processes	2000	16.8	61.8	13.9	6.8	13.3	3.5	33.7	6.0
	2008	11.5	56.6	9.0	5.1	9.8	5.8	14.1	3.7
Mobile sources	2000	4.1	15.2	139.5	68.5	59.9	15.5	342.4	60.5
	2008	4.3	21.2	111.3	63.5	42. 7	25. 2	215.8	56.4
Solvents	2000	–	–	–	–	47.2	12.3	–	–
	2008	–	–	–	–	48.9	28.9	–	–
Miscellaneous	2000	–	–	1.6	0.8	254	66	11.6	2.1
	2008	–	–	1.9	1.1	56	33	7.1	1.9
Total	2000	27.1	100.0	203.6	100.0	385.2	100.0	566.0	100.0
	2008	20.3	100.0	175.3	100.0	169.5	100.0	382.5	100.0
Change 2008/2000		–25.4		–13.9		–56.0		–32.4	

Source: Inventory submission to the UNFCCC, April 2010.

StatLink http://dx.doi.org/10.1787/888932375186

Figure 3.1. **Emissions of conventional air pollutants**



a) Preliminary data.
Source: KLIF (2010b).

StatLink http://dx.doi.org/10.1787/888932374559

SO_x emissions per unit of GDP are well below the OECD average while emission reduction between 2000 and 2008 (–25%) was comparable to that in other OECD countries.

Emissions of nitrogen oxides (NO_x) showed a slower decreasing trend, falling by 14% between 2000 and 2008 (Table 3.1). Emissions from vehicles fell by 28% and from ships/fishing vessels by 20%. Renewal of the car fleet and strict exhaust requirements, as well as reduced flaring at the Melkøya LNG installation, also contributed to the reduction (Statistics Norway, 2009). However, these decreases were partly offset by an increase of emissions from oil and gas extraction (+25%), resulting in the NO_x emission level being still 12% above the 2010 Gothenburg Protocol targets in 2008 (Figure 3.1). The biggest emitters were ships and fishing vessels (34%), followed by oil and gas extraction (25%), and vehicles (22%). NO_x emissions per unit of GDP remain higher than the EU15 average.

Emissions of ammonia (NH_3) have long been at the same level, just below the Gothenburg Protocol target of 23 000 tonnes (Figure 3.1). Agriculture generated 88% of the Norwegian emissions, the main sources being livestock, commercial fertiliser use, and treatment of straw with ammonia. Other sources are petrol vehicles (9%), and manufacturing processes (3%).

Emissions of *carbon monoxide* (CO) were reduced by 32%, mostly because of decreases in emissions from road traffic due to catalytic converters. The largest sources of CO

emissions are still road traffic (56%) and household heating (33%), in which wood is used as a fuel (Table 3.1). Total emissions of *particulate matter* (PM_{10}) were also reduced (by 29% since 2000), mostly due to lower emissions from fuel wood use; nevertheless, the use of wood for household heating is still the largest source, accounting for 60% of PM_{10} emissions (Figure 3.1). Other sources include minerals and metals production (22%) and transport (10%), which includes exhaust, road dust and tyre wear (Statistics Norway, 2009).

Important progress was made in reducing air emissions of *hazardous substances*. Emissions of dioxins have been reduced by 67% since 1995. A large proportion of this decrease was due to the closure of an iron mine and a processing plant in northern Norway (Statistics Norway, 2009). Dioxin emissions from waste incineration fell significantly (by 98%) between 1990 and 2008 even though waste incineration capacity rose. In particular, a tax on incineration stimulated emission reduction measures (Chapter 7). In 2008, the most important dioxin source was wood burning by private households (30%), followed by combustion from navigation (19%) and metal production (17%). Emissions of polycyclic aromatic hydrocarbons (PAHs) remained stable, albeit with large annual variations. Aluminium production contributed 54% of PAH emissions in 2008 (compared to 38% in 1995), while wood burning was responsible for 24%. Other sources included road traffic (7%), and solvents (5%) (Statistics Norway, 2009).

Emissions of *heavy metals* such as arsenic, chromium and cadmium have been substantially reduced since 1995: chromium by 80%, arsenic by 50% and cadmium by 44%. The reductions were due to factory closings but also better emission control equipment in iron, steel and ferroalloy facilities and wood processing. After a considerable decrease in lead emissions in 1990-96 as leaded petrol was phased out, further reductions followed as emissions from iron, steel and ferroalloy production fell; some 40% of lead emissions in 2008 still stemmed from production processes in these industries. Other important sources were brake wear and use of leaded petrol in light aircraft, which together accounted for another 40% of lead emissions in 2008.[21] In contrast, copper emissions are increasing due to brake wear and combustion emissions from road traffic. Emissions of mercury were relatively stable over the review period, the main source being iron, steel and ferroalloy production (20% in 2008) (Statistics Norway, 2009).

Air quality

Norway's *air quality objectives* were harmonised with the EU air quality framework directive (96/62/EC) and four "daughter" directives with the adoption of the 2004 Pollution Regulations. The regulations established binding air quality standards for SO_x, NO_x, lead, PM_{10}, benzene, CO and ozone, as well as target values for heavy metals. They also established monitoring and information requirements, including alert thresholds related to the concentration of tropospheric ozone in agglomerations and sparsely populated areas. In some instances, the requirements are more stringent that those of the EU.[22]

PM_{10} and nitrogen dioxide (NO_2) are the most important contributors to *local air pollution*. High levels of PM and NO_2 occur every winter and spring in Norwegian cities when emissions from domestic wood burning, car exhaust, and use of studded tyres are associated with temperature inversions and low winds. Analysis by the Norwegian Institute for Air Research in 2003, showed that almost half the population of Oslo was exposed to PM levels exceeding national targets. The situation has improved recently: the yearly average concentration limits (40 $\mu g/m^3$ of PM_{10}) were met in the main cities in 2007 and 2008, and the limit on the number of days with PM_{10} levels exceeding a daily average

of 50 μg/m^3 was met in all cities in 2008 (KLIF, 2010b). However, some cities experience difficulties in complying with the limit values for NO_2. For example, in Oslo, Trondheim and Bergen, annual mean values of NO_2 (40 μg/m^3) were exceeded in 2009. Maximum recommended limits for ground-level ozone concentrations established by KLIF are also exceeded, usually in spring and early summer.[23] Despite the reduction of emissions of some ozone precursors, NMVOCs in particular, it is highly probable that the maximum concentration of ground-level ozone will continue to be exceeded (KLIF, 2008).

Mindful of the potential health impact of air pollution, authorities have paid particular attention to *informing the public about air quality in urban areas*. The Norwegian Institute for Air Research, the Norwegian Meteorological Institute and the Norwegian Public Road Administration developed an Urban Air Quality Information and Forecasting System, which is now applied in Oslo, Bergen, Trondheim, Drammen, Stavanger and Grenland during the winter. Each city forecast is based on concentration levels and population exposure to air pollutant concentrations. An index is made available through a website (*www.luftkvalitet.info*), which displays forecasts for the coming day updated every four hours. Recommendations concerning air quality are also published in local newspapers and a service has been developed to distribute the forecast via SMS. The forecasts are used for health warnings and may be used to plan immediate measures, such as reduction of speed limits, when pollution episodes are predicted.

Policy measures to address air pollution

Norway's efforts to reduce air pollution from the energy and industry sectors have benefited from the improved environmental permitting and compliance assurance procedures described above. In some cases, industrial restructuring, especially in metal and mineral production, contributed to emission reductions. *Co-operation with industry* played an important role in reducing NMVOC emissions from the oil and gas sector, which accounted for over 60% of total NMVOCs in 2000, mostly from storage and loading of crude oil offshore. Following the development of a technology to capture NMVOC emissions, strict regulations were issued in 2003 requiring all vessels to use it. Ships without such equipment were not granted access to ports. NMVOC emissions in the sector fell from 250 000 tonnes in 2001, to 40 000 in 2009 with no reduction in the amount of oil loaded. Today's technology can reduce emissions from loading by approximately 70% (NPD, 2010).

Economic instruments have played an important role in reducing emissions to air. The tax on sulplur in oil applied to oil products was instrumental in reducing SO_x emissions in the 1990s. In 2003, the *incineration tax* was differentiated on emissions of air pollutants. For example, dioxin emissions were taxed at NOK 2.7 million per gram, lead at NOK 74, mercury at NOK 24 and NO_x/SO_2 at NOK 0.02. Since the tax was applied, important reductions have been achieved, especially with regard to dioxins (Chapter 7).

The application of taxes on emissions stimulated *vigorous engagement of industry in discussions with the government on emission reduction efforts*. For example, in 2001 a letter of intent between the government and the Confederation of Norwegian Enterprises committed industries to reduce their SO_x emissions so as to achieve Norwegian compliance with the SO_2 emission ceiling of the Gothenburg Protocol (Nordic Council of Ministers, 2009). Similar arrangements were made with the recently introduced tax on NO_x emissions, which aimed to speed up reductions of NO_x emissions in light of the Gothenburg Protocol requirements (NHO, 2010) (Box 3.3). Since the introduction of the tax in 2007 and an environmental agreement in 2008, NO_x emissions have decreased by 10%. It may be too early to link the

Box 3.3. **Tax on NO_x emissions**

On 28 November 2006, the *Storting* adopted a declaration introducing a tax on emissions of NO_x. The tax, calculated on the basis of actual emissions of NO_x (as NO_2 equivalent), targeted domestic activities, including major land-based and continental shelf sources and aviation. The tax applied to propulsion machinery with total installed engine power of more than 750 kW, engines, boilers and turbines with total heating power of more than 10 MW, and flaring at offshore and onshore installations. The rate was NOK 15/kg of NO_x emitted in 2007, increasing to NOK 15.4/kg in 2008, NOK 15.9/kg in 2009 and 16.4/kg in 2010. Exemptions were applied for emissions from freight ships, fishing vessels and aircraft in direct traffic between Norwegian and foreign locations.

In light of discussions with domestic industry about the feasibility of the tax, the *Storting* introduced a clause allowing exemptions with respect to "emission sources encompassed by environmental agreements with the state concerning the implementation of measures to reduce NO_x emissions in accordance with a predetermined environmental target".

Following the adoption of the tax, an environmental agreement was concluded between 14 business organisations and the government on 14 May 2008 to reduce emissions by 30 000 tonnes by 2010 to an annual level of 98 000 tonnes. The agreement encompassed sources listed in the *Storting*'s tax decision, to which industrial processes were added. The 30 000 tonne reduction was phased in, requiring reductions of 2 000 tonnes in 2008, 4 000 tonnes in 2009 and 24 000 tonnes in 2010 (with the provision that 7 000 tonnes of the reductions planned for 2010 to could be fully implemented by 2012). The agreement stipulated that enterprises conforming to the agreement were exempt from the NO_x tax for 2008, 2009 and 2010. On 13 December 2010 the Ministry of the Environment signed a new agreement with 15 business organisations to ensure that Norway reduced its yearly NO_x emissions by 16 000 tonnes by the end of 2017.

The Confederation of Norwegian Enterprises reported that more than 580 businesses had joined the agreement as of February 2010, including most oil and gas firms. It is estimated that these enterprises represent more than 90% of NO_x emissions from sources covered by the agreement. To help them meet their obligations, business organisations set up a fund that all participating enterprises had to join. It is managed by a secretariat supported by the company *Det Norske Veritas*, with a management board chaired by a representative of the Confederation of Norwegian Enterprises. The fund collects emission payments from enterprises: 11 NOK/kg of NO_x emitted from the oil and gas industry and NOK 4/kg from other sectors, such as shipping, fishing, aviation and district heating. In exchange, the fund offers financial support to enterprises for implementing NO_x emission abatement measures. The fund was expected to allocate NOK 1.8 billion over 2008-10.

Company payments to the fund are tax deductible, and the amount allocated from the fund to companies is taxable. The oil and gas sector's contribution to the fund is almost triple that from land-based companies, as the sector accounts for a large portion of the total emissions covered by the agreement. However, the allocation to that sector from the fund is small. Furthermore, oil and gas companies are subject to a 50% special tax in addition to the ordinary tax of 28%. This implies that a substantial amount of the fund is indirectly financed by the government budget through the forgone tax revenue. Since Norway is a party to the EEA Agreement, it notified the EFTA Surveillance Authority about the exemptions from the NO_x tax. The authority did not raise objections.

reductions with the tax and the agreement, however, as the period coincided with the economic crisis, which resulted in lower industrial production and reduced combustion of natural gas in oil and gas activities on the Norwegian continental shelf. Careful monitoring and analysis of the initial results should help optimise the government and industry approaches to the tax and tax exemptions.

In addition to national efforts, *local government actions* have targeted urban air pollution. All major cities have action plans to improve air quality, with priority on addressing pollution from road traffic and household heating. Several municipalities,

including Oslo, Bergen and Trondheim, introduced charges on use of studded tyres, which contribute to air pollution due to road and tyre wear. In Oslo, studded tyres are subject to a daily, monthly or seasonal charge (NOK 30, 400, or 1 200, respectively). Introduction of the charge in 1999 stimulated a switch to non-studded tyres; progress was reversed in 2001, when the charge was removed. It was reintroduced in 2004, and by 2008, 84% of cars had stud-free tyres. At the same time, an environmental speed limit of 60 km/h (down from 80 km/h) was introduced on major roads around Oslo to reduce wear on the tarmac and the resulting dust. Analysis in 2004-05 showed PM concentrations and noise levels fell along the associated roads. The project gained high public acceptability as the reduction in speed limit did not cause additional traffic congestion (NPRA, 2005).

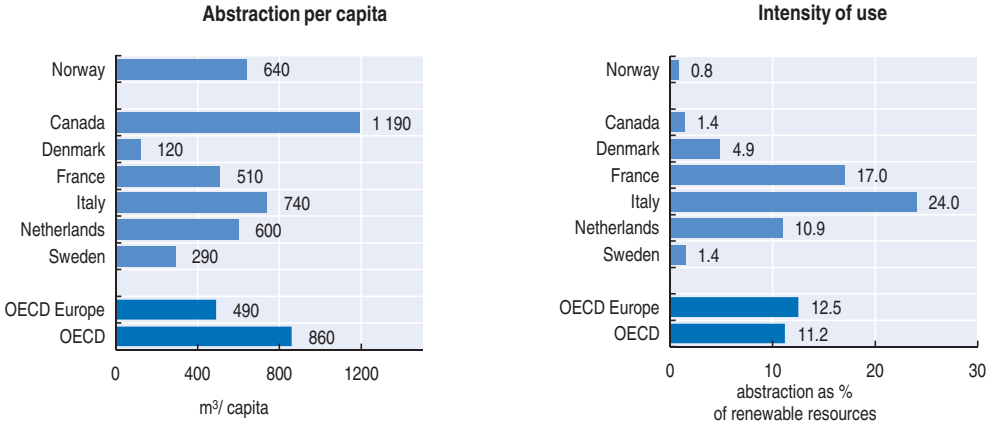
Recognising the large contribution of *wood burning for household heating* to high levels of PM_{10}, the government introduced regulations in 1998 requiring higher performance standards for newly installed wood-burning stoves. To encourage the replacement of old stoves, Oslo and Bergen introduced partial refunds for new stoves. Between 1998 and 2008, around 4 400 stoves were replaced, at a cost of NOK 12.3 million. It is estimated that the change contributed an average of 35.2 tonnes a year to the reduction in PM emissions. In 2008, almost half the wood used for heating in Oslo was burned in new stoves.

3.2. Water management

Water availability and use

Norway is a country with an abundance of water.[24] *Intensity of water use* (withdrawal as a percentage of available resources) is 0.8%, among the lowest levels in the OECD.[25] Per capita withdrawal of freshwater is 640 m^3 per year, also well below the average for OECD countries (Figure 3.2). Total *freshwater withdrawal* has increased due to higher use by industry, which accounted for around 40% of the total 3.0 billion m^3 used in 2007.[26] Agricultural and household use of freshwater remained relatively stable, accounting for around 30% each (Figure 1.1).[27] More than 70% of Norway's largest rivers are regulated for *hydropower production*. Nine of the world's 20 highest waterfalls are in Norway, and the water flows of seven of them are subject to hydropower regulation.

Figure 3.2. **Freshwater use, 2007**[a]



a) Or latest available year.
Source: OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932374578

Acidification of water bodies, with serious consequences for fish stocks, was an issue of high concern until the late 1980s. Reductions in air emissions of SO_x and NO_x, together with liming of rivers and lakes, reduced the total area affected by acidification by 40% between 1990 and 2006.[28] However, long-range transboundary pollution is still a problem, especially in south-western Norway. Some analyses show freshwater will continue to suffer from acidification in large areas of southern Norway, and water quality may be insufficient to support viable populations of fish and other organisms (Larsson *et al.*, 2010).

KLIF has mapped over 100 coastal sites with *polluted marine sediment* (Chapter 7). Of these, 17 (including 7 harbour areas) have been identified as particularly exposed. In several of these areas, pilot clean-up projects have been initiated. State of environment monitoring enables measures to be taken to prevent sales and consumption of contaminated seafood.

Pressures on water quality

In 2006, agriculture accounted for nearly 60% for total nitrogen and 45% of total phosphorus released *to coastal areas of the North Sea* classified as sensitive under the North Sea Declarations.[29] Households accounted for 35% of nitrogen and 33% of phosphorus, and industry for 7% of nitrogen and 21% of phosphorus (Statistics Norway, 2009). As fish farming is largely banned along the North Sea coasts, releases from this industry are marginal.

Agriculture historically has also been the largest anthropogenic source of nitrogen inputs to Norway's northern and western coastal waters (not considered the most sensitive to eutrophication). In 2005, however, inputs from aquaculture exceeded those from agriculture for the first time (Figure 3.3). Phosphorus and nitrogen discharges from aquaculture now account for 78% and 45%, respectively, of the total anthropogenic inputs. Moreover, expansion of fish farming northwards from Rogaland county is resulting in sharply rising trends. Total anthropogenic input of phosphorus and nitrogen to the Norwegian Sea increased by about 35% and 9%, respectively, between 2000 and 2006 (Statistics Norway, 2009).

Hazardous chemicals in water come from various sources. In some areas, past local discharges from industry have resulted in high levels of hazardous chemicals in fish and other aquatic fauna. At Sørfjorden in Hardanger and in Lake Mjøsa, for example, elevated levels of PCBs, brominated flame retardants and chlorinated paraffin have been detected (NIVA, 2007). Seepage from landfills and dispersal of polluted sediment add to the problem. Estimates in 2008 suggested that discharges into receiving water included 57 tonnes of heavy metals from the wastewater sector (with zinc accounting for 65%) and 30 000 tonnes of hazardous organic pollutants (KLIF, 2010b).

Long-range air pollution is also a source of hazardous chemicals in Norwegian water bodies. The high levels of mercury found in Norwegian freshwater fish are believed to come mainly from long-range transboundary air pollution plus past releases from some local sources such as smelters.

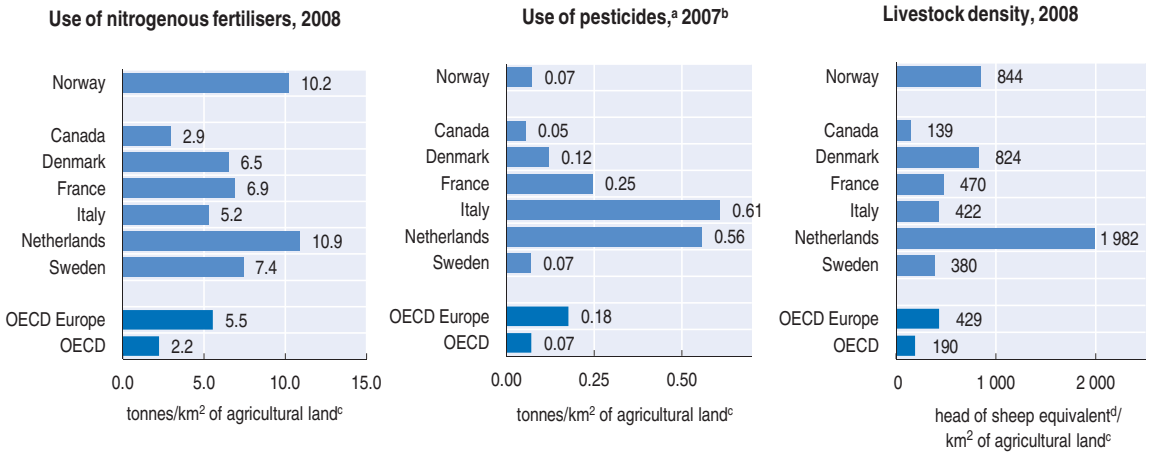
Measures to reduce nutrient and pesticide loads from agriculture

Most point sources of nutrient pollution of water, especially urban sources, have been reduced significantly, so *agricultural non-point pollution is now the main source of eutrophication in surface and coastal waters* (Box 3.4). Recognising this challenge, Norway has taken various initiatives to address water pollution from agriculture. The National Environmental Programme was introduced in 2004 to better co-ordinate a range of agri-environmental payments with the objective of reducing pollution, protecting biodiversity, cultural landscapes

Box 3.4. **Environmental effects of agriculture**

Nutrient surpluses (input minus output of nitrogen and phosphorus) declined over the review period, both in absolute terms and per hectare of farmland. Much of the reduction was due to lower fertiliser use. In particular, use of nitrogenous fertiliser fell from 12.4 tonnes/km^2 of arable land in 1998 to 10.1 tonnes/km^2 in 2008, which is still above the OECD and OECD Europe averages (Figure 3.3). The reduction of the nutrient surpluses was aided by the nearly stable uptake of nutrients by crop and pasture. However, this has been offset to some extent by an increase in nutrient inputs from livestock manure due to growth in numbers of livestock, notably pigs and poultry, already very high by OECD standards (Figure 3.3).

Figure 3.3. **Agriculture inputs and livestock density**



a) For many countries, sales are used as a proxy for pesticide use.
b) Or latest available year.
c) Arable area, permanent crop land and permanent grassland.
d) Based on equivalent coefficients in terms of manure: 1 horse = 4.8 sheep; 1 pig = 1 goat = 1 sheep; 1 hen = 0.1 sheep; 1 cow = 6 sheep.
Source: FAO, FAOSTAT database; OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932374597

and heritage, and increasing public access to the countryside. The programme required each farmer to establish an environmental plan (OECD, 2008).[30] To prevent further eutrophication of coastal waters from aquaculture, new fish farms must be located in waters with greater dilution capacity, closer to the open sea, and regulations govern use of feed; regulations have also increased monitoring obligations (Chapter 6). The share of farms and farmland under nutrient management plans rose over the 1990s. In 1999, such plans became compulsory.

The use of environmental taxes on *pesticides* and a decision to target the tax at the most harmful compounds has led to lower use of the most hazardous pesticides. The proceeds from the tax (NOK 65-70 million a year) were used to finance measures to further reduce pesticide use and address related damage under the 2004-08 Action Plan for Pesticide Risk Reduction (OECD, 2008).

Despite progress in reducing agricultural pressures on the environment, a number of concerns remain. While the North Sea Declarations target the reduction of nutrient discharges (including from agriculture) into the North Sea by 50% compared to 1985 levels has been met for phosphorus (a 64% reduction), the reduction of 42% for nitrogen by 2004 indicates that further effort is required.[31] There are still challenges regarding phosphorus

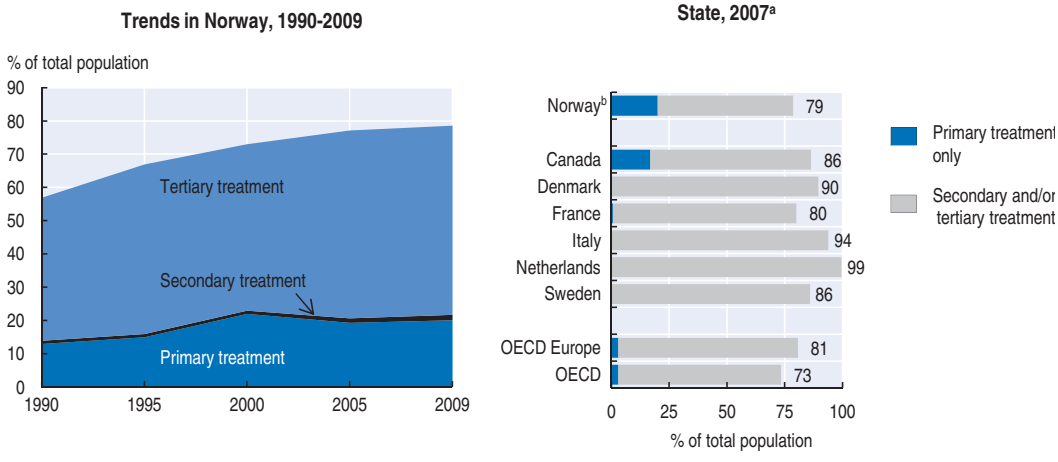
in some freshwater bodies, which are being targeted in the implementation of the EU Water Framework Directive. At the same time, the *high level of support to agriculture* (62% of gross farm receipts in 2008, the highest rate in the OECD) counteracts incentives provided by direct payments, pesticide regulations and taxes. In particular, there are still many policy incentives that make farmers more likely to take decisions based on production rather than environmental criteria (Chapter 2).

Water supply and sanitation

The quality of drinking water for most users in Norway is very good or good; about 95% of the population is served by public drinking water supplies from over 2 000 waterworks. These include municipal, intermunicipal, state-owned and private waterworks, which are subject to registration and reporting requirements of the National Institute of Public Health.[32] *Outbreaks of diseases caused by waterborne pathogens* have been reported in recent years. Between 2003 and 2007, 15 outbreaks were linked to microbiological contamination. For example, a giardia epidemic in Bergen in the autumn of 2004 made at least 6 000 people ill. In 2007, a warning was issued in Oslo that water must be boiled before use. In 2006 and 2007, the Norwegian Food Safety Authority carried out nationwide inspections for drinking water in response to the failure of some waterworks to obtain approval and draw up emergency plans. Most waterworks were found to supply consumers with drinking water of satisfactory quality, but at a few, serious breaches of the rules were found to represent a substantial health risk (Statistics Norway, 2009).

The *share of the population connected to municipal wastewater treatment plants* increased from 73% in 2000 to 79% in 2007 (Figure 3.4). Around 17% of the population is connected to small and individual treatment facilities (less than 50 person-equivalents). Only 5% are connected to sewerage with no treatment.[33] Actual treatment requirements vary by location depending on the estimated absorption capacity of recipient waters and their sensitivity to eutrophication; thus, the share of the population connected to wastewater treatment differs across the country, reaching over 86% in the North Sea catchment counties while the figure for the rest of the country was 23% (KLIF, 2010b).

Figure 3.4. **Population connected to public wastewater treatment plants**



a) Or latest available year.
b) 2009 data.
Source: OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932374616

Treatment efficiency shows similar trends. Norway has improved the level of treatment efficiency for phosphorus in municipal wastewater treatment overall, mainly by building and upgrading plants to provide chemical or chemical-biological treatment (they account for 58% of the total population covered) (Figure 3.4). While in the North Sea counties, wastewater treatment plants remove on average 92% of the phosphorus and 38% of the nitrogen, elsewhere the treatment efficiency is 43% for phosphorus and 15% for nitrogen.[34] As the pollution control authorities set less stringent standards for less sensitive areas, municipalities often choose to use simpler and cheaper processes, such as mechanical treatment.

In 2008, 63% of municipalities, accounting for 72% of the population, were close to *fully covering the direct and indirect operating, maintenance and capital costs of water supply and wastewater services*, up from 40% at the beginning of the review period (KLIF, 2010b). The average annual wastewater charge was NOK 2 920 in 2009, with levels ranging from NOK 300 to NOK 6 614 depending on size of the municipality; the charges are highest in the small municipalities of south-eastern Norway, where wastewater treatment requirements are the most stringent (Berge *et al.*, 2009).[35] There are opportunities in some municipalities to increase cost recovery and to promote wider application of water metering.

Up to 2002, the government provided substantial financial support for construction of new municipal wastewater treatment plants or upgrading of inadequate drinking water treatment plants. Such *grants to municipalities have since been phased out or incorporated into general regional development funding*. Investment related to water supply and wastewater treatment is generally funded on national and international financial markets and repaid through user charges on water and wastewater (KLIF, 2010b).

Despite investment in renewal of water and sewerage pipes, the *sewerage systems are ageing* and their performance diminishing. The average age of the sewers in Norwegian municipalities is estimated to be 34 years. About 50% of the sewers were constructed before 1980, around 20% before 1970, and 5% before 1940 (KLIF, 2010b). Often water and sewerage pipes lie in the same ditch, allowing leakage to contaminate the water supply with bacteria and viruses. Leaks from sewers contribute around 5-10% of phosphorus and nitrogen discharges from the municipal sector, and may have worsened water-related health risks; therefore, the renewal of sewerage should be accelerated. Similarly, investment is required in the water distribution network: out of the 743 million m^3 of water produced annually by waterworks, *about a third is lost due to leakage from pipelines* (Statistics Norway, 2009).

Integrated water resource management

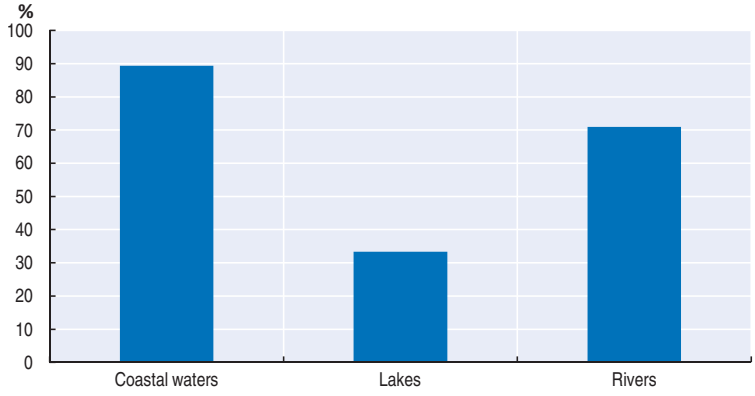
The EU Water Framework Directive was incorporated into Norwegian law with the adoption of the *Water Management Regulations*, which entered into force in 2007. Implementation began before the regulations came into force under the European Economic Area (EEA) Agreement in 2009. The regulations divided Norway into river basin districts managed by river basin district authorities and the regional councils. The regulations provided the basis for establishing environmental standards that would assure integrated protection and sustainable use of water bodies, and adoption of regional management plans aimed at fulfilling these standards (Iversen, 2009).[36]

In 2007-08, river basin management plans and programmes of measures were prepared for a *pilot group of 29 subdistricts* (out of 105) representing about 20% of Norway's watercourses and coastal areas. Characterisation of all water bodies has been concluded, but so far only water bodies in the selected subdistricts are classified according to criteria for status set in the EU directive. After a period of consultation, all pilot river basin

management plans, programmes of measures and overviews of significant water management issues were adopted by the regional councils in 2009 and central government in 2010. The first river basin management plans became operational in 2010. The Directive will be implemented in all subdistricts after 2010, with complete river basin management plans and programmes of measures expected by 2016 (Iversen, 2009).

Around *70% of rivers and one-third of the lake area are expected to have good ecological status by 2015*, short of the target in the EU directive that all water bodies should have good ecological status by then (Figure 3.5). The situation is better for coastal waters, with 90% of the area expected to have good ecological status by 2015. The deadline for achieving good status has been extended until 2021 for water bodies affected by nutrient pollution (and the resulting eutrophication). Initial experience from the practical application of measures in selected river basins suggests that a lack and inconsistency of environmental, economic and social data is a constraint and that better co-ordination of data collection and monitoring between water managers and the research community is needed to help improve use of existing knowledge and identify knowledge gaps where applied research could be beneficial. The finalisation of institutional arrangements for river basin management would help in dispute resolution, co-ordination of decision making among water users, planning, and mobilising of funding for pollution reduction and water management efforts.

Figure 3.5. **Water bodies classified as "not at risk"**[a]



a) Assessment of whether water bodies are expected to meet the EU Water Framework Directive's objective of good ecological status by 2015. The assessment is based on physical, chemical and biological criteria.
Source: *Water Framework Directive Database* (August 2008 data).

Notes

1. KLIF is the former Norwegian Pollution Control Authority. The name change, which did not involve any organisational or responsibility adjustments, was introduced on 18 January 2010.
2. Other bodies under the MoE include the Norwegian Polar Research Institute, which carries out mapping and scientific investigations in polar regions; the Directorate for Cultural Heritage, an advisory and executive body for management of architectural and archaeological monuments and sites and cultural environments; and the Norwegian Mapping Authority, which provides nationwide geographic information and services to private and public users.
3. The MoE is responsible for implementation of the EU Water Framework Directive.
4. The municipalities now focus on treatment plants in smaller urban areas, with increased enforcement authority.

5. In line with this strategy, responsibility for economic development budgets was devolved from the Ministry of Local Government and Regional Development to the counties starting in 2003. As a result, four-fifths of the ministry's annual budget now goes directly to the counties.
6. In 2006, the 1992 Local Government Act was amended to widen the range of tasks that can be delegated from municipalities and county councils to intermunicipal councils.
7. For this co-operative arrangement a written agreement is mandatory. Depending on the character of the delegated tasks, a political body has to be set up in which all participating municipalities can be represented.
8. The EEA unites the 27 EU states and three member states of EFTA (Iceland, Liechtenstein and Norway), in an internal market governed by the same basic rules. These rules aim "to enable goods, services, capital and persons to move freely across the EEA in an open and competitive environment".
9. The Nature Diversity Act replaced the 1970 Nature Conservation Act, and the Planning and Building Act replace a similarly titled 1985 law.
10. Regulations prohibiting building in a 100-metre shore belt were made more stringent and several exemptions were abolished. The new Act introduces the concept of zones requiring "special" consideration related to risk (*e.g.* from flood or avalanche) or to environmental or cultural values.
11. One main task of the EFTA Surveillance Authority is to monitor EFTA states' obligations to incorporate internal market rules into domestic law and apply them correctly. The EFTA states must notify the authority of measures they adopt to implement directives. The authority can also require them to inform it of the incorporation of regulations into domestic law. If an EFTA state does not implement EEA rules, the authority intervenes and may initiate infringement proceedings, which may ultimately be adjudicated by the EFTA Court.
12. The responsibility for permitting is divided between KLIF and the counties, with KLIF regulating 170 out of 250 installations subject to IPPC requirements. Municipalities can influence the permitting process under the Planning and Building Act, which gives them authority to assure a safety distance between an industrial site and local communities.
13. Fees are lower for lower-risk sites. The total fee must not exceed the costs incurred by the competent authority in connection with the inspection.
14. When a violation is detected or suspected, KLIF send a warning letter stating how the firm is believed to be out of compliance, indicating the seriousness of the violation, requesting documentation of compliance by a given deadline and pointing out the firm's legal duty to comply with the instructions. If a firm provides the requested documentation within the deadline, KLIF generally takes no further action.
15. The size of a fine in lieu of prosecution is not subject to bargaining, and it is set to reflect what the expected outcome of a court case would be if a trial were held. Acceptance of a fine in lieu of prosecution does not require or imply that the accused accepts any guilt.
16. The Government Pension Fund supports government savings to finance the pension expenditure of the National Insurance Scheme in the spending of government oil and gas revenue.
17. An independent council made up of five individuals, with its own secretariat.
18. Members included representatives of the ministry of Government Administration and Reform, KLIF, the Directorate of Public Construction and Property, the Confederation of Norwegian Enterprises and the Norwegian Confederation of Trade Unions.
19. Half the members of the Appeals Board come from industry, the other half from environmental or consumer organisations and the media.
20. Norway signed the Gothenburg Protocol in 1999 and ratified it in 2005. The EU Directive on National Emission Ceilings (NEC Directive), establishing emission limits for NO_x, SO_x, NMVOCs and ammonia (the same pollutants regulated by the Gothenburg Protocol), was introduced in the EEA Agreement in 2009. The Norwegian ceilings for 2010 in the NEC Directive were similar to those in the Gothenburg Protocol.
21. Emissions from road traffic combustion accounted for 90% of total lead emissions in 1990, 52% in 1995 and 3% in 2008.
22. Under the EEA Agreement, Norway has to comply with the EU air quality directive related to pollution by ozone, which requires authorities to issue information when concentrations reach 180 mg/m3. KLIF, in collaboration with the national health authorities, decided to establish a stricter threshold of 160 mg/m^3.

23. Tropospheric ozone is formed by oxidation of ozone precursors *i.e.* – CH_4, CO, NO_x and NMVOCs – in the presence of sunlight. The hourly mean value recommended by KLIF, 100 mg/m^3, is close to the natural background concentration, which varies from 40 to 80 mg/m^3. The tight limit is intended to protect those most susceptible to respiratory diseases.

24. Out of 372 billion m^3 of freshwater available in Norway, groundwater accounts for around 7%, much less than in many OECD countries.

25. Water used in hydropower production is not included.

26. The metal, chemical, pulp and paper, and food industries are the biggest consumers of freshwater.

27. Manufacturing and the primary industries (agriculture, forestry, fish farming) largely meet their water needs from on-site sources, mostly surface waters. About 16% of water supplied to industry and 8% in agriculture comes from public waterworks. In 2006, about 90% of Norway's households were served by public water supplies, mostly using surface water. On average, only 10% of the population is supplied by waterworks using groundwater as their source. In some counties, though, such as Finnmark, Oppland and Hedmark, the share is as high as 35-55%.

28. Liming of rivers and lakes as a means of remedying damage caused by acid precipitation is usually carried out by boat or helicopter once a year, at a total estimated cost of NOK 100 million. Liming is most extensive in Telemark, Aust-Agder, Vest-Agder and Rogaland, where it is carried out in about 3 000 locations. Analysis of its effects at 90 locations found that fish stocks were healthy and zooplankton and benthic animals showed satisfactory species diversity in 85-90% of sites.

29. This includes an area from the border with Sweden to Lindesnes, at the southern tip of Norway.

30. The programme provided about NOK 350 million in 2005 and NOK 390 million in 2006 for environmental measures based on regional priorities, including support for techniques to help farmers alter soil management regimes (*e.g.* to avoid leaving areas with no plant cover in winter), avoid nutrient surpluses in fertiliser application, and maintain vegetation strips alongside fields and waterways to prevent erosion. In 2008, the focus was on measures to reduce tillage, improve use of natural fertiliser and increase production and consumption of organic food, with no chemical-synthetic pesticides permitted (Chapter 6).

31. The North Sea Declarations are joint ministerial declarations made by the countries around the North Sea to address common problems, among them nutrient inputs. The original target for Norway was to halve total inputs of nitrogen and phosphorus between 1985 and 1995. As the nitrogen target was not reached by the end of 1995, the deadline was extended to 2005.

32. Since 2008, authorisation has been required for all waterworks supplying more than 50 persons, or 20 households or holiday homes, or supplying food manufacturers or health institutions.

33. Sludge separators (46%) and sludge separators with filtration (31%) were the two most-common treatment methods in use by 335 000 small and individual treatment plants, which are most common in scattered settlements. The share of untreated wastewater releases is higher in northern countries such as Finnmark, where over 50% sewage is not treated.

34. In the review period, priority was given to measures to reduce nitrogen discharges in two areas considered sensitive for eutrophication: from the border with Sweden to Fredrikstad, and in the Inner Oslofjord, as municipal wastewater is the main source of nitrogen discharges. In the first area, two large wastewater treatment plants were upgraded to provide nitrogen removal, with the result that nitrogen inputs to the fjord were reduced by 60-70%. Only one municipal wastewater treatment plant in the rest of the Sweden-Lindesnes area includes a nitrogen removal process. However, in this area, agriculture is the largest anthropogenic source of nitrogen inputs.

35. The annual charge is calculated for a standard house of 120 m^2.

36. There are nine river basin districts: Glomma, Vest-Viken, Sør-Vest, Vestlandet, Møre and Romsdal, Trøndelag, Nordland, Troms and Finnmark.

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PART I

Chapter 4

International Co-operation

Norway has continued to play a significant role in promoting international environmental co-operation bilaterally, regionally and globally. The country has positively contributed to international negotiations on climate change, marine environment protection and chemicals. Reducing environmental impacts in sea waters of oil and gas extraction, shipping activities and fisheries are some of the challenges that Norway has to address in co-operation with other countries. Norway is setting the standard in development assistance with a high rate of per GNI financial aid and significant support to reduce emissions from deforestation and forest degradation in developing countries.

Assessment and recommendations

International co-operation on environment and sustainable development are long-standing foreign policy priorities in Norway. Since 2000, Norway has continued to play an active and innovative role at global and regional levels, especially concerning climate change, marine environment protection and chemicals. These efforts have been supported by relatively large financial commitments. The commitments require sufficient staff effort to ensure that they are managed cost-effectively and supported by appropriate expertise.

Norway has actively supported the development of a sound scientific basis for environmental co-operation, often together with neighbouring countries. Co-operation in the Arctic region made an important contribution to the development of a global convention on mercury and more ambitious global targets on persistent organic pollutants (POPs). Joint assessments of the marine environment have been conducted with Russia on the Barents Sea and with parties to the Convention for the Protection of the Marine Environment in the North-East Atlantic (OSPAR). They provide benchmarks for developing joint sustainable marine management plans with common quality objectives.

In 2000, Norway initiated a binding regional agreement on port state control to combat illegal, unreported and unregulated fishing that was ratified under the North East Atlantic Fisheries Commission in 2007. The system led to a significant reduction in unreported catches, and subsequently to the approval by the Food and Agricultural Organization in 2009 of an international agreement on port state measures. However, further efforts are needed to monitor and enforce fisheries management policies. A number of fish stocks in the North Sea continue to be overexploited and aquaculture exerts adverse impacts on wild fish stocks.

Norway has continued to play a leading role in developing international conventions to reduce environmental impacts of shipping, for example on ballast waters and on ship recycling. In 2007, a maritime corridor was established in the north to move traffic away from the coast and to reduce the risks of marine pollution. However, over the last decade, several major oil spills from ships have had severe impacts on the marine ecosystem. NO_x and CO_2 emissions from international shipping are expected to continue to increase. Further efforts are needed to accede to, and implement, agreements on preparedness for pollution incidents by hazardous and noxious substances, and on ship recycling.

The oil and gas industry has adopted measures that led to a drastic reduction of discharges of most harmful chemical additives to the sea. Nonetheless, reducing pollution from oil extraction is becoming more challenging as some fields are nearing depletion. In 2007, an accident on the Statfjord field in the North Sea resulted in the second largest oil spill ever on the Norwegian continental shelf. With the expected increase of activities in the Barents and the Arctic region, Norway will need to reinforce its efforts to protect the marine environment and establish robust pollution prevention and response mechanisms.

Co-operation with Russia has given significant results in the fight against illegal fisheries and on nuclear safety. In 2010, both countries solved a 40 year maritime delimitation dispute in the Barents Sea and the Arctic. Norway has played an active role to co-ordinate

environmental co-operation in the Barents region through the Barents Euro-Arctic Council, the Barents Regional Council, the Nordic Council of Ministers and the Arctic Council. However, with the expected increase of oil, gas and shipping activities, further co-operative efforts are needed on maritime safety, pollution response and preparedness.

Since 2000, Norway's net official development assistance has risen by 67% to reach USD 4 billion in 2009, equivalent to 1.06% of its gross national income. This is the second-highest percentage of all DAC donors. Norway is one of only five countries to exceed the UN target of 0.7% and has reached its national goal of 1% of GNI devoted to ODA. Following the adoption of an action plan for environment in 2006, environment-focused aid doubled to USD 677 million, equivalent to a quarter of bilateral ODA, a high share compared to other donors. However, there is a question whether sufficient expertise exists in the relevant agencies to manage these resources cost-effectively. Climate change, reduction of deforestation (REDD) and clean energy are the main priorities. However, there is a risk that climate-related issues might crowd out other important environment and development issues. Further efforts are needed to ensure that adequate environmental assessments are made of development co-operation programmes and projects, particularly in the energy and petroleum sectors.

Recommendations

- Strengthen measures, including co-operation with neighbours, to *protect the marine environment,* including robust preparedness and response mechanisms for accidents, in line with the risks associated with increased shipping and oil and gas activities in fragile environments.
- Reinforce efforts to meet *marine pollution reduction targets* (*e.g.* on nitrogen input to the sea, discharges of hazardous substances in produced water from oil activities); and promote international efforts to reduce CO_2, NO_x and other *emissions from shipping*.
- Phase out the exemption on *fuel taxation for fishing vessels* in co-ordination with neighbouring countries.
- Continue to promote international co-operation to *combat illegal, unreported and unregulated fishing* and the enforcement of the related FAO agreement (*e.g.* by supporting participation by non-Parties in the agreement; developing collaboration with non-Norwegian ports where fish are landed; and improving information exchange with main trade partners).
- Maintain the strong commitment to environment in Norway's ambitious *development co-operation programme*; ensure that non-climate-related activities in the environmental action plan receive adequate finance and support; allocate appropriate staff resources to manage and provide technical support for activities; ensure that the environmental aspects of all projects and programmes are appropriately assessed.

1. Marine environment

1.1. *Objectives and institutional framework*

Over the last decade, Norway has developed a comprehensive marine policy. The Council of State approved the policy goals and principles in 2002 (MoE, 2002). The overall objective is to balance commercial interests with environmental concerns in the oil and gas industry, fisheries, aquaculture and shipping. Norway is one of the OECD countries that has made the most progress in developing maritime spatial planning. The government adopted integrated management plans for the Barents Sea-Lofoten area in 2006 and for the

Norwegian Sea in 2009. They were developed by an interministerial steering committee[1] chaired by the Ministry of the Environment (MoE). The Barents Sea-Lofoten plan is under review, raising concerns on the opening of new oil and gas exploitation in ecologically valuable areas.

Norway is committed to co-operation under the Convention for the Protection of the Marine Environment in the North-East Atlantic (the OSPAR Convention) and hosted the 2010 Ministerial Meeting of the OSPAR Commission in Bergen. The management plans for the Norwegian seas provided valuable input to the report on the status of the marine environment of the North-East Atlantic (Quality Status Report 2010), released at the meeting. The report sets a baseline for designing measures to achieve good environmental status in the North-East Atlantic by 2020 as required by the EU Marine Strategy Framework Directive.

1.2. Pollution from ships

In 2009, the Norwegian-controlled fleet was the world's fifth largest, amounting to 4.5% of global deadweight tonnage (UNCTAD, 2009). International shipping accounts for the largest share of Norwegian revenue from trade in services. The main pressures associated with shipping are incidental, operational and illegal discharges of oil and hazardous substances, air pollution, discharges of waste, release of toxic chemicals in anti-fouling paint and the introduction of non-indigenous organisms in ship ballast water.

Norway plays a leading role in the International Maritime Organization (IMO) and promotes development of global environmental regulatory regimes. The government has made political commitments to reduce the environmental impact of shipping through the Ministerial Declarations of the North Sea Conference (Bergen 2002, Gothenburg 2006). In the 2007 Maritime Strategy, the government adopted an objective of making the Norwegian maritime industry the world's most environment-friendly and leading the way in developing solutions. In the review period, maritime research and innovation, in particular on environment, received increased government funding via the Research Council and Innovation Norway (Chapter 2).

The Norwegian Coastal Administration reports that the number of oil spills from ships has remained fairly constant since 2000, but that several of the worst spills have affected seabirds and resulted in extensive contamination of the shoreline (MoE, 2009). Several technical standards and safety and preventive measures have been implemented to reduce the risk of spills from ships. In particular, the government established a corridor in 2007 between Vardø and Røst in the north to move maritime tanker traffic away from the coast to about 30 nautical miles. Norway co-operates on oil pollution emergency response with other Nordic countries under the Copenhagen Agreement, with the North Sea states under the Bonn Agreement, as well as with Russia. It has not yet ratified the protocol on preparedness, response and co-operation to pollution incidents by hazardous and noxious substances (OPRC-HNS 2000) but the Ministry of Fisheries and the Norwegian Coastal Administration are working on measures to enable Norway to fulfil its requirements. The good performance of the Norwegian maritime administration[2] was recognised in the framework of the voluntary International Maritime Organization member state audit programme (IMO, 2007). The audit covered state obligations on organisational control, development of legislation, policies for the implementation of legislation, flag state control of national shipping, port state control and coastal state functions such as search and rescue and counter pollution, and provision of navigation information.

Coastal shipping and fisheries account for 35% of national NO_x emissions, 18% of SO_2 emissions and 8% of CO_2 emissions. Since the last OECD review, Norway has ratified the 1997 protocol to amend the International Convention for the Prevention of Pollution from Ships (MARPOL PROT), which regulates air emissions from ships. In 2007, the North Sea was designated a special SO_x emission control area, with more stringent requirements for sulphur content of fuel oil. Ship engines above 750 kW have been liable for the tax on NO_x emissions since 2007. Owners affiliated with the Business Sector's NO_x Fund are exempted and may apply for government support for investment in emission-reducing measures (Chapter 2). On Norway's initiative, ocean acidification was included in the work of the OSPAR Commission in 2004. NO_x emissions from international shipping have significantly increased in the OSPAR maritime area and are expected to grow further as traffic rises (OSPAR, 2009). CO_2 emissions from international shipping also contribute to ocean acidification and climate change. Norway aims to establish a mandatory regime to reduce greenhouse gas (GHG) emissions from international shipping. Within the International Maritime Organization, it contributes to work to improve energy efficiency of maritime transport and reducing GHG emissions from vessels. Norway has ratified the 1996 protocol to the Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matter and initiated its 2006 amendment allowing the storage of CO_2 under the seabed. Similar amendments were adopted in the OSPAR Convention.

Norway is party to the 2001 Convention on the Control of Harmful Anti-fouling Systems on Ships and the 2004 Convention for the Control and Management of Ships' Ballast Water and Sediments (not yet in force). Its maritime industry has developed advanced anti-fouling solutions and ballast water management systems. Norway submitted the draft text of the International Convention for the Safe and Environmentally Sound Recycling of Ships, adopted in Hong Kong in 2009 (not yet in force), and is preparing to accede. Guidelines on inventories of hazardous materials on ships are under development. The Norwegian Shipowners' Association has given members a list of countries with acceptable standards and urges owners to send their ships to the relevant facilities. In co-operation with the IMO, the country has initiated a project to upgrade recycling areas in Bangladesh.

1.3. Pollution from land-based sources

Along the Skagerrak coast, defined as an OSPAR problem area with regard to *eutrophication*, anthropogenic discharges of phosphorus decreased by 58% and of nitrogen by 31% between 1985 and 2008. Under the North Sea Declarations, Norway committed to halve total inputs of nutrients to the North Sea by 2005. It achieved the target for phosphorus but not for nitrogen. Coastal water eutrophication continues to affect water quality. Between 2000 and 2008, total anthropogenic inputs of phosphorus into the Norwegian coastal waters increased by 56% and nitrogen inputs were up by 27%. The largest share now comes from aquaculture (Chapter 6).

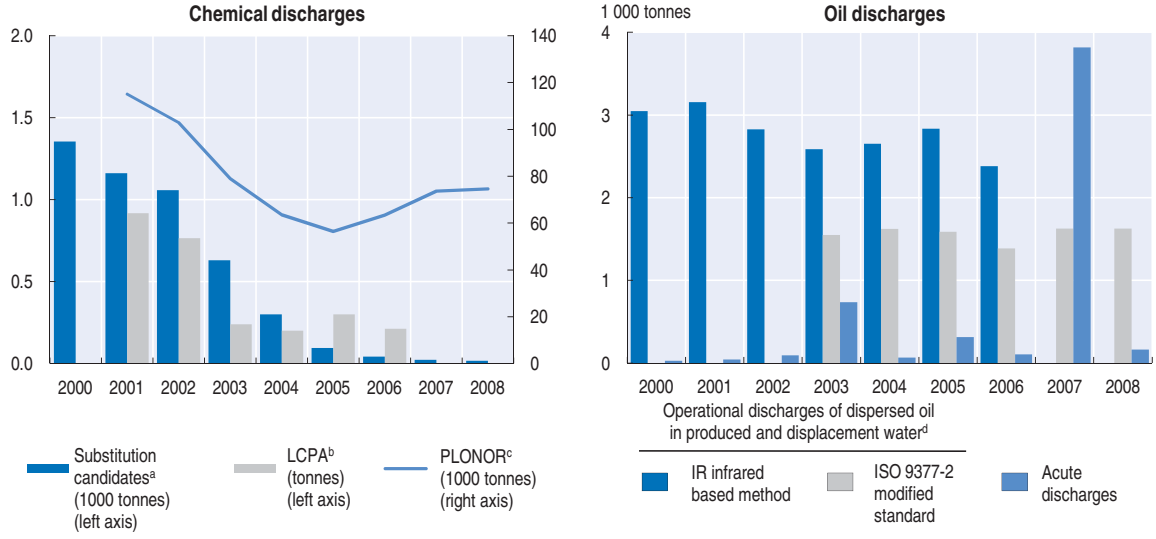
1.4. Pollution from offshore sources

In 2009, 29% of state revenue came from the *oil and gas sector*, which accounted for 21% of GDP. Environmental expenditure by the oil and gas industry was around NOK 4.6 billion, or about 0.2% of GDP, in 2008. About a third was spent on protection of the sea and seabed (which includes 20% of current expenditure on oil spill response), followed by reduction of GHG emissions (28%) and management of produced water[3] (16%).

The oil and gas industry is the country's second largest source of GHG emissions and one of the largest sources of acidifying emissions (Chapter 3). The main pressures on the marine environment from oil and gas activities include operational and accidental discharges of chemicals, crude oil and produced water, which contains residues of oil, other organic and inorganic components, and added chemicals. As a party to the OSPAR Convention, Norway committed (for 2020) to reduce oil in produced water discharged into the sea to a level that presents no harm to the marine environment, and to move towards eliminating discharges of hazardous substances. In 1997, the Norwegian authorities established a zero-discharge target for the oil and gas industry on the Norwegian continental shelf to minimise or eliminate discharges of environmentally hazardous substances by the end of 2005. The target for *chemical additives* was achieved. Efforts to replace chemicals with less hazardous alternatives have led to significantly lower discharges of substances on the OSPAR List of Chemicals for Priority Action (Figure 4.1).

Between 2000 and 2006, the volume of produced water[4] from Norwegian offshore installations increased with the ageing of fields, but the amount of *dispersed oil discharged* in produced water was reduced by about 20%, in line with the related OSPAR recommendation[5] (Figure 4.1). However, the results of industry actions are below expectations. There has been no net reduction in total discharges of oil and other naturally occurring substances with produced water. Since 2000, discharges of other naturally occurring chemicals (PAHs, NPD, BTEX,[6] alkyl phenols and heavy metals) have increased. The target for hazardous natural substances in produced water has not been achieved.

Figure 4.1. **Discharges into the sea from offshore installations, 2000-08**



a) Sum of substances reported as: inorganic with LC50 or EC50<1 mg/l; biodegradation < 20% in OECD 306, Marine BODIS or any other accepted marine protocols or < 20% during 28 days in freshwater; meets two of three OSPAR criteria for biodegradation, bioaccumulation and toxicity (OSPAR Recommendation 2000/4).
b) Substances of the OSPAR List of Chemicals for Priority Action (2004-12).
c) PLONOR: substances which are considered to Pose Little Or NO Risk to the environment (OSPAR Agreements 2004-10).
d) Produced water is the water found in reservoirs along with the oil or gas. When the oil or gas is extracted, produced water is associated with it. This water is separated and treated before being either re-injected into the reservoirs or discharged into the sea. As the volume of hydrocarbons found in a reservoir decreases over the life of the field, the volume of produced water generally increases. Displacement water: seawater which is used for ballasting the storage tanks of the offshore installations (when oil is loaded into the tanks, the water is displaced and discharged to the sea; when oil is downloaded to shuttle tanks, is introduced into the storage tanks to replace the downloaded oil).
Source: OSPAR Commission; Norwegian Oil Industry Association.

In 2007, an accident in the Statfjord field in the North Sea resulted in a spill of about 4 400 m^3 of oil, the second largest acute oil discharge ever in production on the Norwegian continental shelf. Norwegian authorities and the oil industry have a mutual understanding on the need to further reduce the number of accidental discharges of oil and chemicals.

1.5. *Fisheries*

Although its fishing industry contributes less than 1% of GDP, Norway accounts for about 3% of the global fish catch. The relative importance of aquaculture (mainly salmon) is steadily increasing and revenue from fish farming exceeds the value of catches. Norway is the world's second largest seafood exporter.

Most of Norway's important fisheries are based on shared or straddling stocks; the latter migrate between national and international zones. The sustainability of Norwegian fisheries, therefore, strongly depends on international co-operation. Norway seeks to limit exploitation of shared fish stocks to sustainable levels through international agreements defining species-specific total allowable catch (TAC) quotas and management strategies based on scientific advice. For the Barents Sea, Russia and Norway have established a TAC quota system for key fisheries, as well as routines for mutual monitoring and regular exchange of information. For the North Sea, the Skagerrak and the Kattegat, Norway and the EU jointly manage important stocks using annual TACs (OECD, 2001).

Norwegian fish stocks are found in the Barents Sea, the Norwegian Sea, and the North Sea plus the Skagerrak. The Barents Sea stocks are in good condition, with a few exceptions. In the Norwegian Sea, the pelagic stocks are in good condition but the deep-water resources suffer from low recruitment and are recovering very slowly. In the North Sea/Skagerrak, many important fish stocks (notably cod and herring) remain overfished with poor recruitment[7] (Table 4.1).

Table 4.1. **Biological status of some of the most important species in Norwegian fisheries**

Species	Spawning stock biomass (1 000 tonnes)		Biological limit reference point (1 000 tonnes)	Within (W)/Close to (C)/ Outside (O) safe biological limits
	2000	2009		
Groundfish species				
Cod (NE Arctic)	240	1 079	460[a]	W
Cod (North Sea)	49	60	150[a]	O
Haddock (NE Arctic)	105	241	80[a]	W
Haddock (North Sea)	138	229	140[a]	W
Saithe (NE Arctic)	821	690	220[a]	W
Saithe (North Sea and Skagerrak)	188	263	200[a]	W
Greenland halibut	22	42	. .	O
Pelagic species				
Capelin (Barents Sea)	599	517	200[b]	W
Norwegian spring spawning herring	5 837	13 300	5 000[a]	W
Herring (North Sea)	865	971	1 300[a]	O
Mackerel	2 222	2 591	2 300[a]	W/C
Horse mackerel	2 076	2 580	1 800[a]	W
Blue whiting	4 261	3 588	2 250[a]	W
Sandeel	464	455	600[a]	O
Norway	163	186	150[a]	W

a) Bpa (precautionary approach spawning stock biomass).
b) Blim (spawning stock level associated with a danger of stock collapse).
Source: International Council for the Exploration of the Sea (ICES); Advisory Committee on Fishery Management (ACFM).

Since 2000, the number of vessels in the Norwegian fishing fleet and the number of fishermen has decreased significantly. *Fishing capacity has not declined* because the size of vessels has increased and technology has improved (OECD 2010). Between 2000 and 2009, catches slightly decreased (–6%), with a downward trend in pelagic species (–13%), with groundfish species on the rise (+17%). Fishermen are subject to a favourable income tax regime. While direct subsidies have been largely phased out, the fuel and CO_2 taxes are fully reimbursed for vessels refuelling in Norway. The exemptions have little effect on employment as they mainly benefit large vessels with small crews.

Norway has played a leading role in implementing the 2001 Food and Agricultural Organization (FAO) International Plan of Action to Prevent, Deter and Eliminate *Illegal, Unreported and Unregulated* Fishing (IUU). Blacklisting of vessels engaged in IUU, which Norway began in 1994, has since been adopted by several regional fishery management organisations to which Norway belongs. The number of states refusing to let IUU vessels enter their ports has expanded considerably. On Norway's initiative, a binding regional agreement on port state control was ratified under the North East Atlantic Fisheries Commission[8] (NEAFC) in 2007. Concerted efforts with Russia have contributed to the success of efforts in the Barents Sea: between 2006 and 2009, unreported landings of North-east Arctic cod dropped from 25% of the reported catch to zero. The approach gained global support with the 2009 approval of the FAO agreement on port state measures. Once it takes effect,[9] parties to this agreement will have to deny port access to foreign ships that cannot justify the legitimacy of their catch and will require ships' flag countries to take action against their own vessels subject to such refusal. If more countries take similar actions, the risk of IUU catches reaching international markets will be reduced.

Norway has put in place a set of measures aimed at avoiding unwanted catches; by-catch may amount to 20 million tonnes globally or one-quarter of marine landings (FAO, 2009). The country has advocated a ban on discards,[10] in particular with the EU, and reached agreement for a ban on high grading[11] in the North Sea/Skagerrak in 2009 for all TAC-regulated species. A ban on discards of the species regulated by the North East Atlantic Fisheries Commission (NEAFC) in the high seas was adopted in 2009. On a proposal by Norway, the NEAFC closed several areas to bottom fishing to protect vulnerable marine ecosystems in the high seas.[12]

Under the North Atlantic Salmon Conservation Organization (NASCO), Norway has agreed to minimise harm from salmon aquaculture to wild salmon stocks. Although regulatory measures have had significant results, escaped farmed salmon remain one of the most severe threats to the wild fish stock (Chapter 6).

2. Bilateral and regional co-operation

2.1. Co-operation with Russia

Since 1988, Norway and *Russia* have co-operated extensively on environment through a Joint Environmental Protection Commission. Marine environment, radioactivity, cleaner production, capacity building, biodiversity and climate change are priority areas. Co-operation with Russia on environment and resource management plays a prominent role in the Norwegian High North Strategy 2006 (revised in 2009), which has become a top priority in Norwegian foreign policy. Its overall objective is to safeguard Norwegian interests, enhance knowledge and promote sustainable development in the area concerned[13] (MFA, 2006, 2009).

Protection of the marine environment in the Barents Sea is the top priority, as bilateral co-operation is necessary to assure sustainable management of a shared ecosystem. Under the joint commission, led by Norway's Ministry of the Environment and Russia's Ministry of Natural Resources, a working group on marine environment was established in 2005. It released a joint report on the environmental status of the Barents Sea in 2009. This progress in scientific co-operation could be an important step towards enhanced co-operation on management issues in the Barents Sea (Box 4.1). Under a 1994 agreement between Norway and Russia on co-operation on combating oil spills in the Barents Sea, the two countries have developed a joint contingency plan for counterpollution operations. An exercise is conducted annually in accordance with the plan. A joint environmental surveillance system for the area should grow in importance as oil, gas and shipping activities in the region are expected to increase. In 2010, after 40 years of negotiations, Norway and Russia concluded an agreement on maritime delimitation in the Barents Sea and the Arctic, opening up new prospects for oil and gas exploration.

Nuclear safety is another important area of co-operation with Russia. From 1995-2009, Norway's parliament, the *Storting*, allocated about NOK 1.4 billion for this purpose. An additional NOK 95 million was allocated in 2010. Since the government's adoption of the Action Plan for Nuclear Safety in North-west Russia in 1995 (revised in 1998, 2005 and 2008), concrete results have been achieved bilaterally, regionally and internationally. Norway contributed to the dismantling and safe handling of five decommissioned nuclear submarines and the replacement of strontium batteries by solar panels in 180 lighthouses in north-western Russia. In 2010, the government focused on restoring the radioactive waste storage facility at Andreyev Bay, continuing the lighthouse project in the Baltic Sea, conducting training and information in the nuclear power sector and continuing broad co-operation on inspection, emergency preparedness, environmental monitoring and safety (MFA, 2010).

Box 4.1. **Status of the Barents Sea ecosystem: progress of Norwegian-Russian scientific co-operation**

The *joint Norwegian-Russian environmental status report on the Barents Sea ecosystem* (2009) was a project of the Joint Environmental and Joint Fisheries commissions. Led by the Sevmorgeo marine geological research unit and the Knipovich Polar Research Institute of Marine Fisheries and Oceanography (Russia) and the Institute of Marine Research and the Norwegian Polar Institute (Norway), the work was carried out by more than 130 experts from 9 Russian and 20 Norwegian institutions. The report gives a comprehensive description of the Barents Sea ecosystem, including human activities and their impact on the area. It supports the development of an ecosystem-based management plan for the Russian part of the Barents Sea and the further development of the 2006 ecosystem-based management plan for the Norwegian part (revised in 2010).

The Barents Sea is a sub-Arctic shelf ecosystem located between 70° and 80° N. Its surface area of 1.4 million km^2 is about four times as large as Norway. It connects with the Norwegian Sea to the west and the Arctic Ocean to the north. Defined by the UN as a *large marine ecosystem*, it is characterised by high latitude, an extreme environment, large seasonal and annual changes in ocean climate and its position close to the Arctic Ocean. Its climatic variations depend mainly on the activity and temperature of the inflowing Atlantic water. These climatic conditions, and the extent of the ice cover, have a pronounced effect on bioproductivity and fish stock recruitment.

Box 4.1. **Status of the Barents Sea ecosystem: progress of Norwegian-Russian scientific co-operation** *(cont.)*

The Barents Sea is home to *one of the world's largest concentrations of seabirds* (some 20 million individuals representing 40 species), a diverse assemblage of marine mammals, including polar bears, and several commercially important fish stocks, the largest of which are Northeast Arctic cod, capelin and haddock. It is also a nursery area for Norwegian spring spawning herring, one of the largest fish stocks in the world. There is a rich community of benthic fauna, numbering more than 3 000 species, as well as a diverse range of zooplankton. Several alien species, such as the red king crab, have invaded the ecosystem. The most important fisheries are in good condition, but most of the seabird populations have declined alarmingly.

Capelin is a key species because it feeds on zooplankton near the ice edge, is typically the main prey of top predators in the area and thus is a major transporter of biomass from the northern Barents Sea to the south. Predation pressure from young herring is thought to be one reason for population collapses in 1984-86, 1992-94 and 2001-05. These collapses had far-reaching consequences for other species in the ecosystem, including a severe food shortage for the North-east Arctic cod stock, collapses of seabird populations, and food shortages and massive migrations in the seal population. The capelin stock has been increasing since 2007 and is now in good condition.

Sea temperature in the Barents Sea has shown an increasing trend over the past 30 years, but is decreasing from a peak in 2006. At the same time, the extent of sea ice has decreased, and since 2000 there have been several years when the entire Barents Sea has been ice-free in summer. Variations in *water temperature* have important effects on the ecosystem. In particular, periods of high temperature tend to stimulate recruitment of North-east Arctic cod, Norwegian spring spawning herring and other fish stocks. Indirectly, recruitment of capelin may be impaired by high temperatures because of increased predation from larger schools of juvenile herring drifting into the area from spawning grounds along the Norwegian coast. Climate change can also cause reproductive failure and negative population trends in ice-dependent marine mammals.

Negative *impacts of the fishing industry* include overfishing and damage to benthic communities caused by bottom trawling. *Oil and gas activities and shipping* have so far had no significant direct impact on the ecosystem, but this may change with the expected increase in the level of activity. Shipping traffic will grow in line with oil and gas activities in the area and as ice-free shipping routes open due to climate warming. It is estimated that in 2009, 16 million tonnes of Russian crude and oil products were exported via the Barents Sea, compared to 4 million tonnes in 2002. Depending on the scenario, from 50 million to more than 100 million tonnes could be shipped in 2025. This will increase the risk of pollution and of introduction of alien species through ballast water or on ship hulls. The probability of incidents related to traffic at sea or oil and gas activities is considered low, but the consequences of such incidents on the environment and on society may be considerable.

The Barents Sea is a relatively clean ocean but *long-range transboundary pollutants*, such as PCBs and other POPs, as well as some inorganic contaminants (*e.g.* mercury and lead) still occur in significant concentrations in top predators like polar bears and glaucous gulls. Regulations and bans on several POPs led to decreasing input to the Barents Sea over the last decade but a trend reversal has been observed in the last few years. Radioactive substances have been declining in recent years and current concentrations are too low to have an effect on marine organisms, but there is still a risk of significant radioactive pollution from local sources.

Ocean acidification caused by anthropogenic emissions of CO_2 is an emerging problem that might have a large impact on the Barents Sea ecosystem in the future.

Source: Stiansen *et al.*, 2009.

2.2. Regional co-operation

The *Barents region* consists of the 13 northernmost counties in Norway, Sweden, Finland and Russia. Multilateral co-operation has developed at governmental and regional level through the Barents Euro-Arctic Council (BEAC) and the Barents Regional Council.[14] Under Norwegian MoE chairmanship of the BEAC working group on environment from November 2007 to February 2010, priority was given to climate change, hazardous substances, biodiversity and habitat conservation. This forum has proved useful to co-ordinate bilateral co-operation between the Nordic countries and Russia and between national and regional environmental authorities.

Nordic countries have been supporting a number of projects to clean up sites and promote cleaner production in the Barents region. However, the goal of eliminating environmental hot spots in the Russian part of the region by 2013 is unlikely to be achieved. Transboundary co-operation on nature conservation has led to positive outcomes. In 2010, Norway, Finland and Russia signed an agreement for development of the Green Belt of Fennoscandia in the area around their common borders.

Under the *Nordic Council of Ministers*,[15] co-operation on environmental issues is addressed in a 2001 strategy, *Sustainable Development: New Bearings for the Nordic Countries* (revised 2005 and 2009), which sets development goals for the period up to 2020. The Nordic Environmental Action Plan 2005-08 focused on environment and health, the sea, nature, the cultural environment and outdoor life, and sustainable consumption and production. It was updated in 2008 to emphasise action on climate and air, sea and coastal regions, biological diversity and ecosystem services, and sustainable consumption and production.

Nordic co-operation has influenced EU policy and other international processes on the environment. A collective strategy has been devised on pollution and climate change in the Arctic. The Nordic region's location and its experts' intimate knowledge of the sensitive Arctic environment makes it well suited to highlight Arctic issues in international contexts. Norway has been instrumental, with the other Nordic countries, in introducing and highlighting essential environmental issues, including international environmental governance, a global convention on mercury and more ambitious global targets on persistent organic pollutants (POPs).

Addressing regional environmental issues is a priority area to which Norway provides substantial support. The Nordic Environment Finance Corporation has funded many small and medium-sized environment projects in Russia, Ukraine and the Baltic states. The Nordic Investment Bank increasingly prioritises environmental issues, especially concerning the climate and the Baltic Sea. The Nordic Development Fund and Nordic Project Fund are involved with many environment-related initiatives. Nordic co-operation in eco-labelling has resulted in annual turnover of more than EUR 10 million and employment for about 100 people. More than 60 product groups now bear the Swan eco-label and about 1 900 licenses have been issued for more than 5 000 products.

However, maintaining a constructive, international, development-oriented agenda between the Nordic countries requires substantial high-level engagement, which increases demand for human resources and intellectual input from Norway's MoE and other central environmental agencies.

In recent years, *Arctic co-operation* has gained momentum for ecological, economic and geopolitical reasons. Trends in the Arctic environment are good indicators of broader environmental trends, such as climate change and long-range trans-boundary pollution.

Sea ice reduction will increase marine access to the Arctic's natural resources. Gas and oil activities, marine transport, cruise ship tourism and fishing are expected to expand and pose increased environmental risks to the Arctic marine environment. Arctic states have committed to promoting sustainable development and environmental protection in the region under the Arctic Council.[16] This co-operation plays an important role in the Norwegian High North Strategy.

The Arctic Council has helped generate extensive knowledge of the Arctic ecosystem, achieved concrete results on pollution and climate change, and influenced the development of international environmental agreements (*e.g.* the Stockholm Convention, the Intergovernmental Panel on Climate Change, the International Maritime Organization (IMO). When it chaired the council in 2007-09, Norway set priorities on climate change, on integrated resource management and on stronger circumpolar co-operation. It has led projects concerning brominated flame retardants and non-CO_2 drivers of Arctic climate change, to take just two examples. As a chair of the working group on protection of the Arctic marine environment, Norway promotes, in particular, stronger international standards for vessels operating in the Arctic.

Environment has emerged as a major component of co-operation in the *European Economic Area*[17] (EEA), making the EU an important contributor to the development of Norwegian environmental policy and regulations. Although Norway is not involved in formal EU decision making,[18] it takes part in expert groups of the European Commission and informal dialogue with the European Parliament and member states. Seeking to develop strong co-operation on the environment and sustainable development, the Ministry of the Environment tries to address and influence EU initiatives as early as possible to defend Norwegian priorities and interests. Norway has been a leader in developing policy in several areas, including chemicals and maritime policy.

Since the establishment of the European Economic Area, the EEA EFTA states have provided substantial funds to reduce economic and social disparities in Europe. Between 2004 and 2009, Norway, Iceland and Liechtenstein made available EUR 1.3 billion to support the twelve new EU members as well as Greece, Portugal and Spain. Norway provided 97% of these grant funds, of which nearly one-quarter were awarded to projects on environmental protection. Green funds have mainly been granted to energy and climate activities. Other key areas include water management and sustainable development. By far the biggest beneficiary is Poland, where about 350 public buildings, mainly schools and hospitals, are being upgraded and average energy savings are expected to exceed 50%. In late 2009, a new agreement was reached between the EEA EFTA states and the EU for a EUR 1.8 billion contribution over 2009-14. Priority will be given to environmental protection and management, climate change and renewable energy, carbon capture and storage, and green industry innovation.

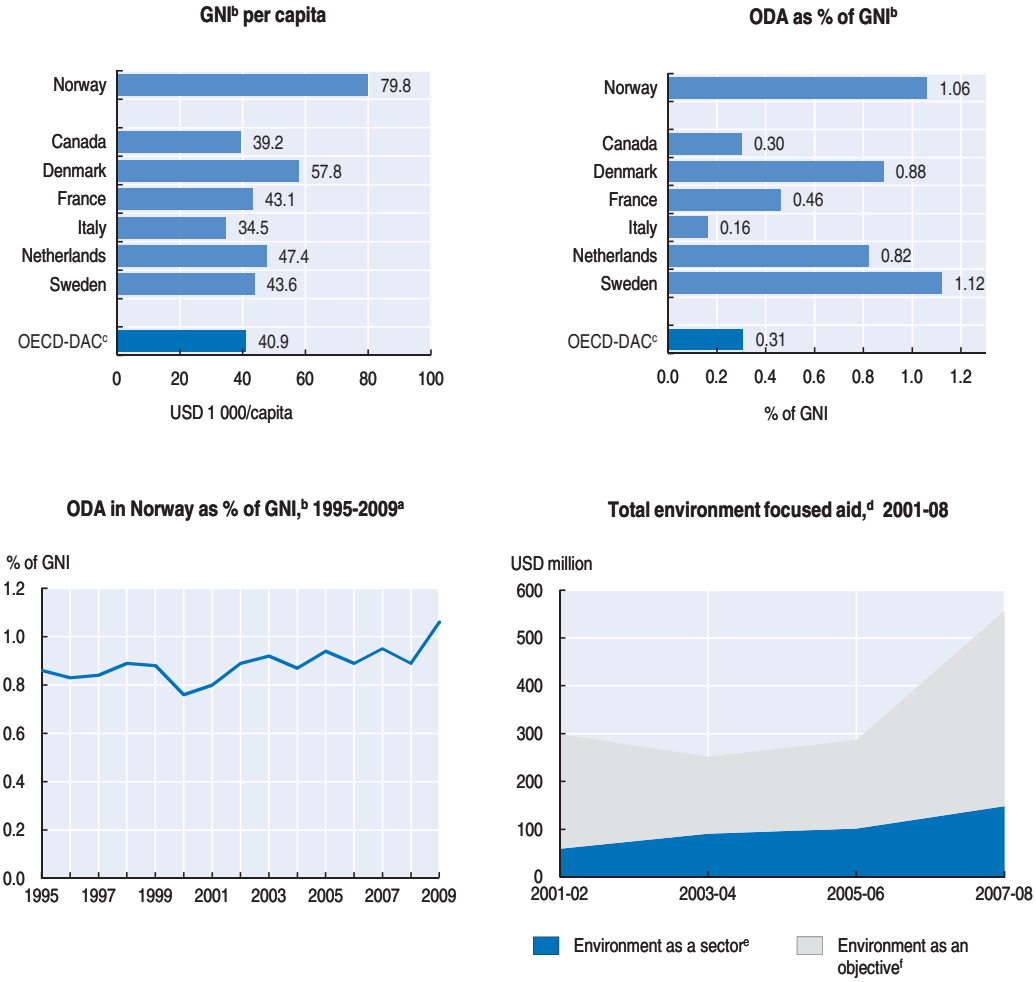
3. Official development assistance

In 2004, Norway's development policy and foreign policy were fully integrated within the Ministry of Foreign Affairs. Embassies' role in managing bilateral aid to partner countries was strengthened. The Norwegian Agency for Development Cooperation (*Norad*) became a technical directorate under the ministry's responsibility. *Norfund*, responsible for private sector development, became independent of *Norad* (OECD, 2008).

Since 2000, Norway's net official development assistance (ODA) has risen by 67% to reach USD 4 billion in 2009, equivalent to 1.06% of gross national income (GNI). This is the second highest percentage among donors in the OECD Development Assistance Committee (DAC). Norway is one of only five countries to exceed the UN target of 0.7%. Norway has surpassed the 0.7% figure for more than 30 consecutive years, and has fulfilled its own commitment to allocate 1% of GNI to ODA (Figure 4.2).

The share of bilateral aid has continued to increase, reaching nearly 80% of total ODA in 2009, and the number of partner countries has risen. In 2008, Norway disbursed 53% of bilateral ODA[19] to Africa, 27% to Asia, 6% to Latin America and the Caribbean, 8% to the Middle East and 6% to Europe.

Figure 4.2. **Official development assistance, 2009**[d]



a) Preliminary data.
b) Gross national income in USD at current exchange rates.
c) Member countries of the OECD Development Assistance Committee.
d) Average commitments of bilateral ODA expressed at constant 2008 prices and exchange rates.
e) The "environment sector" includes general environmental protection activities i.e. environmental policy and administrative management, biosphere protection, biodiversity, site preservation, flood prevention and control, environmental education and research.
f) Activities where environment is an important and explilcit objective or activities where environment is an important but secondary objective. The coverage ratio of the activities screened against the environment policy marker is 100% of the total sector allocable aid.
Source: OECD, *OECD International Development Statistics Database.*

StatLink http://dx.doi.org/10.1787/888932374673

Norway is a strong supporter of the multilateral system as well, and has considerable leverage and impact on it. The World Bank is the largest recipient of Norwegian multilateral ODA and the country's contribution to the UN budget is proportionately much higher than that of most other donors (OECD, 2008).

Norway aspires to play a leading role in integrating environmental issues with development co-operation. Protection of the environment and sustainable management of natural resources were identified as prerequisites for development in 2004 (MFA, 2004). The government approved an ambitious action plan for environment in development co-operation in 2006, establishing four priorities up to 2015: *i)* sustainable management of biological diversity and natural resources; *ii)* water resource management and water and sanitation; *iii)* climate change and access to clean energy; and *iv)* hazardous substances.

While environment-focused aid[20] remained steady until 2006, ranging from USD 200 million to USD 300 million, implementation of the environmental action plan was followed by a surge in related commitments. In 2008, they totalled USD 677 million, representing a quarter of Norway's bilateral sector-allocable ODA, a high percentage in OECD-DAC terms (Figure 4.2). However, the increased budget does not seem to have been matched by an increase in the specialised staff required to manage it, and this may hinder the cost-effectiveness of resource use.

Environment has been increasingly reported as an objective in other sectors, particularly energy and forestry. This reflects the growing emphasis on climate change and reduction of deforestation since 2007. The Climate and Forest Initiative and the Initiative for Clean Energy in International Development Co-operation now represent a major part of the action plan for environment in development co-operation (Box 4.2).

Box 4.2. **Norwegian development co-operation on climate change**

The Bali Action Plan, adopted during the climate change negotiations in 2007, mandates parties to the UN Framework Convention on Climate Change (UNFCCC) to negotiate a post-2012 instrument, including possible financial incentives to reduce emissions from deforestation and forest degradation in developing countries (REDD).[a] A decision was adopted to encourage parties to explore a range of actions, identify options and undertake efforts, including pilot activities, to address the drivers of deforestation and forest degradation. Since then REDD has been expanded to include conservation, sustainable forest management and enhancement of carbon stocks, and is now known as REDD+ (Karousakis, 2009).

The Norwegian *Climate and Forest Initiative* launched in Bali seeks to promote inclusion of emissions from deforestation and forest degradation in a new international climate regime after 2012, take early action to achieve cost-effective and verifiable reductions in GHG emissions from forests in developing countries and promote conservation of natural forests to maintain their carbon storage capacity (while recognising the multiple benefits of natural forests). Norway works closely with committed tropical forest countries and international REDD+ initiatives such as the Forest Carbon Partnership Facility, the UN-REDD Programme, the Forest Investment Program and the Congo Basin Forest Fund. It also supports civil society organisations and the International Tropical Timber Organization in their REDD efforts. Norway has engaged in direct partnerships with Brazil, the United Republic of Tanzania and the Guyana REDD+ investment fund to pilot large-scale models for performance-based REDD+ payments.

As of May 2010, Norway had disbursed USD 270 million for REDD efforts. Most projects in the preliminary phase of the initiative are pilot projects, and focus on capacity building and support for national strategy development. Larger-scale payments will be based on results. The government has pledged USD 1 billion over 2010-12. Norway is the largest single donor to the international REDD+ efforts.

Box 4.2. **Norwegian development co-operation on climate change** *(cont.)*

Norwegian leadership on REDD was internationally recognised at the Oslo Climate and Forest Conference in May 2010. A voluntary global climate and forest partnership was established among the biggest donors and developing countries as a platform for the partners to scale up REDD actions and finance. A loose set-up consisting of country co-chairs and secretariat support from the REDD initiatives hosted by the World Bank and the UN reflects the voluntary, non-legally-binding nature of the partnership, which will help co-ordinate efforts and set up a database to monitor REDD+ programmes. Developed countries pledged more than USD 4 billion (an additional USD 500 million since the December 2009 UN climate conference). In the margins of the conference, Norway and Indonesia signed a letter of intent in which Norway promised USD 1 billion to support efforts to reduce emissions caused by deforestation in Indonesia, a country that has been identified as a global priority for actions to conserve biodiversity. The Oslo agreement was seen as a major step towards the establishment of an international REDD mechanism under the UNFCCC. Notwithstanding the progress in advancing the REDD initiative, a range of technical and political challenges remains to be addressed before REDD can play a full role in international efforts to combat climate change (Karousakis, 2009).

The Initiative for Clean Energy in International Development Co-operation, also established in 2007, aims at strengthening the links between environment, climate and energy in international development co-operation. It seeks to improve access to clean and affordable energy in partner countries, focusing on long-term administration of natural resources and efficient energy use, and on contributing to economic and social development in partner countries through bilateral, multilateral and regional channels. The core countries for bilateral co-operation are Mozambique, Nepal, the United Republic of Tanzania, Uganda, Timor-Leste, Liberia and Ethiopia. Support is also provided for regional energy collaboration and for multilateral institutions working on this issue. In addition, *Norfund* plays an important role as owner of SN Power[b] and through other investments. In 2009, total Norwegian allocations came to about NOK 800 million.

a) The initiative to reduce emissions from deforestation (RED) was proposed in 2005. Its scope was extended to forest degradation (REDD) in Bali in 2007.

b) SN Power was jointly funded in 2002 by *Norfund* and *Statkraft* to increase Norwegian expertise and technology transfers for profitable hydropower projects in developing countries. Since then, SN Power has expanded rapidly. The company runs large-scale hydropower plants in Peru, Chile, the Philippines, Sri Lanka, Nepal and India. In Statkraft's overall operations, SN Power is still a small player, but for Norfund it accounts for half of its portfolio and a large share of its profit.

Source: MoE; REDD+ Survey.

While climate and the related forestry issues have received growing attention, support for the other areas identified in the action plan have not kept pace. Disbursements for water supply and sanitation and for waste management remained stable over the review period but decreased as a share of ODA, representing 1% of bilateral ODA in 2008. Although important benefits can arise from a concentration of efforts, there is a risk that the current emphasis on climate issues could crowd out efforts needed to address other pressing environment and development issues.

All ODA activities and programmes should be subject to environmental impact assessment, and *Norad* has developed guidelines for this purpose. However, mainstreaming environment in development co-operation remains a challenge. *Norad* carries out regular evaluations of Norwegian aid, and baseline studies have been conducted to better measure the results of the environmental action plan. It has been reported that in several projects not specifically related to environment, environmental issues have been neglected because of lack of environmental and social impact assessments as well as environmental indicators (Norad, 2009). Concerns have been expressed about environmental assessments of projects in the energy and oil and gas sectors (Norad, 2007a, 2007b).

Norwegian *business-related assistance*[21] is estimated at NOK 1.2 billion a year in government allocations, or NOK 2 billion including investments by *Norfund* (Norad, 2010). This support, in particular for the energy and marine sectors, was assessed by *Norad* in 2010.[22] It reported that no projects[23] resulted in "environmental harm", one-third had no impact and about half had a positive impact in terms of transfer of environment-friendly technology or investment in clean energy. Some members of the Policy Coherence Commission, established by the government in 2006, have suggested strengthening the poverty orientation and sustainability of Norwegian aid for hydropower, oil and gas projects. Mentioning the possible controversial effects of hydropower projects on local populations and the environment, they called for setting strict conditions on investment funded by aid (NOU, 2008).

The government is preparing a new white paper on environment and development due to be presented to the *Storting* in spring 2011. It will focus on ongoing and planned efforts linked to the climate and forest initiative, support to clean energy and climate adaptation, maintaining and using nature services in development and maintaining a development perspective in the international negotiations for a global climate deal.

Notes

1. Including representatives of the ministries of Labour and Social Inclusion, Finance, Fisheries and Coastal Affairs, Local Government and Regional Development, Trade and Industry, Petroleum and Energy, and Foreign Affairs.
2. The maritime administration is shared by seven ministries. Most obligations arising from mandatory IMO instruments fall to the Norwegian Maritime Directorate under the Ministry of Trade and Industry and the Norwegian Coastal Administration under the Ministry of Fisheries and Coastal Affairs.
3. Produced water is the water found in oil and gas reservoirs and extracted along with the oil or gas. It is separated and treated before being either reinjected into the reservoir or discharged to the sea. As the volume of hydrocarbons found in a reservoir decreases over the life of the field, the volume of produced water generally increases.
4. In 2008, more than 170 million m^3 of water (along with 123 million m^3 of oil) was produced on the Norwegian continental shelf, an increase of more than 50% since 2000.
5. OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations defined a performance standard of 40 mg of dispersed oil per litre of produced water. The limit was reduced to 30 mg in 2007 and contracting parties agreed that by 2006 they should achieve at least a 15% reduction (compared to 2000) in the total quantity of oil in produced water discharged to the sea.
6. Polycyclic aromatic hydrocarbons; naphthalene, phenantrene and dibenzotiophene; and benzene, toluene and ethylbenzene.
7. Recruitment means the number of fish added annually to the exploitable stock in a fishing area through growth (*i.e.* the fish reaches a size where it becomes catchable) or migration (*i.e.* the fish moves into the area).
8. The NEAFC is responsible for fisheries and area management in the high seas of the North-east Atlantic. Norway, the European Union, the Russian Federation, Iceland and Denmark (for the Faroe Islands and Greenland) are the contracting parties, which have agreed to abide by the Convention on Future Multilateral Cooperation in North East Atlantic Fisheries.
9. The agreement will enter into force after 25 countries have ratified it.
10. Unwanted catches released to the sea.
11. Discarding part of a legal catch so that a higher or larger grade of fish that brings higher prices can be caught.
12. The objective of the North East Atlantic Fisheries Convention, as amended in 2006, is to assure the long-term conservation and optimum use of fishery resources in the convention area, providing

sustainable economic, environmental and social benefits. Vessels flying the flags of NEAFC contracting parties and co-operating parties with fishing gear which is likely to contact the seafloor during the normal course of fishing operations are prohibited from fishing in the closed areas.

13. The High North is a broad concept, both geographically and politically. It covers the sea and land, including islands and archipelagos, northwards from the southern boundary of Nordland county in Norway and eastwards from the Greenland Sea to the Barents and Pechora seas. In political terms, it encompasses Barents co-operation, Nordic co-operation, the Arctic Council and EU relations through the Northern Dimension policy drawn up with Russia and Iceland.
14. The BEAC was established in 1993 through a declaration signed by foreign ministers of the five Nordic countries, the Russian Federation and the European Commission. At the same time, Barents region county governors and representatives of indigenous peoples signed a co-operation protocol establishing the Barents Regional Council.
15. This council was set up in 1971 as the formal forum for co-operation between the governments of the Nordic countries (Denmark, Finland, Iceland, Norway, Sweden) and the political leaders of the autonomous areas, the Faroe Islands and Greenland (Denmark) and Åland (Finland).
16. This high-level intergovernmental organisation was established in 1996. Its members are the United States, Canada, Russia and the five Nordic countries. It includes permanent participants representing indigenous peoples and observer states. It has six working groups, dealing with climate change, pollution, biodiversity, protection of the marine environment, emergency prevention and response, and living conditions of the Arctic residents.
17. The Agreement on the European Economic Area (in force since 1994) extends the EU internal market to Norway, Iceland and Liechtenstein. It does not cover agriculture and fisheries, although it contains provisions on various aspects of trade in agricultural and fish products. Other fields of co-operation include research and development, education, social policy, environment, consumer protection, tourism and culture.
18. A narrow majority of Norwegian voters rejected EU membership in referendums in 1972 and 1994.
19. The percentage concerns only bilateral aid allocable by region (less than two-thirds of total bilateral ODA).
20. In the *OECD Creditor Reporting System Aid Activity Database*, countries use a policy marker to identify activities that have environmental objectives. Norway screened 100% of its sector-allocable aid against the environment marker in 2006-08.
21. Support for investments and technical assistance to enterprises, financial institutions (banks or microfinance institutions) and business organisations such as chambers of commerce. The organisational system includes *Norad*, the Norwegian embassies, the Norwegian Investment Fund for Developing Countries (Norfund) and its affiliates Aureos Capital and SN Power, Fredskorpset (FK Norway), and a wide variety of organisations such as Innovation Norway, the Confederation of Norwegian Enterprises and various Norwegian NGOs.
22. According to a 1999 business-related assistance strategy, the environmental guidelines that apply to Norwegian aid in general also apply to business-related support. The whole production cycle is to be assessed, from supply of raw material to the end product, including transport and use of energy and chemicals. The 2006 action plan for environment in development co-operation seeks to make environment and sustainable development an integral part of partner countries' strategies, plans and budgets. The government has committed to focus on competence and capacity development for improved governance in environmental issues.
23. A possible exception is support for the Nile perch in 1992.

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PART II

Selected Issues

PART II

Chapter 5

Climate Change

As one of the first countries to adopt a carbon tax, Norway uses this, along with its membership in the EU Emissions Trading Scheme in a determined attempt to reduce emissions. Norway experienced a rise in emissions over the past 20 years, meaning its ambitious reduction target by 2020 will need support through the establishment of a more consistent price for carbon across the economy, the development of an economy-wide energy efficiency strategy, and a review of transport taxes and exemptions. If it can successfully manage these elements, Norway could act as a positive example for other countries in the move to a low-carbon economy.

Assessment and recommendations

Norway continues to be a leader in the international effort to address climate change and has adopted some of the most ambitious emission mitigation targets of any developed country. In addition to the Kyoto target of +1% relative to 1990 levels in the period 2008-12, Norway has made a unilateral commitment to reduce greenhouse gas emissions by 10% below this target. Norway is also one of a few countries that is considering longer-term targets in line with the goal of limiting the average rise in global temperatures to no more than 2°C.

Norway has pursued early and proactive implementation of economy-wide economic measures to reduce emissions, as well as sector-specific policies and measures. Emissions associated with a rapidly growing economy were, in the period up to 2008, considerably higher than in 1990, but a strong emission reduction in 2009 (linked to the economic recession) brought the emissions down to less than 2% above the 1990 level. As this reduction probably will be transitory, meeting Kyoto commitments will require supplementing domestic abatement measures with the purchase of emission permits on international carbon markets.

Norway was one of the first countries to adopt a carbon tax, and it joined the EU Emission Trading System (EU ETS) in 2008. It has achieved some success in combining these two instruments to set a common price on emissions, though the effective price still varies by sector, and exemptions granted to certain sectors have undermined the overall effectiveness of the carbon tax in reducing emissions.

The context within which Norwegian energy-related policies are formulated and implemented changed significantly when Norway was linked to the EU ETS. For emission sources that are directly or indirectly covered by this system, further reductions in CO_2 emissions would not necessarily be achieved by adding additional instruments – such as emission taxes, renewable energy targets, energy efficiency standards – as long as the cap remains unchanged. Additional instruments should provide co-benefits or effectively address other market failures, and the benefits of applying them should exceed their costs.

For example, given that 98% of Norway's electricity is generated by renewables, mostly large-scale hydro, the cost-effectiveness of any further support for this sector should be subject to careful assessment. An overall strategy regarding energy efficiency should be developed, with consideration given to possible interactions with the expected widening of the Norwegian ETS after 2012.

Emissions from transport continued to rise over the review period while declining somewhat in 2008 and 2009. Recent incentives for purchases of lower-emission vehicles have very high marginal abatement costs and emission reductions could perhaps be achieved more cost-effectively by measures related to vehicle use, such as road pricing and fuel taxes. Emissions from the oil and gas extraction sector will also continue to rise on business-as-usual projections in the period to 2020, and manufacturing will remain a major emitter.

Compliance with the level of ambition for domestic reductions in GHG emissions (in addition to ambitious international obligations) is a contentious issue in Norway. Careful assessments of a broad spectrum of possible policies and measures to achieve future emission reductions show that it will be very challenging to comply with the level of ambition

set for domestic emissions in 2020. If a common carbon price were to be used for all sectors in the pursuit of the domestic target, the major share of the emission reductions would take place in sectors covered by the EU ETS – and thus be accompanied by increased emissions in another country covered by the ETS, causing little or no change in global GHG emissions. This could also entail a significant downscaling of production and employment in the emission-intensive sectors, which often are located in areas with few alternative employment possibilities. Alternatively, if these sectors were sheltered from any policies applied on top of the EU ETS, very high carbon prices would have to be applied in the non-trading sectors if the current domestic emission reduction target is to be reached; for example, perhaps a doubling of motor fuel prices by 2020.

Achieving an ambitious domestic target perhaps could act as an example for other countries, and enable Norway to be a constructive player in promoting innovation and the move to a low-carbon economy. In the short run, Norway could do more to reduce the global climate problem for a given cost (or achieve the same outcome for a lower cost) by focusing on its international obligations – for example, by buying and retiring a comparable number of emission allowances within the EU ETS.

Recommendations

- Agree clear and realistic *domestic mitigation targets* for 2020 and 2050, using 1990 as a baseline, that reflect both Norway's wish to serve as a model for other countries and the need to ensure the cost-effectiveness of the climate policy overall.
- Based on the existing monitoring systems, strengthen the *mechanism for identifying policy adjustments*, if needed, to stay on track to achieve climate targets; use the proposed carbon budget to address the overall impact of the public budget on emissions, and its implications for achieving mitigation targets.
- Establish a more *consistent price for carbon across the economy*, *e.g.* by removing exemptions from the carbon tax for the sectors that are not covered by the EU ETS; and establish a common carbon shadow price, and a trajectory for future carbon prices, to be used explicitly and consistently in policy assessments.
- Develop an *economy-wide energy efficiency strategy with appropriate incentives*; regularly reassess policies to promote energy efficiency and renewable energy generation, taking possible interactions with the "cap" of the EU ETS into account; where interactions occur, these policies should provide co-benefits or effectively address other market failures.
- Comprehensively review all *taxes and exemptions related to motor fuel use, vehicle ownership and use, as well as road pricing* with a view to making them more coherent, cost-effective and better targeted to reduce CO_2 and other emissions.

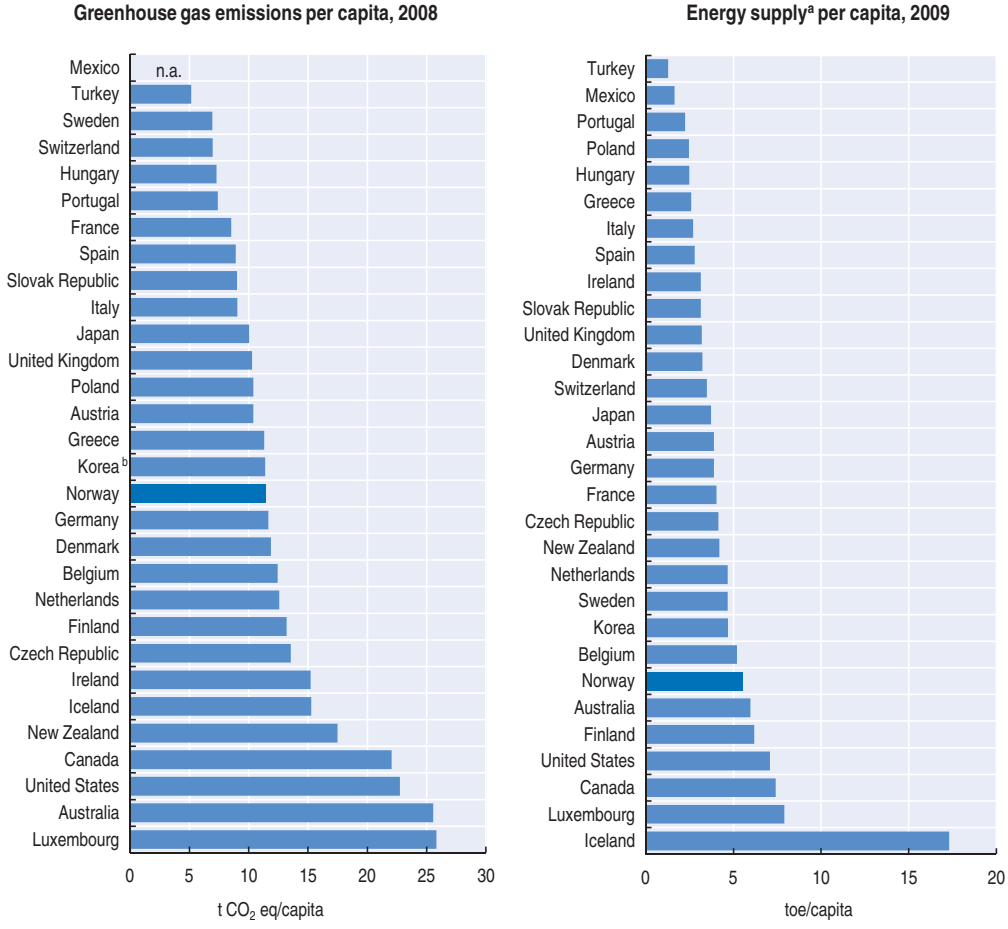
1. Introduction

The overriding objective of Norwegian climate policy is to limit the average rise in global temperatures to no more than 2 degrees Celsius above pre-industrial levels (MoE, 2008). To achieve this objective, the Norwegian government seeks to play a part in establishing a global, binding, long-term, post-2012 regime that will assure sufficiently deep cuts in global emissions of greenhouse gases (GHGs). Norway, therefore plays a leadership role in international climate change negotiations. For example, it established the International Climate and Forest Initiative to reduce emissions from deforestation in developing countries. Domestically, the government has adopted challenging short-, medium- and long-term targets for emission reductions with a view to encouraging others to follow suit.

Norway's emission profile is unusual in several ways. On the one hand, Norway is a very large producer and exporter of fossil fuels. Its offshore fossil fuel extraction and export industry, combined with its heavy industry sector, intemperate climate and low population density, means that Norway's energy use per capita is among the highest for developed countries (Figure 5.1).

On the other hand, Norway produces some 96% of its electricity from renewable sources, mostly large-scale hydro. Extensive use of electricity for space heating and industrial processes means the energy intensity of the Norwegian economy does not translate into particularly high GHG emissions on a per capita basis in comparison to other OECD countries (Figure 5.1).

Figure 5.1. **GHG emissions and energy supply per capita**



a) Total primary energy supply. Excludes international marine and aviation bunkers.
b) 2005 data.
Source: OECD-IEA (2010), *Energy Balances of OECD Countries;* Inventory submission to the UNFCCC.

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2. Emission performance and Kyoto compliance

2.1. Objectives

The Kyoto Protocol commits Norway to ensure that its average annual net GHG emissions are no more than 1% above 1990 emissions for the period 2008-12, or a maximum of 50.1 million tonnes of CO_2 equivalent (Mt CO_2 eq) a year over the Kyoto

commitment period (MoE, 2010a). Norway made a supplementary unilateral commitment in the 2007 White Paper on Norwegian Climate Policy to reduce net emissions to 9% below 1990 levels over the Kyoto period. This represents an additional 10% cut in Norway's legally binding commitment under the protocol (Table 5.1).

Table 5.1. **Norway's Kyoto inventory: projected emissions and acquisitions of permits**

	Mt CO_2 eq[a]
A. Net projected emissions 2010	53.9
B. Assigned amount under Kyoto Protocol	50.1
C. Sequestration from sinks	1.5
D. Distance to Kyoto target (A-B-C)	2.3
E. Projected use of EU ETS[b] credits (EUAs)	5.3
F. Kyoto commitment (D-E)	–3.3
G. Additional unilateral commitment[c]	6.6
H. Requirement for additional (CDM[d]) permits (G+F)	3.3

a) Metric tonnes of CO_2 equivalent.
b) EU Emission Trading System.
c) Includes strengthening of Norway's commitment by 10%, quotas equal to uptake of CO_2 in forests, and government employees' international air travel.
d) Clean Development Mechanism.
Source: MoF, 2010.

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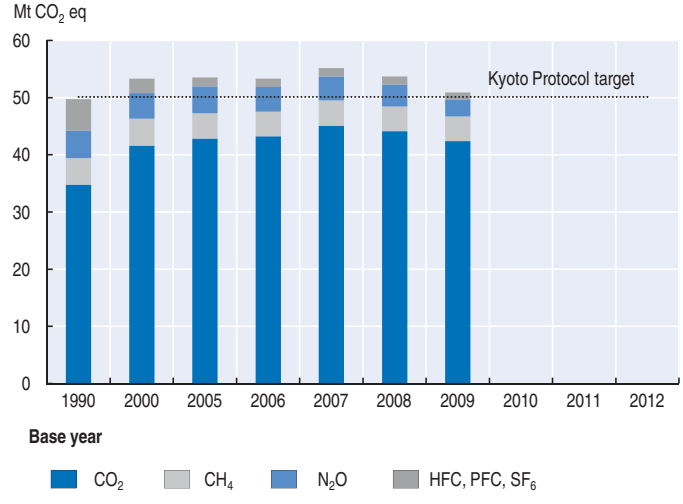
2.2. Performance overview

Norway's aggregate GHG emissions came to 50.8 Mt CO_2 eq in 2009, about 1.5% over the 1990 level. Most of the increase occurred in 1995-2000. In 2000-08, emissions stabilised somewhat, fluctuating between 53.4 and 55.1 Mt CO_2 eq a year, but from 2008 to 2009, they decreased 5.4% – partly due to the economic recession (Figure 5.2).

Figure 5.2. **Norwegian GHG emissions,[a] 1990-2009[b]**



a) Excluding emissions/removals from land-use, land-use change and forestry.
b) 2009: Preliminary data.
Source: Emission Inventory from Statistics Norway and KLIF.

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As Norwegian economic output has risen faster than emissions, the CO_2 emission intensity of the economy is decreasing in all sectors (Table 5.2). In mainland Norway, the emission intensity has fallen more than 50% since 1990. The intensity for Norway overall is comparable to that of Sweden, and significantly below the OECD average (Figure 5.3).

Table 5.2. **GHG emission intensities of selected industries, 1990-2008**

(Mt CO_2 eq/USD 1 000)

	1990	2008
Total	0.37	0.23
Agriculture, forestry and fishing	0.05	0.03
Manufacturing	0.14	0.06
Oil and gas extraction	0.06	0.06
Transport	0.03	0.03
Other	0.09	0.05

Source: Emission Inventory from Statistics Norway and KLIF.

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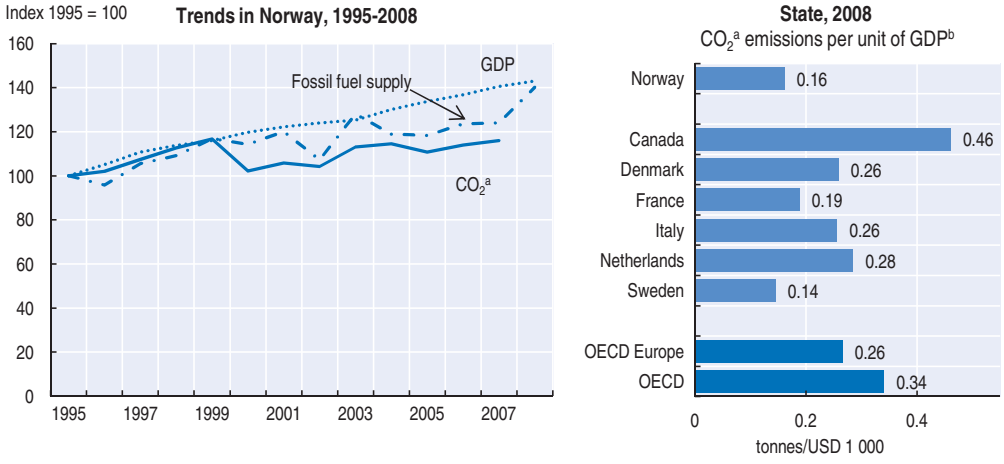
Figure 5.3. **CO_2 emission intensity, 2008**



a) CO_2 emissions from energy use only, sectoral approach.
b) At 2005 prices and purchasing power parities.
Source: OECD-IEA (2010), *Energy Balances of OECD Countries;* OECD-IEA (2010), *CO_2 Emissions from Fuel Combustion*; OECD (2010), OECD *Economic Outlook No. 87.*

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2.3. *Trends in sectors*

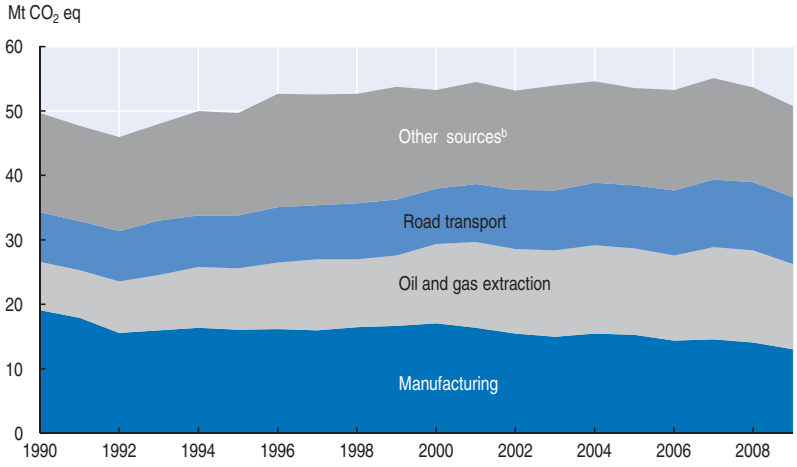
Three sectors account for the majority of Norwegian GHG emissions: transport, manufacturing, and oil and gas extraction (Figure 5.4).

Norway is a significant producer of oil and gas. In 2009, this sector accounted for 20% of GDP and 46% of exports. While oil production is now in decline, gas extraction is increasing (Figure 2.2). The sector accounted for 26.2% of the country's total CO_2 emissions in 2009, down 7.6% from 2008 but up more than 70% from the 1990 level and more than 10% since 2000. Both total CO_2 and CO_2 per unit of GDP[1] have increased since 2000, partly because of the rise in transport involved in bringing oil and gas ashore from increasingly remote fields. According to the revised national budget for 2010, emissions are projected to continue rising in this sector, peaking by 2016.

Hydropower is used to generate 96% of all electricity produced in Norway, making the country the world's highest per capita producer of hydropower (Statistics Norway, 2009). Emissions from power generation are limited to two gas-fired power plants: a Statoil-operated integrated gas-fired liquefaction plant in the north and a gas-fired plant at Kårstø that has been operated intermittently since 2007.

Emissions from heating and stationary combustion, largely of oil and gas for commercial, institutional and residential use, decreased slightly over the review period and amounted to 1.3 Mt CO_2 eq in 2008.

Figure 5.4. **Trends in GHG emissions per sector, 1990-2009**[a]



a) Preliminary data.
b) Including emissions from waste management, households and mobile sources other than road transport
Source: Statistics Norway and KLIF.

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Norway's fairly dispersed settlement pattern[2] and raw-material-based export economy mean that transport emissions are relatively high and rising. In 2009, about 20% of all GHG emissions stemmed from road transport. Emissions grew strongly in all transport sectors from 1990 to 2007: up 33% in road transport; 10% in domestic aviation; and 40% in domestic maritime transport. In 2008 and 2009, however, transport emissions fell, partly because economic activity was lower due to the global economic downturn, but also to some extent because of an increased share of biodiesel in auto diesel consumption.

GHG emissions from land-based manufacturing industries fell from 14 Mt CO_2 eq in 2008 to 11.7 Mt CO_2 eq in 2009 – a decrease of 17% in one year, largely due to the recession.[3] This sector mainly comprises iron and steel, non-ferrous metals, chemicals, fertiliser, pulp and paper, minerals, food processing, and construction and building. The main emissions from manufacturing are related to the use of coal, as well as oil and gas for heating and processing. Manufacturing emissions have fallen by over 35% since 1990.

Agriculture[4] is estimated to account for about 8% of Norwegian emissions. Emissions from the sector decreased by 7% from 2008 to 2009, due to lower estimated emissions of NO_x from fertiliser use.

In recent years, net CO_2 uptake in Norwegian forests has been of the order of 25-32 Mt CO_2 eq per year – equal to around 50% of all Norwegian CO_2 emissions. Under Kyoto rules, 1.5 Mt CO_2 eq of sequestered emissions from forestry (the proportion of sequestered emissions which arise from new forests) can be counted to meet Kyoto commitments.

Methane emissions from waste amounted to about 1.2 Mt CO_2 eq in 2008, around 2% of total Norwegian GHG emissions, a nearly 30% decrease from 1990 and 7% from 2000.

3. Policies and measures

3.1. Overview

Norway intends to meet its Kyoto commitments through a mix of domestic mitigation and the purchase of emission permits from abroad. Norwegian companies operating under the EU Emission Trading System (EU ETS) will require an estimated 5.6 Mt CO_2 eq of permits a year over the Kyoto period (Table 5.1).[5] In addition, to fulfil its commitment to more than meet the Kyoto Protocol, the Norwegian government needs to acquire 3.3 Mt CO_2 eq of permits a year and 15-20 Mt from 2008-12, mainly by buying UN-approved allowances generated by projects under the Clean Development Mechanism (CDM).

Norway will not meet its Kyoto commitments exclusively through domestic measures, but it is estimated that measures taken since 1990 have yielded emission reductions totalling some 10 Mt CO_2 eq (MoE, 2009). Domestic measures will supplement the use of flexible mechanisms (such as the CDM), and the CO_2 tax on offshore installations, in combination with the sector's obligation to hold EU ETS allowances, is expected to have the greatest effect on domestic emissions in the years to come (Table 5.3).

Table 5.3. **Policy measures, estimated effect on domestic emissions**

Million tonnes CO_2 equivalents reduction per year

	1995	2000	2005	2007	2010	2020
Directly related to climate change:						
CO_2 tax offshore	0.6	3.0	3.0	4.5	5.2[a]	6.9[a]
CO_2 tax onshore		0.8	0.8	0.85	0.85	0.85
Requirement to collect land fill gas	0.2	0.4	0.4	0.4	0.4	0.4
Other measures in the waste sector			0.1	0.1	0.1	0.5
Tax and recycling schemes on HFC			0.3	0.5	0.5	0.5
Climate change agreement with aluminium industry[b]	0-1.3	0.5-2.7	1.6-4.5	1.6-4.5	1.5-4.2	1.8-4.3
Road transport measures[c]					0.4	0.7
Other regulations:						
VOC regulation offshore			0.2	0.2	0.3	0.1
Voluntary reductions:						
SF_6 reduction, magnesium production	1	1.4	1.8	2.1	2.1	2.1
N_2O reduction, production of nitric acid	0.7	0.6	0.5	1.2	1.2-1.6	1.2-1.6
Use of bi-carbon in cement production			0.13	0.13	0.13	0.13
Sum of implemented policy measures		5-7.2			8.6-11.7	11.5-14.6
New policies and measures post 2008:						
Emission trading scheme					0-0.3	0-0.3
Consensus with the processing industry 2009					0.2	0.2

a) Includes combined effect of CO_2 tax and EU emission trading system.
b) The lowest number reflects direct effect of the agreement, while the highest estimate includes voluntary measures taken before adopting the agreement in 1997.
c) Biofuel requirement and CO_2-related tax on new passenger cars.
Source: Norway's fifth national communication under the UNFCCC, Table 5.5.

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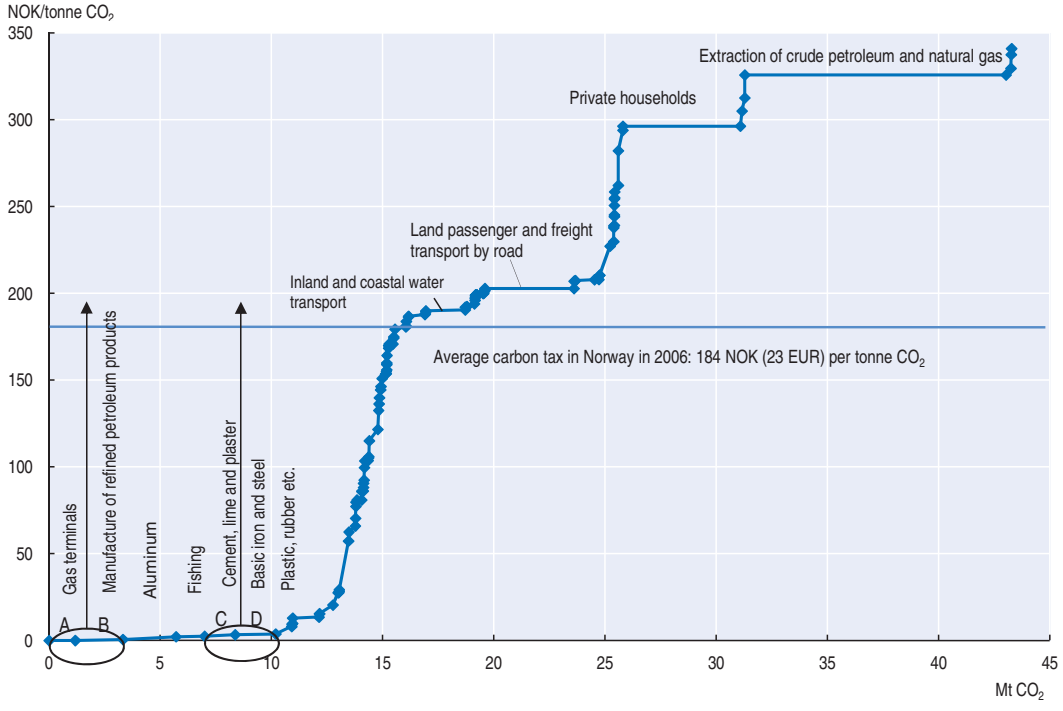
Norway is using cost-effective cross-sectoral economic instruments to an increasing extent in climate policy. More than 70% of Norway's GHG emissions are now either covered by emission trading or subject to environmental taxes, and considerable effort has been made to assure the effectiveness and compatibility of these two types of instruments. Complementary sector-specific agreements and measures have also been implemented.

3.2. Taxation

A CO_2 tax was introduced in 1991 as a potentially cost-effective way to reduce emissions. Mainland energy-intensive industries were, however, exempted from the tax due to the perceived danger of so-called carbon leakage. The tax rate varies by fuel type and sector. There are large differences in average CO_2 tax rates paid by different sectors, with a number of important sectors more or less exempted from the tax (Figure 5.5). However, some of these sectors are part of the EU ETS, and thus at the margin, face a price on their carbon emissions approximately in line with the average CO_2 tax rate.

In recent years, a number of modifications have been made to the CO_2 tax (Table 5.4). The tax on oil use in domestic aviation and internal shipping of goods was increased from the lower to the higher rate in 2006. From 2008, the CO_2 tax was reduced for the offshore oil and gas sector, which was included in the Norwegian ETS. This was done to keep the CO_2 price constant for the sector, based on an anticipated EU ETS allowance of NOK 160. A further modification is the introduction of a CO_2 tax on natural gas and liquefied petroleum gas from late 2010. As of 2009, the average CO_2 tax rate was NOK 219 per tonne of CO_2, but the sector rates still differed significantly.

Figure 5.5. **Average CO_2 tax by sector, 2006**



Note: Sectors A, B, C and D are part of the EU ETS.

Source: Bruvoll and Dalen, in Statistics Norway, 2009.

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Table 5.4. **Norwegian CO_2 tax rates**

(NOK/unit)	Unit	2006	2007	2008	2009	2010	2010 NOK per t CO_2 eq
Oil							
Unleaded petrol	Litre	0.79	0.80	0.82	0.84	0.86	371
Jet fuel	Litre	0.53	0.54	0.65	0.67	0.68	267
Light fuel oil, diesel	Litre	0.53	0.54	0.55	0.57	0.58	218
Heavy fuel oil	Kg	0.53	0.54	0.55	0.57	0.58	185
Oil for pulp and paper and fishmeal industries							
Light fuel oil, diesel	Litre	0.27	0.27	0.28	0.29	0.30	113
Heavy fuel oil	kg	0.27	0.27	0.28	0.29	0.30	96
Gas used for heating							
Natural gas	m^3	0	0.47	0.48	0.49	0.51	218
LPG	kg	0	0.60	0.62	0.64	0.65	217
Offshore oil and gas extraction							
Light fuel oil, diesel	Litre	0.79	0.80	0.45	0.46	0.47	177
Heavy fuel oil	Kg	0.79	0.80	0.45	0.46	0.47	150
Natural gas	m^3	0.79	0.80	0.45	0.46	0.47	201

Source: MoF.

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Since 2003, the use of coal and coke has been exempt from the CO_2 tax.[6] Moreover, coal has never been subject to the basic tax and is exempt from the sulphur tax.[7] This situation does not reflect the high environmental externalities associated with coal use. Given that most of the coal used in industrial sectors has been covered by the EU ETS since 2008, the practical implication of the tax exemption is now reduced. However, as the emission allowances are distributed for free, there are equity-related questions as to whether it is "fair" that these polluters – and others – do not have to pay.

Since 2003, a tax has been levied on the import and production of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), chemicals with a high global warming potential. The intent is to reduce emissions and stimulate use of alternative gases and the development of new technologies and products that do not use HFCs and PFCs. The HFC/PFC tax rate has risen slightly, from NOK 190 per tonne of CO_2 eq to NOK 209 in 2010. In addition, in 1999 Norway introduced a tax on final waste disposal covering both landfill and incineration. The objective was to internalise the environmental costs associated with waste disposal, which includes methane emissions from landfills and CO_2 emissions from incineration. However, the tax levied on emissions from incineration was recently discontinued (Chapter 7).

Impact of taxes

The effectiveness of the carbon tax has been limited because of the exemptions granted to mainland energy-intensive industry. Hence, the most significant impact of the introduction of the tax was on the offshore oil and gas industry, where reduced flaring and adoption of carbon capture and storage (CCS) is estimated to have reduced emissions by 3 Mt CO_2 eq annually by 2000 (MoE, 2009). Specific effects include the sequestration of 1 Mt of CO_2 a year from the Sleipner West gas field into the subterranean Utsira formation. Increased energy efficiency measures, electrification of some processes, and CCS at the Snøhvit gas field, are estimated to have resulted in another 1.5 Mt CO_2 eq of reduced emissions by 2010. A further 2 Mt CO_2 eq of reductions are projected by 2020.

The CO_2 tax rate on unleaded petrol amounts to NOK 0.86 per litre and on diesel to NOK 0.58. These amounts are in addition to fuel tax rates of NOK 4.54 per litre for petrol and NOK 3.56 for diesel (Chapter 2). It is reasonable to assume, therefore, that the CO_2 tax and the fuel tax have limited the increase in transport emissions by providing incentives for public transport use and purchases of more fuel-efficient vehicles.[8]

In some cases, the extent to which emission reductions arose directly from the carbon tax is difficult to separate from other factors (OECD, 2010b).

Perfluorocarbons (PFC) emissions have fallen considerably since the introduction of the PFC tax in 2003, and the use of PFCs in new or modified applications has fallen to an insignificant level. Hydrofluorocarbon (HFC) emissions have continued to rise since the introduction of the tax, albeit at a rate far below what was projected. The introduction of the tax has probably resulted in better equipment maintenance and switching to gases with lower global warming potential.

3.3. Emission trading

On 1 January 2005, the national Greenhouse Gas Emission Trading Act came into force, establishing an emission trading system from 2005 to 2007. The system closely resembled the EU ETS, but covered only 10-15% of Norwegian emissions (MoE, 2009). The sectors included from 2005 were energy installations over 20 MW; oil refining; calcining/sintering of iron ore; production of cast iron and steel; production of cement and lime; and production of glass, fibreglass and ceramics. Industries covered by the carbon tax were excluded, and allowances were distributed free of charge, generally equivalent to about 95% of average emissions in 1998-2001. The economic consequences for the industries included are thought to have been relatively minor due to the free allocation of allowances (Nordic Council of Ministers, 2009).

The act was amended in June 2007 to align the Norwegian ETS with the EU ETS, with the total amount of allowances set at 20% below 2005 emissions for the installations concerned. Three subsectors were included from 1 January 2008: pulp and paper; fertiliser and offshore oil and gas installations, with the offshore sector contributing more than 60% of the emissions concerned. The system was expected to cover 21-23 Mt. Effective from 1 July 2008, emissions from nitric acid production (4% of total emissions) were also included. The emissions covered by the Norwegian ETS totalled 19.3 Mt in 2008 and 19.2 Mt in 2009, corresponding to 36% of Norwegian emissions in 2008 and 38% in 2009. This was lower than expected partly owing to reduced economic activity during the financial crisis. In October 2007, the government announced a limit on the total allocation at 15 Mt (about 4 Mt less than 2005 emissions for these sources) and a corresponding cap on the use of project-based mechanisms at 20% of the allocation (a maximum of 3 Mt). In March 2009, the total amount for 2008-12 was finally set at about 75 Mt, including the allocation to nitric acid plants.

Half of the Norwegian allowances in the ETS are being auctioned in 2008-12, with only a third of Norwegian installations' expected demand being met through free allocation of allowances (Table 5.5). For land-based industries, the free allowances distributed were equivalent to 92% of their emissions in the base period (1998-2001).[9] This was equivalent to 7.9 Mt of CO_2 annually (including free allowances to installations producing nitric acid). Installations producing nitric acid were allocated free allowances equivalent to 50% of average base period emissions (0.75 Mt CO_2 eq a

year). The oil and gas sector was not allocated any free allowances.[10] Following rejection by the *Storting* of parts of the allocation plan in July 2008, in February 2009 the GHG Emission Trading Act was amended to allocate allowances free of charge to new installations or installations that had significantly changed their activities, based on later base years or benchmarks. Also, the rules for allocation from the reserve were changed, and the volume adjusted downwards. The changes have resulted in a total allocation of about 7.9 Mt/year free of charge, plus potential allocation from the reserve. In all, about 6.3 Mt CO_2 eq a year of permits are auctioned. A limit on the use of Kyoto mechanisms was set equal to 20% of the total allocation, *i.e.* about 3 Mt. A further increase in the use of auctioning in future years would be an efficient way of raising public revenue.

Table 5.5. **Emission trading sector, key figures 2008-12**

Norwegian ETS	Mt CO_2 eq
Emissions 2005	18
Projected emissions 2010	21
Annual allocation	15
(Of which) Free allocation	*7.9*
Sales/auctions	*6.3*
Reserves	*0.8*
(Of which) CDM/JI[a]	*3 (20% of allocation)*

a) Clean Development Mechanism/Joint Implementation. Under the Kyoto Protocol, JI and CDM are the project-based mechanisms which feed the carbon market. JI enables industrialised countries to implement projects jointly with other developed countries, while the CDM involves investment in sustainable development projects that reduce emissions in developing countries.

Source: MoE, 2010.

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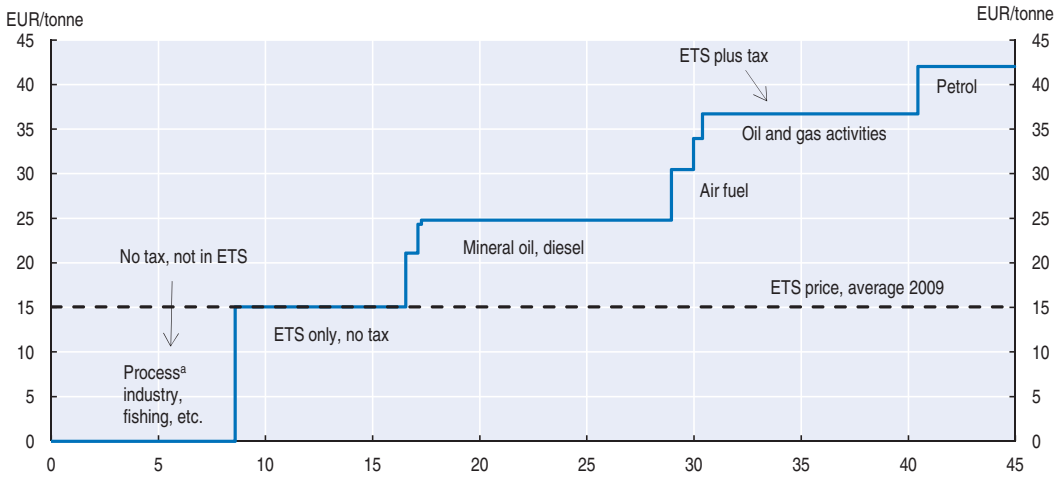
Although the national allocation plan makes no general reserve of allowances for new entrants, a reserve of 4.2 Mt CO_2 eq (0.8 Mt CO_2 eq a year) is set aside for highly efficient combined heat and power (CHP) plants. A CHP plant must exceed "best available technology" for combined cycle gas turbines by 10% to be eligible for reserve permits. The Mongstad CHP plant has been allocated nearly 1 Mt of allowances (or 24%) from the reserve.

The Norwegian approach to emission trading is exemplary in three respects: the use of auctioning went well beyond the EU average[11] (although on-shore industries were again treated preferentially due to the perceived threat of carbon leakage); the amount of emission allowances allocated was tighter than that allocated by EU member states; and since 2009, the scope of the Norwegian system has been wider than that of the EU with the inclusion of N_2O emissions from nitric acid producers.

The additional impact of the adoption of emission trading was reduced because some sectors that were included had been subject to a carbon tax, which was eliminated for many of them when they entered the Norwegian ETS. However, the introduction of the ETS significantly increased the carbon prices facing some major sectors, and in the offshore oil and gas sector, taxation and emission trading were combined, causing this sector to face much higher abatement incentives than other Norwegian emission sources (Figures 5.5 and 5.6).

Figure 5.6. **The marginal cost of CO_2 emissions, 2009**



a) Process industry concerns mainly aluminium, ferro alloys and fertilisers.
Source: MoF.

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3.4. Energy

The high proportion of hydropower in the Norwegian electricity generation mix means there is limited potential for switching from fossil fuel to renewable forms of energy (Box 2.6). The country's gross consumption of energy rose significantly in the years after 1990. There was a significant reduction in energy use from 2008 to 2009, and the level in 2009 was only marginally higher than in 1990. However, the reduction was clearly linked to the recession, and demand is projected to increase again up to 2020.

The government has made efforts to ensure that demand is met from low-carbon sources by encouraging the development of combined-cycle gas power plants fitted with CCS, along with renewables and energy efficiency.

Carbon capture and storage (CCS)

CCS technology has the potential to significantly mitigate GHG emissions associated with the extraction and production of energy from fossil fuels. Norway has pioneered carbon capture and storage (CCS) in its gas extraction industry at the Sleipner (1996) and Snøhvit (2008) fields. The technology required in gas-fired power generation is quite different, however, and no large-scale demonstration plant yet exists in Norway.

In June 2007, *Gassnova* was established to promote CCS in Norway through innovation, technology development and both micro- and full-scale demonstration. Since 2005, the government's policy has been that all new gas-fired power plants must have carbon capture technology. In 2006, the government began planning full-scale CCS at the Kårstø gas-fired plant. In 2009, however, the government halted the procurement process for the assignment of contracts to construct the CCS facility there because the power plant had not been running full-time.[12]

In 2009, construction began on a CCS technology centre at Mongstad. The Technology Centre Mongstad (TCM), has become the focus of Norwegian CCS research and development efforts. TCM, a public-private partnership between *Gassnova*the Norwegian

state, Statoil, Shell and Sasol, aims to carry out development, testing and qualification of CO_2 capture technology for large-scale treatment of flue gases. The focus is on amine and chilled ammonia technologies.

The government also plans to build a full-scale CCS project at the CHP plant in the Mongstad refinery. The planning process is based on a co-operation agreement with Statoil. In May 2010, the government decided to extend the planning phase of this project, as it became clear that it would take longer than previously expected to develop the necessary technology.

Renewables and energy efficiency

Although the development of renewables and energy efficiency measures covered by the EU ETS does not cause additional reductions in CO_2 emissions,[13] it nonetheless plays an important role in Norway's climate policy.

Further development of large-scale hydro is not considered an option, for political reasons.[14] Recent development has therefore focused on micro-hydro. In 2007, micro-hydro plants with total capacity of 1.3 TWh were under construction, and the development of a further 1 TWh is licensed. These projects are commercially viable and require no state subsidy (MPE, 2009).

To promote the development of renewables and energy efficiency, a public agency, *Enova* SF, was established in 2001. Its aim is to provide incentives for renewable heating, wind power and energy efficiency, with an overall target of 18 TWh per year by the end of 2010. The annual targets are divided between wind and renewable heating. *Enova* works primarily by subsidising a portfolio of projects. It has already exceeded the targets for heating. However, the Ministry of Petroleum and Energy (MPE) informed the *Storting* in the national budget for 2010 that due to higher investment costs and lower electricity prices than expected, the target of 3 TWh a year in wind power production by 2010 would not be achieved. *Enova* had granted aid to wind power projects totalling 1.6 TWh a year by the end of 2009.

Enova has the potentially contradictory objective of increasing "environmentally friendly land-based use of natural gas" and so is involved in development of infrastructure for the use of natural gas, in particular for heating. Notwithstanding *Enova*'s promotion of renewable heating, the use of gas for household heating has also increased. Net domestic consumption of natural gas came to 3 950 GWh in 2008, an increase of 13% from 2007. According to Statistics Norway, the use of gas in district heating rose from 20.5 GWh in 1990 to 249.9 GWh in 2008. While natural gas still makes up only 1.7% of total net consumption of energy, its share is rising rapidly.

In addition to the subsidies available for renewables, in 2010 Norway and Sweden agreed to launch a common market for green certificates from 1 January 2012.[15] The move is expected to generate 26.4 TWh by 2020, with each country financing half of the production. However, some have argued that such a market would be costly and not achieve its intended objective (Bye and Hoel, 2009). Similarly, the commercial viability of micro-hydro and the role of *Enova* need to be taken into account in promoting renewable technologies.

Enova has no specific target for energy efficiency, but Norway is negotiating adoption of the EU renewables directive. Depending on the outcome of the negotiations, compliance with the targets set could prove to be a challenge, given the already high share of renewables in total energy use (Box 2.6).

When assessing policies to promote renewables and energy efficiency, it should be kept in mind that applying additional instruments to sources covered by the EU ETS, either directly (*e.g.* many industrial emissions) or indirectly (*e.g.* all electricity use), is required only if these instruments provide co-benefits such as reduced local air pollution and improved health outcomes, or effectively address other market failures (*e.g.* technology spillover, market power in relevant markets, information barriers). In addition, the additional instruments should be applied only if the benefits of doing so exceed the cost (without assuming any benefits regarding CO_2 emission reductions). Any subsidies should be well targeted to the relevant market failure and time bound.

3.5. *Transport*

In addition to the carbon and energy taxes on transport fuel, other mitigation measures have been outlined in the transport sector.

A change in the registration tax for new cars in 2007, introduced an element based on CO_2 emissions alongside tax elements based on engine size and car weight. While CO_2 emissions per vehicle for the 15 years until 2006 had been relatively constant, the reduction in average CO_2 emissions per vehicle from 2006 to 2009 was 15% (from 177 grams per km to 151). Following a further change in the tax basis towards an even stronger emphasis on low-carbon vehicles in 2009, the average CO_2 emissions of vehicles registered in the first half of 2010 came to 141 grams per km.[16]

The CO_2-related tax rate differentiation of the vehicle registration tax, in terms of emissions over a vehicle's lifetime, is very-high per-estimated tonne of CO_2 abated – more than EUR 700 per tonne in some cases (OECD, 2009). In 2009, the CO_2-related tax element was made even more progressive, providing further incentives to purchase more carbon-efficient vehicles.[17] As other elements of the registration tax are also very progressive,[18] the marginal cost (in terms of forgone consumer surpluses) of reducing emissions by this means could be high. Moreover, it is linked to car ownership rather than CO_2 emissions, which are explicitly addressed in the CO_2 tax on petrol and diesel. This of course means that a large SUV incurs much higher costs than a small vehicle, because it uses much more fuel, but the tax is the same per tonne of CO_2 emitted.

The annual car tax remains unrelated to vehicle CO_2 emissions, so older vehicles are not affected by the recent changes. A CO_2-related differentiation of the annual tax is feasible, but coming on top of the fuel taxes and the differentiation of the registration tax, this would make the incentives for abating CO_2 emissions in the vehicle fleet disproportionally larger than those provided elsewhere in the economy.

A transport authority called *Transnova* was established in 2009 on a three-year trial basis under the Norwegian Public Roads Administration. It has an annual budget of some NOK 50 million. Its task is to administer government subsidies and promote technologies that would help reduce CO_2 emissions from transport. The main focus has been on demonstration and infrastructure projects for introducing renewable energy carriers. As part of the government's 2009 stimulus package, for example, *Transnova* administered a EUR 6 million subsidy programme for 1 900 electric vehicle charging spots around the country.

Using electricity effectively reduces transport emissions while the EU ETS cap ensures that there is no rise in emissions elsewhere and increases the price of permits.[19] The government has also taken other measures to create incentives for electric (and hydrogen) vehicles: they are exempt from purchase tax and road tolls and can drive in public

transport lanes. *Econ Pöyry* (2009) estimated that the subsidies to electric vehicles in Norway exceed EUR 2 500 per tonne of CO_2 emissions avoided, indicating that the incentives provided are considerably higher than those in other sectors, and raising questions as to whether the benefits of the package exceed the costs (Chapter 2).

In March 2009, the government began requiring road transport fuels to contain at least 2.5% biofuel. The level was increased to 3.5% in April 2010. The government has stated its intention to increase the mandatory level to 5% by 2011. Flexi-fuel vehicles benefit from a lower purchase tax.

A reward programme known as the *belønningsordning,* in place since 2004, makes grants available to local authorities that increase public transport use. It encourages local governments to introduce congestion charges, local fuel taxes, cycling, parking restrictions and better public transport. The programme has grown considerably since its introduction, although local authorities often oppose road pricing and variable toll charges.

Emissions from aviation continue to grow in Norway. *Avinor*, the state-owned corporation that runs 46 Norwegian airports, earns 18% of its income from renting space for tax-free sales at Oslo/Gardermoen and the country's other international airports. *Avinor* reports that the income is used to subsidise 42 regional airports that do not cover their own costs with income from landing fees and taxed commercial sales. Though many of these airports contribute to traffic at the airports that do cover their costs, others are not economically viable even when such network effects are taken into account. The Ministry of Finance's Commission on Excise Taxation therefore recommended abolishing tax-free shopping in Norway, as was done within the EU some years ago.

3.6. Industry

Apart from emission trading and the CO_2 tax on oil, the main instrument used to reduce emissions from industry has been voluntary approaches. After the government proposed the Norwegian ETS for 2005-07 for sectors not targeted by the CO_2 tax, industry argued against the plan, citing the risk of carbon leakage. In 2004, it was agreed that energy-intensive subsectors such as the aluminium, ferroalloy, carbon, mineral fertiliser and carbide industries would not be included in the 2005-07 ETS. Instead they negotiated an agreement with the Ministry of the Environment (MoE) in which they pledged to keep their emissions at the 2005 level to the end of 2007. Final emissions were lower than this – which might be indicative of the "asymmetric information" problems often linked to voluntary policy approaches. The MoE also reached an agreement with industry on sulphur hexafluoride (SF_6) emissions, which accounted for about 0.11 Mt CO_2 eq in 2001: industry pledged to reduce the emissions by 30% by 2010, relative to the 2000 baseline, and met this target. In September 2009, processors[20] not covered by the Norwegian ETS, accounting for 6.4 Mt CO_2 eq of emissions in 2007, agreed to limit their emissions to 6.2 Mt CO_2 eq by 2012.

In addition, there are programmes in place to support energy efficiency efforts in industry.

Nearly all Norwegian emissions from process industry are either included in the ETS or are covered by voluntary approaches. The government intends to include all process industry emissions in the ETS after 2012,[21] assuming the successful transposition of the revised EU ETS directive in Norway. Over 50% of Norwegian emissions would then be covered by emission trading.

3.7. Agriculture, forestry and waste

Agricultural greenhouse gas (GHG) emissions remained relatively constant after 1990, but there was a decrease of more than 7% from 2008 to 2009, largely due to lower emissions of N_2O related to the use of nitrogenous fertiliser. A recent report to the *Storting* details measures for reducing emissions in the agricultural sector (MAF, 2009). Among the political priorities is capturing biogas from manure (responsible for 14% of methane emissions), but this initiative is at an early stage. Other potential measures include improving efficiency of cow, sheep and reindeer farming and making fertiliser use more efficient by improving soil analysis and the efficiency of manure use.

Norwegian forests sequester 25-30 Mt CO_2 eq of emissions a year, of which 1.5 Mt CO_2 eq are linked with new or "Kyoto" forests and thus can be counted against emissions. Active management of forests is important in increasing uptake. Planned measures to raise uptake include: increasing wood production through increased planting; plant breeding; fertilisation; and forest management. A recent study, *Klimakur 2020* (KLIF, 2010), estimates that these measures would allow uptake of 8-12 Mt CO_2 eq in the long term. There is also potential to use more biomass for energy and as a construction material, as only 50% of the annual forest growth increment is currently felled. Increased harvesting would, however, decrease forest stocks in coming decades (Box 2.8). The potential trade-off between biodiversity protection and active forestry management also needs to be considered.

Methane emissions from landfills have fallen more than 29% since 1990 and are projected to continue to decrease. This has largely been attributed to a drop in the amount of waste sent to landfill. Since 1998, the Pollution Control Act has gradually introduced a requirement to collect methane from landfills, and in 2002 sending wet organic waste to landfill was banned. In 2009, the ban was extended to all biodegradable waste.

Emissions from flaring and incineration have increased by 60% since 1990, though 75% of the energy from incineration is used for heat and for biogas, which displaces fossil fuel.

4. Post-Kyoto climate policy: 2020 and 2050

4.1. Objectives

Norway's intermediate target is to reduce "net" GHG emissions by 30-40% from 1990 levels by 2020. The 40% target was announced as part of a new coalition policy platform in October 2009 and formalised in Norway's quantified emission reduction commitment following negotiation of the Copenhagen Accord in December 2009 (MoE, 2010b). It will only be triggered, however, "as part of a global and comprehensive agreement for the period beyond 2012 where major emitting parties agree on emissions reductions in line with the 2 degree Celsius target".[22] Norway is considered one of only two developed countries (the other being Japan)[23] with an emission reduction target compatible with keeping global temperature rises to within 2 degrees of pre-industrial levels (Ecofys, 2010). Its targets go beyond the EU target of a 20-30% reduction.

"Net emissions" refers to Norway's total commitment to reducing global emissions: it includes domestic mitigation efforts and the purchase of emission permits. The government has indicated that domestic mitigation efforts will account for 15-17 Mt CO_2 eq, relative to the reference scenario presented in the national budget for 2007, when CO_2 uptake by forests is included. Domestic emission reductions should amount to about two-thirds of total reductions.

The nature of the domestic mitigation ambition is somewhat uncertain. Unlike Norway's international commitments, which use a 1990 baseline, the domestic mitigation ambition is set against reference emission projections for 2020, which until recently came to 59 Mt, or nearly 19% above 1990 levels. New projections in the national budget for 2011, fully taking account of Norwegian participation in the EU ETS and assuming a permit price of EUR 25 per tonne, estimate the emissions in 2020 at 57.5 Mt.

When the projection changes, it is unclear what the implication is for the domestic mitigation ambition. Furthermore, when that ambition was introduced in the 2007 climate policy white paper, it was qualified by cost estimates concerning future economic growth, developments in the oil and gas extraction sector, the development of mitigation technology, and progress in international negotiations. In the political decision of 2008 that led to an even more onerous ambition for domestic emissions, the high degree of uncertainty is again mentioned. It is unclear, therefore, whether the ambition for domestic mitigation is just a scenario. In any case, it is not legally binding.

If there is too much uncertainty in targets, actors in the public and private sector will not have the guidance they need. It is not possible to outline emission pathways to achieve uncertain targets. Nor is it possible to benchmark progress. Uncertain targets, therefore, make policy evaluation more difficult, and may make implementation of ambitious mitigation measures less likely. This could be the case, particularly in Norway, where the exchequer might be in a position to make up for any shortfall in domestic mitigation by buying emission permits. Too much flexibility could also be incompatible with Norway's climate leadership objective. Deriving the minimum envisaged reduction of 12 Mt CO_2 eq (excluding uptake by forests) from the domestic sector would leave 2020 emissions some 10% below the 1990 baseline.[24]

Norway also has ambitious long-term climate goals. The 2007 white paper acknowledged that to increase the probability of limiting global temperature rises to a 2 degree Celsius increase from the pre-industrial level, GHG emissions would have to be cut by 50-85% from the 2000 level by 2050; it also recognised that developed countries had a special responsibility to reduce emissions. Within this context, Norway has committed to being "net carbon neutral" by 2050, meaning it will ensure that, by 2050, global emissions are reduced by the equivalent of 100% of Norwegian emissions (from the 1990 level) (MoF, 2010). This commitment will be brought forward to 2030 if "an acceptable international agreement" is reached.[25] No long-term strategy for meeting the objective has been developed, nor has the commitment been divided between domestic mitigation efforts and action abroad. The white paper clearly states that "this target says nothing about the level of Norwegian emissions in 2050" (MoE, 2008).

4.2. Policies and measures to 2020

The 2007 white paper on Norwegian climate policy considered policies to meet the domestic mitigation ambition for 2020. It set out six action plans: for the oil and gas sector and energy; transport; manufacturing; primary industry; municipalities; and the functioning of the state. It also established five-yearly progress reviews of climate policy. The Ministry of the Environment commissioned two major reports intended to inform the first review, scheduled for 2010.

The first report, published by the Climate and Pollution Agency (KLIF) in 2007, catalogued a range of domestic emission mitigation options (KLIF, 2007). It was followed in February 2010 by the *Klimakur 2020* report, which investigated measures and instruments needed to meet

the 2020 target of a 15-17 Mt CO_2 eq reduction in domestic emissions (KLIF, 2010). *Klimakur 2020*, produced by an *ad hoc* group led by KLIF, projected that baseline emissions would continue to rise to 59 Mt CO_2 eq by 2020, an increase of 4 Mt CO_2 eq from 2008 (Box 5.1).

Box 5.1. **Klimakur 2020: estimated costs of reaching climate policy targets**

Policies to combat climate change are central to any strategy to promote sustainable development. To improve the foundation for formulating future climate policies in Norway, the MoE in June 2008 asked KLIF to lead a study (in co-operation with the public roads administration, the Norwegian Petroleum Directorate, the Norwegian Water Resources and Energy Directorate and Statistics Norway) assessing the costs of implementing various instruments to reduce GHG emissions.

The main report of this study, *Klimakur 2020* (Climate Cure 2020), was presented in February 2010. It projected that baseline emissions would continue to rise to 59 Mt CO_2 eq by 2020, an increase of 9 Mt CO_2 eq from 1990 or 4 Mt CO_2 eq from 2008. The projection was based on continued increases in transport emissions to 2030 and in oil and gas sector emissions to 2020, and stable emissions from the industrial sector. This baseline scenario includes the impact of all policies already adopted, such as operation of the CCS plant at Mongstad from 2014 and assumed improvements in energy efficiency of 1% per year on average.

The report contains quite detailed "bottom-up" descriptions of 160 measures that could reduce GHG emissions, totalling around 22 Mt CO_2 eq (almost half of all Norwegian GHG emissions). They entail widely ranging costs per tonne of CO_2 eq abated, up to around EUR 500 for the most expensive ones (Figure 5.7) (KLIF, 2010).

The study also contains "top-down", macroeconomic model simulations of the costs to society of implementing the following climate policy objectives: *i)* an ambitious international emission reduction obligation (at least 30% emission reduction compared to 1990 by 2020); *ii)* that obligation plus a 15-17 Mt CO_2 eq reduction in emissions within Norway, compared to a specified reference scenario, implemented cost-effectively; and, *iii)* the same as *ii)* but without subjecting the sectors covered by the EU ETS to additional policy instruments. In the last case, the emission price for sectors outside the EU ETS would have to reach about EUR 425 per tonne by 2020.

In case *i)*, total welfare would be reduced by 0.1% compared to the reference scenario in 2008-20, or NOK 1.5 billion annually (disregarding any welfare gain from avoided climate change) (Fæhn, 2010).

In case *ii)*, the welfare loss is estimated at 0.2%, or NOK 5 billion annually (Fæhn, 2010). It is important to keep in mind that around two-thirds of the domestic emission reductions in this case would take place within sectors covered by the EU ETS, whereby increases in Norwegian emissions would be "matched" by higher emissions (than otherwise) in some other country covered by the EU ETS. It is also significant that this alternative would entail quite considerable reductions in production and employment in Norway, in the sectors covered by the ETS, in which firms are often located in places where alternative employment opportunities are few.

In case *iii)*, when the trading sectors are sheltered, the annual welfare loss is estimated at 0.4% or NOK 10 billion (EUR 1.25 billion) (Fæhn, 2010). A very high emission price would have to be applied in the other sectors, *e.g.* a doubling of motor vehicle fuel prices by 2020.

It is an important strength of the Norwegian decision-making process that priority is given to such in-depth analyses, and due weight ought to be given to them in the formulation of practical policy. The government is expected to present a fourth white paper to the *Storting* on climate policy in 2011; earlier climate white papers were prepared in 1998, 2001 and 2007.

Cost of climate policy to 2020

Klimakur 2020 estimates that a reduction of 12 Mt of CO_2 eq by 2020, beyond what is already included in the baseline scenario, could be achieved by implementing all the measures investigated, at a cost of up to about NOK 1 100 per tonne of CO_2 eq, and with a wide range in the estimated costs of the various measures (KLIF, 2010). According to a macro analysis undertaken as part of the report, an emission price of about EUR 200 per tonne of CO_2 eq would be required by 2020 to achieve the domestic emission ambition, if all domestic sources faced the same price. If the sectors covered by the EU ETS were to be sheltered – in part because emission reductions there would be met by increased emissions elsewhere in the trading system – the price facing the remaining sectors would have to reach about EUR 425 per tonne of CO_2 eq.

New simulations by the Ministry of Finance indicate that the costs of achieving the domestic CO_2 mitigation ambition are likely to be higher than the *Klimakur report* estimates.[26] The *Klimakur macroeconomic cost* estimates represent an average for 2008-20. They do not take into account the need to maintain the ambitious policy after 2020.[27] The reduction in the level of total public and private consumption in 2020 is therefore a better estimate of long-term cost. *Klimakur* puts that reduction at about 1% of total consumption (around NOK 20 billion). Macroeconomic analysis by the Ministry of Finance, using the same carbon prices as *Klimakur* but including adjustment costs,[28] estimates the cost in 2020 at 1.25-1.50% of total consumption. Moreover, the bottom-up analysis from *Klimakur* indicates that 12 Mt can be reduced domestically in 2020 while the bottom-up estimates from 2007, which the national mitigation ambition is based on, assumed a reduction of about 14 Mt in 2020. Thus the new cost estimates are substantially higher.

Norway faces a major challenge in meeting its domestic emission mitigation ambition within the context of an expanding EU ETS, which is likely to cover 50% of Norwegian emissions after 2012. The expected emission permit price for 2020 will not yield enough emission reductions in Norway for it to meet its domestic emission reductions target in 2020. If companies regulated under the system carried out measures costing more than the permit price, the only effect would be to move emissions elsewhere within the EU ETS, as another company would purchase the excess permits. No overall reduction in emissions would occur (Box 5.1).

Norway could choose to target its mitigation efforts outside the EU ETS, but this would greatly increase the cost of compliance. Sheltering the sectors that are covered by the EU ETS from any additional efforts to meet the domestic emission ambition would add considerably to the burden on other sectors.

Alternatively the authorities could buy and cancel a volume of permits corresponding to the emissions they wished to cut over and above those related to the EU allowance price, thus reducing the overall quantity of permits available within the EU ETS. The benefits and challenges associated with reaching a domestic emission reduction ambition, when up to half of the emissions are regulated within a transboundary economic instrument, need to be considered further.

Since the release of the *Klimakur study*, an important debate has emerged as to whether increased use of biofuel based on increased felling and replanting in Norwegian forests would be CO_2 neutral (Box 2.7). It would seem urgent to clarify this issue – not only for Norwegian policy formulation, but also for policy making in other countries considering similar measures.

4.3. *Institutional structures*

As with all policies in Norway, climate policies and measures are developed and assessed through interministerial processes before the political proposals are introduced. Two interministerial groups deal with climate change. The first, the Group on Sustainable Development and Climate, dealt exclusively with sustainable development until 2008, when it was expanded to deal with climate issues. The deputy environment minister leads the group when climate issues are being discussed. The second is an *ad hoc* group of deputy ministers established to evaluate the *Klimakur* report and review climate policy as outlined in the 2007 white paper. It will meet until the next white paper on climate policy is submitted to the *Storting*. The ministers are supported by a cross-departmental group of officials at senior adviser level.

The interparty climate agreement of 2008 stated that, to enable the climate impact of policy to be evaluated, "greenhouse gas budgets will be presented; these will evaluate the effects of climate policy on greenhouse gas emissions and present trends in emissions and progress in the implementation of climate policy". To further promote the incorporation of sustainable development and climate policy considerations in public decision making, the government appointed a committee of experts in May 2008 to give an assessment and propose modifications (Chapter 2). In its report published in 2009, the committee proposed, among other things, that the Ministry of Finance should develop a "shadow price of carbon" (linked to the EU ETS permit price) and a trajectory of future carbon prices in order to maintain consistency in future cost-benefit analyses of various policy alternatives.

5. Adaptation

The Norwegian climate is changing. Projections indicate warming in all parts of the country during all seasons, along with increased annual precipitation. Change is expected to be particularly rapid in the Arctic islands. To prepare for the expected change and its impact, in 2008 the Ministry of the Environment presented a policy framework aimed at enhancing society's resilience against climate change. The objective is to identify vulnerabilities and incorporate climate change considerations into affected policy areas.

In December 2008, the Norwegian government appointed a Commission on Vulnerability and Adaptation to Climate Change. The commission delivered its report to the MoE in November 2010. The report discusses challenges and opportunities presented by climate change and provides guidance on priorities and specific measures to reduce vulnerability.

A clearinghouse mechanism, Climate Adaptation Norway, was established in 2009 to meet information needs, in particular for regional and local planners. The clearinghouse mechanism facilitates exchange of information and experience between researchers and policy makers on planning for the impact of climate change. It is run by the national secretariat for climate adaptation[29] and can be accessed on a government website (*www.klimatilpasning.no*).

6. Norway's International Climate and Forest Initiative

The International Climate and Forest Initiative was launched during the climate change negotiations in Bali in December 2007, when Prime Minister Jens Stoltenberg announced that Norway was prepared to allocate up to NOK 3 billion a year to efforts to reduce GHG emissions from deforestation in developing countries. The initiative seeks to achieve cost-effective and verifiable reductions in GHG emissions from deforestation and forest degradation in developing countries.

The objective of the initiative is to give the greatest possible support in establishing a binding global post-2012 regime, capable of limiting warming to no more than 2°C above pre-industrial levels. Its goals are to:

- work towards the inclusion of emissions from deforestation and forest degradation in a new international climate regime;
- take early action to achieve cost-effective and verifiable reductions in GHG emissions;
- promote the conservation of natural forests to maintain their carbon storage capacity.

Promoting sustainable development and poverty reduction is an overriding objective of Norwegian development co-operation policy and thus an inherent but also overriding goal of the International Climate and Forest Initiative, in addition to the climate-related goals.

Notes

1. Refers to the portion of GDP associated with the oil and gas sector.
2. About 80% of the population is urban.
3. Emissions from gas-powered plants are included in these numbers. Emissions at the Kårstø plant increased from 2008 to 2009, according to Statistics Norway.
4. Accounts for about 3% of the land mass.
5. The permit requirement will be lower to the extent that the emission reductions observed between 2008 and 2009 persist.
6. To conform with requirements under the European Economic Area Agreement to implement EU Directive 2003/96/EC.
7. The sulphur tax was applied to coal consumption between 1999 and 2001.
8. These taxes and VAT account for 65% of the end-use price of unleaded petrol (Chapter 2).
9. 87% of their energy-related emissions and 100% of emissions related to industrial processes.
10. The CO_2 tax in the sector, however, was reduced to an extent similar to an expected allowance price of EUR 20/tonne CO_2.
11. Norway engaged in intense negotiation with the European Commission on this point.
12. Irregular operation limits the environmental benefits of a CCS facility.
13. Refers to "electrical" energy efficiency (*e.g.* energy-efficient electrical appliances), as the EU ETS covers almost all electricity generation. The reduction of CO_2 emissions from decreases in electricity generation are offset by increased CO_2 emissions in other sectors covered by the EU ETS cap.
14. Some 98% of electricity production in Norway is generated by hydro. Hydropower development has affected natural habitats, causing protests.
15. Green certificates are bought by electricity suppliers to meet renewable energy targets. Sweden has had a market for green certificates since May 2003.
16. The EU target for the average car sold in 2020 is 95 g/km.
17. While there is a subsidy of NOK 609 per gram of CO_2 for vehicles emitting less than 120 grams per km, the tax rate is NOK 1 704 per gram emitted per km over 180 grams per km and NOK 2 735 per gram per km over 250 grams per km. If a vehicle drives 200 000 km over its lifetime, a car that emits 100 grams per km will in total emit 20 tonnes of CO_2, while a car that emits 120 grams per km will emit 24 tonnes of CO_2. The subsidy in the motor vehicle purchase tax for a car emitting 100 grams per km (about EUR 1 400) is thus equal to about EUR 350 for each tonne saved, compared to what a vehicle emitting 120 grams per km would have emitted. This is very high, compared to the costs of other measures to abate CO_2 emissions.
18. NOK 36 per kg for small vehicles, NOK 181 per kg above 1 500 kg; NOK 55 per kW for small engines; NOK 2 700 per kW above 130 kW.

19. Electric vehicles reduce emissions by replacing fuel with low-carbon electricity in Norway. Because of the ETS cap, emissions cannot rise elsewhere to generate the extra electricity, so there is a net reduction in emissions from transport and no change in the ETS, meaning GHG emissions fall.
20. Process industry concerns mainly aluminium, ferroalloys and fertiliser.
21. This would be a step in the right direction, because while targets for voluntary approaches are met in most cases, they do not represent much beyond business as usual.
22. But even if not, Norway's target is –30%, which is the most ambitious of any OECD country.
23. Under the Copenhagen Accord, Japan's 25% target "is premised on the establishment of a fair and effective international framework in which all major economies such as the US and China participate and on agreement by those economies on ambitious targets".
24. What is an "ambitious goal" also has to be considered in relation to emissions under a business-as-usual scenario and the cost of meeting the goal.
25. The new target was set on 17 January 2008, when the government reached agreement with three opposition parties to bring the goal forward from 2050.
26. The *Klimakur* analysis was conducted using the general equilibrium model MSG-tech. The economic analysis by the Ministry of Finance (included in the national budget for 2011) was conducted using the medium-term macroeconomic model of the Norwegian economy (MODAG model), which takes into account rigidities in adaptation of capital equipment to new prices.
27. Moreover, the *Klimakur* estimates only include one year, 2020, with the most ambitious policy.
28. In particular, cost estimates have risen for CCS, electrification of offshore petroleum installations and the use of biofuel.
29. Under the auspices of the Directorate for Civil Protection and Emergency Planning, Ministry of Justice.

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PART II

Chapter 6

Nature and Biodiversity

Norway has set up a strong biodiversity framework. Substantial progress has been made, promoted by increased spending on biodiversity, with the new Nature Diversity Act, the Biodiversity Information Centre and the sea management plans resulting in better protection of certain land and sea habitats and threatened species. However, targets and actions should be further developed for forest protection, plus coastal and river zones which are still under threat by human activity. This chapter focuses on the priorities for Norway in ensuring sustainable management of biodiversity and nature conservation, as well as the impact of climate change on these areas.

Assessment and recommendations

Norway has developed an ambitious biodiversity policy framework and made significant progress during the review period (*i.e.* since 2000) to provide the means to achieve its goals. It has also played a strong role in international efforts to strengthen biodiversity protection. Especially in the past few years, expenditure for biodiversity in the Norwegian budget has increased markedly. The new and innovative Nature Diversity Act brings together many biodiversity-related issues, establishes new principles for sustainable management of biodiversity and requires authorities to designate threatened habitat types and priority species based on scientific evidence. The area of land under protection has increased significantly. Since the previous OECD review of Norway's environmental performance, several sectoral laws have been revised and new laws have been passed which strengthen biodiversity protection. Sea management plans have been prepared on the basis of broad co-operation among sectors and with broad political backing. They provide a common knowledge base that can support further, informed policy making. More broadly, there has been substantial investment in expanding the biodiversity knowledge base, including the establishment of the Biodiversity Information Centre.

Despite its high ambition and the actions undertaken, Norway still faces major challenges in the conservation and sustainable use of biological diversity. Protected areas do not sufficiently cover all nature types; on land, the low percentage of forests under protection merits further attention. Moreover, Norway lacks targets and objectives for forest protection. Nor is the conservation of biodiversity within protected areas sufficiently secured. Increasing aquaculture continues to pose a threat to biodiversity, especially through disease and genetic effects on wild populations. Aquaculture of cod, which is in its infancy, is of particular concern. The origins of food used in aquaculture are insufficiently traceable; possible negative effects of Norwegian aquaculture on fish stocks in other parts of the world cannot be excluded. Although Norway's four large carnivore species (brown bear, lynx, wolf, wolverine) showed a slight upward trend during the review period, all are listed as threatened on the 2010 Red List. Moreover, targets for the large carnivores are set politically and at levels too low to maintain viable populations. Spatial planning has not been effective in halting the loss of large "wilderness" areas, nor in preventing building in coastal zones and along rivers. Sea management plans do not provide opportunities for long-term protection of marine areas. Possible measures and strategies for adaptation to climate change have been identified, but so far no full analysis on their effect on nature and biodiversity has been undertaken.

Recommendations

- Focus protection efforts on *priority species and selected habitat types*, pursuant to the new Nature Diversity Act; integrate the implementation of the Nature Diversity Act into sectoral policies; establish a science-based target for protection of forests, consistent with international obligations and representative of the different forest ecosystems in Norway; build consensus on conservation measures for large carnivores, based on robust research on their population dynamics, natural habitats and impacts on local communities.
- Strengthen *management of protected areas*, including by securing necessary financing; assure long-term conservation of particularly valuable and vulnerable areas identified in the sea management plans.
- Strengthen the control of *building in coastal zones and along rivers*, pursuant to the new Planning and Building Act.
- Pursue efforts to make *aquaculture* environmentally sustainable, including pest control.
- Assess the effects on nature and biodiversity of measures for *adaptation to climate change*.

1. Setting the scene

1.1. *Objectives*

Pursuant to Article 6 of the Convention on Biological Diversity (CBD), the 2001 Norwegian Biodiversity Strategy and Action Plan (NBSAP) contains Norway's key nature and biodiversity management objectives (MoE, 2001). Additional goals and targets have since been set (MoE, 2005a, MoE, 2007) and Norway now has *three strategic objectives and eleven national targets* for biodiversity and outdoor recreation (Box 6.1). One strategic objective, as in other European countries, is to halt the loss of biodiversity by 2010 (MoE, 2007). In 2011, new objectives are to be adopted pursuant to the new Nature Diversity Act and the outcome of the tenth meeting of the Conference of the Parties to the CBD.[1]

Norway also has to fulfil its *international commitments*. These include the worldwide conventions on wetlands (Ramsar) and migratory species (Bonn), as well as regional or species-specific conventions on the Antarctic, bats, salmon, timber, whales and the protection of European wildlife and habitats (Bern) (MoF, 2009b).

Nature and biodiversity management objectives are also included in *sector strategies* – notably for agriculture, aquaculture, fisheries and forestry – as well as in land and sea management plans.

1.2. *Legislation*

A major step forward was the enactment of the *Nature Diversity Act*. With this law, for the first time, three key principles of biodiversity management are part of national legislation in Norway. The first principle is that any pressure on an ecosystem shall be assessed on the basis of present and future cumulative environmental effects on the ecosystem. The second is the user-pays principle, which says the costs associated with preventing or limiting damage to biodiversity caused by a project shall be borne by the project owner. The third is the precautionary principle.

Box 6.1. **Norway's objectives for biodiversity and outdoor recreation**

Strategic objectives

The environment will be managed in a way that *maintains the diversity of habitats and landscape types* and ensures that there are viable populations of naturally occurring species, to ensure that biological diversity can continue to evolve.

Norway aims to *halt the loss of biodiversity by 2010*.

Everyone will have the *opportunity to take part in outdoor recreation*, both near their homes and in the countryside, as a healthy and environmentally sound leisure activity that provides a sense of well-being.

National targets

Sustainable use and protection of habitats

A representative selection of Norwegian habitats will be protected for future generations.

Major disturbance such as infrastructure development will be avoided in endangered habitats, and important ecological functions will be maintained in vulnerable habitats.

The cultural landscape will be managed in such a way that biological diversity, the historical and aesthetic value of the landscape, opportunities for experiencing it and its accessibility are maintained.

The needs of future generations will be taken into account when managing soil resources that are suitable for cereal production.

Sustainable use and protection of species, populations and genetic resources

Harvesting and other use of living resources will not cause species or populations to become extinct or endangered.

Populations of endangered species and species for which Norway has a special responsibility will be maintained or restored to viable levels.

Alien species and genetically modified organisms

The spread of organisms that do not occur naturally in ecosystems as a result of human activity will not damage or limit ecosystem functions.

Outdoor recreation

The tradition of outdoor recreation based on the right of access to uncultivated land will be kept up by all sections of the population.

Children and young people will be given the opportunity to develop skills in outdoor recreation activities.

Areas of value for outdoor recreation will be safeguarded so that environmentally friendly access and passage and the harvesting of natural resources are promoted and the natural resource base is maintained.

Near housing, schools and day-care centres, there will be adequate opportunities for safe access and play and other activities in a varied and continuous green structure, along with ready access to surrounding areas of countryside.

Source: MoE, 2007.

The Act, which entered into force on 1 July 2009,[2] *goes beyond requirements of the EU Habitats and Birds Directives in many respects*.[3] In particular, it introduces two new concepts – priority species and selected habitat types – that are intended to shape the future of Norway's biodiversity policy.

Where there is scientific evidence that a species shows a state or trend that is not compatible with a viable population, the Act requires authorities to consider designating it as a *priority species*.[4] In addition to protection of the species, this may imply regulation of activities affecting critical habitat. A first list of twelve species is being considered for designation as priority species.

Similarly, if scientific evidence suggests that a *habitat type* is threatened, the Cabinet has to consider whether it is to be "selected" – that is, given priority status in management decisions. A habitat type that has been selected and mapped must be taken into account in projects involving land use change and development, not least in municipal master plans. Action plans must be drawn up for such habitat types. A first list of five habitat types is under consideration: hay meadows, wetlands used for hay making, calcareous lakes, calcareous lime tree forests and hollow oaks.

The Act *promotes both sustainable use and conservation*. For example, it provides for the establishment of functional ecological areas where sustainable use would be allowed along with protection of priority species. It also provides for grants to landowners, rights holders, organisations and municipalities that take care of priority species and selected habitat types. The aim is not to compensate for losses resulting from efforts to conserve critical habitats, but to create incentives for conservation (*e.g.* for habitat types that require active measures if they are not to be lost).

While it is *too early to assess the effects of the Act*, expectations in Norway are high, and the law has generated international interest.[5] It would be interesting to draw a comparison with Canada's experience in implementing its Species at Risk Act (2002), under which Environment Canada may issue emergency orders to protect listed species outside protected areas and may consider the impact on species' critical habitat before authorising specific activities, including sector activities.

The planning part of the *Planning and Building Act* has been revised, with the new provisions entering into force on 1 July 2009. After each election, municipal councils must now adopt a municipal planning strategy, identifying key planning tasks to be pursued in the coming term. Regional plans (county master plans), which before merely established guidelines for municipalities and private developers, can now (under the new Act) be made legally binding until they have been incorporated into municipal master plans. This means a planned building project can be stopped if it conflicts with the regional plan. Building in the shore zone must now be made an integral part of municipal plans, and the rules prohibiting building in a 100-metre belt along the shore have been tightened.

The *2001 Svalbard Environmental Protection Act* regulates almost all environmental issues in the Svalbard archipelago. Its purpose is "to preserve a virtually untouched environment in Svalbard with respect to continuous areas of wilderness, landscape elements, flora, fauna and cultural heritage".

1.3. Status and trends of nature and biodiversity

The knowledge base

Since the last OECD review of its environmental performance in 2001, Norway has made significant efforts to increase its knowledge base on biodiversity. The *Norwegian Biodiversity Information Centre* started operating in 2005 under the Ministry of Education and Research. In 2009, the Ministry of the Environment (MoE) created the Norwegian Species Project to describe poorly known species in Norway; close co-operation was established with Sweden, where a similar project was launched in 2002.

The 2006 *Red List of Threatened Species* covers mainland Norway, the exclusive economic zone, Svalbard and the fishing waters around Svalbard. The methodology of the 2006 Red List was adapted to international standards, so it cannot be directly compared with the previous Red List, from 1998. A new Red List of Threatened Species was published in November 2010.

A *Red List of Threatened Habitats*, the first of its kind in Norway, is being prepared for publication. It is to cover terrestrial, freshwater and marine habitats of mainland Norway and Svalbard (Norwegian Biodiversity Information Centre, 2010a; Framstad *et al.*, 2009). A new system for classifying the diverse Norwegian landscapes has been established (Halvorsen *et al.*, 2008).

Norway has developed a *nature index* for its terrestrial and marine ecosystems. Based on 310 indicators, the index aims at providing environmental managers and the public with an aggregate measure of biodiversity. It differs fundamentally from similar indexes, such as GLOBIO,[6] in that it is based not on pristine, undisturbed nature, but rather on ecological sustainability. For each of the 310 indicators, a reference value is calculated that would minimise the probability of extinction of the species to which the indicator is related, maximise the biodiversity of the natural habitat to which the indicator is related, or at least ensure that biodiversity is not threatened in the habitat (Certain and Skarpaas, 2010). A first version of the nature index was published in October 2010.

Little is known about *genetic diversity* despite emerging related issues (*e.g.* breeds of wild and ocean-farmed salmon) and despite Norway's potential for conserving genetic diversity in the world's food crops (Box 6.2).

Box 6.2. **Conserving genetic diversity of the world's food crops in Svalbard**

The Svalbard Global Seed Vault, opened on 26 February 2008 near Longyearbyen, offers free, safe storage for duplicate *seeds from gene banks all over the world*. There is space for 4.5 million seed samples, or 2.25 billion seeds. This is sufficient to store all varieties of seed found in the approximately 1 400 gene banks worldwide.

The vault and its operation are financed by Norway and *managed by the MAF*, but the seeds remain the property of the depositing seed banks. Priority is given to seeds of importance for sustainable agriculture and food production.

The seed vault was built underground in the permafrost on a location taking into account possible sea level rise due to climate change.

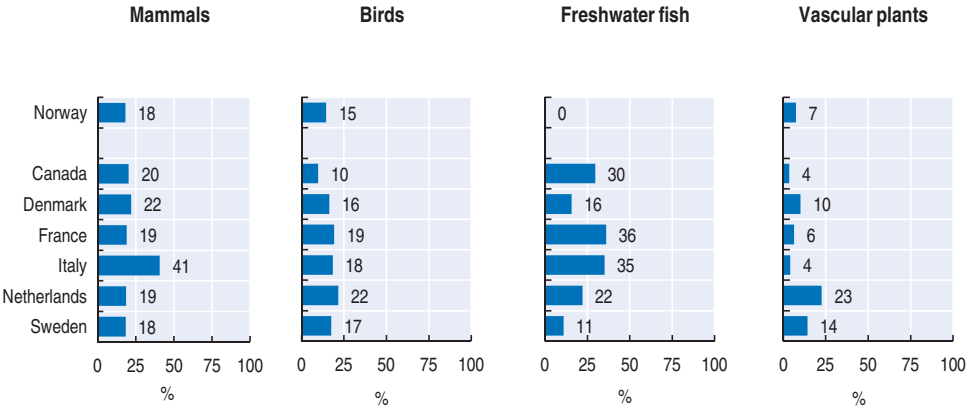
Source: MAF.

Key indicators

More than 20% of the 18 500 monitored species are considered threatened, according to the 2009 Red List. Of these, more than half (1 941 species) are considered critically endangered and 84 regionally extinct. Overall though, the share of threatened species is relatively low compared with the situation in other OECD countries (Figure 6.1).

Threatened species are found mostly in forests and, to a lesser extent, the agricultural landscape. Not surprisingly, most red-listed species (85%) are thought to be threatened by land management practices, with changing land use and infrastructure development being the main pressures. Overexploitation affects only 1% of the red-listed species, but these are

Figure 6.1. **Threatened species, 2010**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.
Source: OECD, Environment Directorate.

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often key species for the ecosystem (MoE, 2009a). Habitat fragmentation and climate change are major threat factors for wild reindeer (Box 6.3). For wild salmon, the main threats are parasites, contact with farmed salmon, acidification of lakes and rivers, and hydropower development (Box 6.4).

Box 6.3. **Main threats to Norwegian wild reindeer**

Norway is *the only country in Europe where wild tundra reindeer still occur* (except for an introduced population in Iceland). Originally found throughout Norway as a continuous population, wild reindeer now range only in the southern mountains. Outside of Norway, the same subspecies is found in northern Siberia. In Finland and Russia, forest reindeer occur, and in northern North America there are four other subspecies (usually called caribou). A further subspecies, the Svalbard reindeer, is found only on Svalbard. In addition, domesticated reindeer are found in northern Scandinavia and northern Russia. The main threats to the Norwegian wild reindeer are habitat fragmentation and climate change. Hunting is strictly regulated to conserve viable populations and avoid overgrazing.

Land use change causing *habitat fragmentation* and disturbance is still a major threat to the Norwegian wild reindeer. Habitat fragmentation has meant that the reindeer now live in relatively isolated populations. It has been difficult to deal with the fragmentation issue at local (municipality) level. The new Planning and Building Act provides for the designation of zones requiring special protection.

An emerging threat is *climate change*. It could affect reindeer habitat by enabling higher forest growth in the mountains, and could reduce food availability in winter if lichens become covered with ice rather than just snow. In summer, climate change could increase the activity of insect pests of reindeer.

Each wild reindeer population is managed separately through *co-operation between public* boards (local authorities) and landowners. Formerly there were 23 wild reindeer boards, but in 2008 they were merged into nine regional boards.

Source: MoE.

Box 6.4. **Main threats to Norwegian wild salmon**

Historically, Norway has had more salmon rivers than any other country and harboured some of the world's largest populations of wild salmon. As populations have decreased elsewhere, the importance of the Norwegian wild salmon has increased (MoE, 1999; WWF 2001). *Although the wild salmon is not red-listed in Norway, its situation is precarious*. In the 1980s and 1990s, its numbers fell by two-thirds. Populations remained stable in the 2000s, but it is estimated that 30% are under threat. The main threats are parasites, contact with farmed salmon, acidification of lakes and rivers, and hydropower development.

The parasite *Gyrodactylus salaries* was introduced in Norwegian rivers, where it now exists in different genetic and morphological forms, all but one of which are lethal to salmon. The only means thus far of combating the parasite (which lives on the skin of salmon) is chemical treatment of contaminated rivers. Of 35 watercourses treated so far, ten were later reinfested. In 2007, the National Veterinary Institute estimated that the parasite had been eradicated in 15 rivers but that its presence was suspected in 25 rivers.

Almost half a million *farmed fish escape* in Norway every year, competing with the wild species for food, spreading disease and vitiating the gene pool through interbreeding. During certain periods, the number of escapees has exceeded one million. A 2008 survey of 13 rivers revealed that 17% of the salmon found were farm escapees, on average, with the share per river ranging from zero to 56% (NINA, 2009). At sea, the shares of escaped farmed salmon found in 2007 were 34% along the outer coast and 26% in fjords; individual site shares ranged from 1% to 86% (Hansen *et al*., 2008).

Sea lice, *Lepeophtheirus salmonis,* are a problem for salmon smolts migrating to the sea. These copepods need to be better controlled in aquaculture facilities as there is a proven correlation between the number of sea lice infesting wild salmon and size of the salmon farming industry. The development of sea lice resistant to chemicals is worrying (Hansen *et al*., 2008).

Acidification of lakes and rivers has caused the extinction or reduction of several populations of salmon in southern Norway. Liming of lakes and rivers since the 1980s has improved the water quality for salmon, and several populations have increased or been re-established. Although acidification is decreasing (Chapter 3), liming of watercourses will remain necessary for many years to come (Hansen *et al*., 2008).

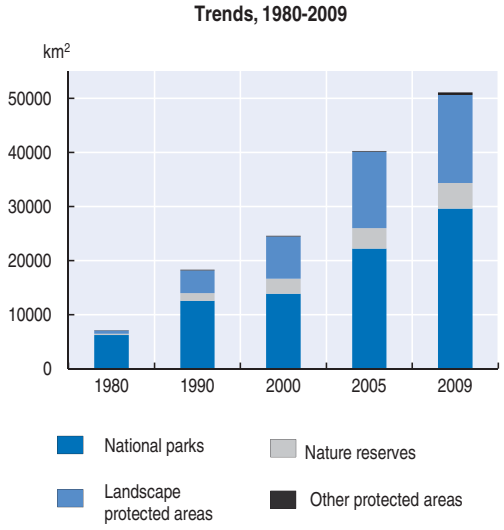
Regulation of watercourses for hydropower has been the single largest cause of extinction of salmon populations, being blamed for 19 of the 45 recorded extinctions (Hansen *et al*., 2008). One-third of the country's salmon rivers are affected. A better understanding of the adverse effects of water regulation on salmon would help reduce these effects (Hansen *et al*., 2008).

To address these threats, in 2007 the government designated 81 protected areas for wild salmon. The 52 river systems and 29 fjords designated, located around the coast, account for the most important stocks in Norway. The aim of designating *National Salmon Watercourses (NSWs) and National Salmon Fjords (NSFs)* is to protect them, especially against intervention and activity in the waterways and against aquaculture nearby. The state imposes restrictions on activities considered harmful to wild salmon stocks. Restrictions in NSWs involve, for instance, hydroelectric power plants and agriculture development that affect the waterways. Aquaculture is prohibited if there is a risk of cultivated fish spreading disease or escaping. In NSFs the restrictions are mainly focused on aquaculture and depend on the type of installation and where it is located. As a consequence of the restrictions, some aquaculture installations have to introduce additional protective measures, and others have to relocate outside the protected areas.

Source: KLIF, 2010.

Protected areas cover 15.7% of mainland Norway, or 50 861 km^2, almost twice the area than in 2000 (Figure 6.2). More than two-thirds of these, totalling 34 850 km^2, are strictly protected (IUCN categories I and II), while a quarter (12 680 km^2) are in IUCN categories III-V (Figure 6.2). Approximately 14.3% of mainland Norway's freshwater is protected.[7]

Figure 6.2. **Protected areas**



Source: KLIF (2010).

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Only 3.2% of Norway's territorial waters[8] *are protected* (2 900 km^2) under the Nature Diversity Act or its predecessor, the Nature Conservation Act (1970, amended 1995).[9] Norway has no "marine protected areas" as such – that is, areas subject to marine protection plans. A total of 36 such areas have been proposed, however, 17 of which are to undergo public hearings in 2010. With some significant exceptions, the nature legislation applies to the exclusive economic zone beyond territorial waters.[10]

Protected areas cover two-thirds of Svalbard's land area and 86.5% of its territorial waters (39 800 km^2 and about 78 000 km^2, respectively). All but 16 km^2 are strictly protected (IUCN categories I and II).[11] The 2001 Svalbard Environmental Protection Act applies to both the land area and the territorial waters.

1.4. *Economic benefits provided by biodiversity and ecosystem services*

In 2002, as part of the UN Millennium Ecosystem Assessment, the Ministry of the Environment's Directorate for Nature Management (DfN) and the Norwegian Institute for Nature Research (NINA) undertook a pilot study of the economic benefits provided by biodiversity and ecosystem services in the *basin of the Glomma River*, Norway's largest, located in the south-east. The *Glomma study* provides examples, but is not a comprehensive assessment.[12] Moreover, many of the services identified have not been valued in monetary terms. Norway might benefit from a national ecosystem assessment, such as the one currently being prepared in the United Kingdom. This could help inform Norwegian biodiversity policy regarding costs and benefits.

An expert committee established by the Norwegian government recommended the elaboration of comprehensive plans to manage the most important categories of ecosystems, in line with what is under way for Norwegian ocean areas and river basins (MoF, 2009b). It also recommended that all *support mechanisms that can have a negative impact on biodiversity* or other environmental "goods" be dismantled or modified. The committee found that it could be difficult to quantify and monetise all relevant benefits in cost-benefit analyses relating to biodiversity and the spread of environmental toxins. It emphasised the need to take into account increases over time in the value of environmental "goods". For toxins that are to be phased out over a certain period and those that do not require a complete phase-out, the use of environmental taxes, rather than legal and administrative ("command and control") instruments, was recommended.

1.5. *Impacts of climate change on nature and biodiversity*

Climate change is expected to have *negative impacts on Norway's biodiversity* (MoE, 2005a; Framstad *et al.*, 2006). Norway's geography (at the northern edge of a continent) and topography (two-thirds of the country is mountainous) mean that many terrestrial species will have no higher latitude or altitude to go to if the climate warms. Many other terrestrial species will have to rely on biodiversity corridors to move to suitable habitats, which makes land use planning a key issue in biodiversity management (DfN, 2007c). In northern Norway, higher precipitation resulting in more ice cover will negatively affect reindeer and other grazing animals. New alien species will compete with indigenous ones.

Climate change is expected to affect all habitats and regions, but the largest changes and thus *the largest effects are expected in the Arctic*. In particular, reduced sea ice will dramatically decrease the marine habitat for polar bears and ice-dependent seals, as well as for several seabirds.

Climate change is likely to have *mostly positive impacts on primary sectors – fisheries, agriculture and forestry* – through increased growth rates and productivity (Schjolden, 2004). For example, stronger year classes of fish and more rapid growth of fish in aquaculture, about 10% per degree Celsius, are expected. An increase in agricultural yield of between 15% and 30% is expected, depending on species and place. For forestry, the expectation is a productivity increase of 20-40%. Another positive feature is the increased potential for exploiting new species as well as the geographic expansion of areas suitable for fishing, agriculture or forestry. In fisheries, herring might become a more valuable resource further north in Norway, and it might be possible to get larger catches of anchovy and begin fish farming of turbot. In agriculture, conditions would improve for most species that are grown today and there would be potential for introducing southern species such as maize. For forestry, the expectations are of more hardwood trees and an expansion of the forested area by nearly half (55 000 km^2) with a 1°C increase.

It is likely, however, that the positive impacts *would be at least partly cancelled by negative effects* (Schjolden, 2004). The expansion of forests northwards and higher in the mountains, and the spread of agriculture with cultivated areas moving up one or two climate zones, will threaten other species' habitats. Migration of fish species as water temperatures change, might lead to a reduction in income from cod fishing for Norway, as this species could move farther east into the Russian part of the Barents Sea. Another negative feature is the expected increase of damage or loss from severe weather, such as storms and frost,

and from increased occurrence of pests and disease. For fisheries, severe weather might cause more damage to the fishing fleet, more days when the weather makes fishing impossible and increased damage to aquaculture equipment. Even today, most escapes from farming nets are caused by extreme weather. In salmon farming, which makes up nearly 90% of total aquaculture in Norway, losses amounted to about 6% of total stocks in 2000, with pests and disease accounting for 41%. In agriculture, it is estimated that spraying needs could rise by 50-100% for herbicides and 100% for pesticides, and that the need to spray against fungi could increase by 100-200% for grains, 100% for vegetables and for tubers like potatoes, and 100-200% for fruit and berries. In forestry, the main concerns are increased risk of frost and wind damage and of more problems with bark beetles and other pests.

Compared with the direct effects of climate change, the *possible impacts of climate change mitigation on biodiversity have received less attention* in Norway, despite the government policy to increase energy supply from renewables such as wind power, small-scale hydropower, and biofuel and biomass. The government is nevertheless committed to develop renewable energy sustainably while also taking into account other environmental objectives (MoE, 2007). For example, the Directorate for Nature Management (DfN) monitors developments and plans in the wind-energy sector and identifies possible problematic locations. Guidelines have been issued to facilitate decisions on location and design of wind energy parks (MoE and MPE, 2007). The impact on biodiversity of climate change mitigation in agriculture and forestry must also be assessed (MoE, 2009b).

Possible *measures and strategies for adaptation to climate change* have been identified, but so far no full analysis of their effect on nature and biodiversity has been undertaken (Aaheim *et al.*, 2009).

2. Key issues in nature and biodiversity policy

2.1. Representativeness of protected areas, especially forests

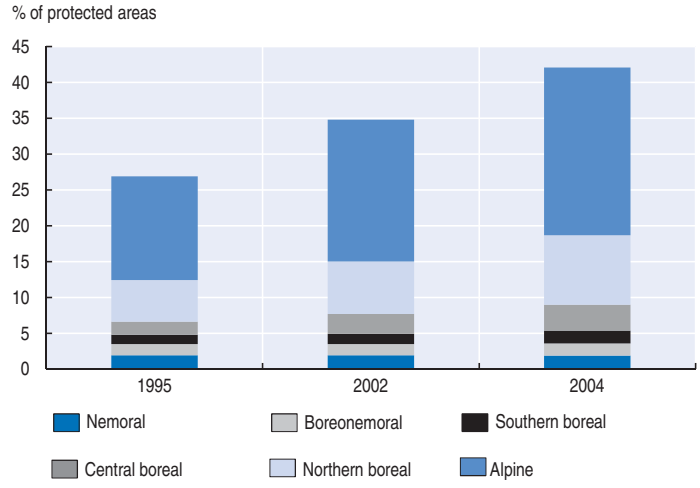
Most Norwegian ecosystem is protected to some extent (Framstad *et al.*, 2010).[13] *Several main nature types show good protection percentages*, above the 10% global target of the Convention on Biodiversity (CBD).[14] They include glaciers/snow (72%), open land/mountains (27%), wetlands (19%) and freshwater (15%).

However, although the area under protection has increased considerably since the 2001 OECD environmental performance review of Norway, most of the increase took place in the alpine zone, which already had the highest percentage of protected land.[15] By the end of 2004, the government had concluded that *the goal of protecting a representative selection of Norwegian habitats had not yet been reached* (MoE, 2005a).

In particular, the forest is insufficiently protected (7%), particularly when it comes to productive forest (1.8%).[16] The need for forest protection has been brought up several times to the *Storting*, Norway's Parliament (MoE, 2001; MoE, 2003a; Storting, 2003). An evaluation of Norwegian forest protection (Framstad *et al.*, 2002) indicated that *at least 4.5% of the country's forests should be protected* to conserve forest-dependent biodiversity, but no official target has been set. At the end of 2008, about 1.7% of Norway's forests were protected (KLIF, 2010). This compares unfavourably with neighbouring Sweden and Finland. Also, the lack of large protected areas applies particularly to forests, and forest protected areas show weak functionality as ecological networks (Framstad *et al.*, 2010).

Southern Norway and lowlands are also under-represented among protected areas. Less than 6% of the vegetation zones from nemoral to central boreal are protected (Figure 6.3).[17] For areas below 600 metres above sea level, the share is between 5% and 10%; it is less than 10% under 300 metres above sea level. Only 8% of the "very oceanic" vegetation sections is protected.[18]

Figure 6.3. **Protected areas per vegetation zone, 1995-2004**



Source: KLIF (2010).

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2.2. *Management of protected areas*

Protection of an area does not automatically result in conservation of its natural values. Lack of management posed a threat to 18% of Norway's protected areas in 1995; by 2004, the percentage had risen to about 30% (DfN, 2007a and 2007b). In 2008, the MoE estimated that *38% of protected areas were threatened*, though the increase was mainly due to better information and data availability (OAG, 2009).[19] All habitat types are affected: coastal areas, agricultural landscape, freshwater and wetlands, and forests.

Until recently, few measures had been taken to address the lack of effective management plans (OAG, 2006). Since 2008, however, *the budget for management of protected areas has increased significantly*, as has the number of management plans (OAG, 2009). Efforts should be made to complete management plans for all protected areas, whose number has risen significantly in recent years. The Nature Diversity Act requires strategic management plans to be prepared for large protected areas (*e.g.* national parks, protected landscapes) and operational management plans where sustainable use is essential to achieving the purpose of protection.

2.3. *Large carnivores*

For the country's four large carnivores (brown bear, lynx, wolf and wolverine), *protection targets are based on political decisions* (MoE, 2003b). In 2004, the *Storting* decided on the following targets (Storting, 2004):

- brown bear: 15 litters (20; 3-6)[20];

- lynx: 65 litters, of which 4 in Finnmark (65; 45);
- wolf: 3 litters, all within the new wolf zone in the south-east ("a few"; 2-3 or 5-6 including border populations);
- wolverine: 39 litters, of which 3 in Finnmark (42; 47).

Progress towards meeting the targets has been mixed. The targets for lynx and wolverine have been met and exceeded in the past few years. The target for wolf was met in 2008 but not in 2007 (when there were no litters) or 2009 (two litters). The Norwegian brown bear population has produced three to six litters yearly, far from the target.

All four large carnivores are listed as threatened in the 2010 Red List. The wolf is critically endangered, the brown bear and wolverine endangered and the lynx vulnerable. None of the species has a population large enough to be viable. The brown bear would be critically endangered and the lynx endangered if not for contact with larger populations in neighbouring Sweden and Finland (Norwegian Biodiversity Information Centre, 2010b;).

Despite the fact that these species appear in Norway's Red List, *the government decided to increase hunting quotas for 2010* (DfN, 2010). Norway is thought to be home to some 360 wolverines, 28% of which could lose their lives under the new quota system, along with 24% of the 440-470 lynxes. In addition, it is estimated that 18 brown bears could be shot, far more than can be replaced with only three to six litters produced each year. The quotas, however, are often far from filled, particularly for wolverine and brown bear. For instance, in 2010 only 3 brown bears were shot out of the quota of 18. Arguably the biggest loser could be the grey wolf, the Norwegian population of which numbers around 33 to 39 (not counting individuals living on the border with Sweden). The killing of just a few would not only represent a great loss in itself, but could upset the chances of survival of whole packs, such is the dependence of wolves on the stability of their social structure.

Not only are the protection targets not being met, but the *geographic management of the lynx, wolverine and wolf populations is also problematic*. For all four large carnivores, areas have been designated where the species are allowed to reproduce.[21] In other parts of the species' range, no reproduction is allowed.

Conflicts between animal husbandry[22] *and protection of the large carnivores* remain politically sensitive issues. Since 1994, livestock holders have been compensated for losses of livestock to predators. The central budget allocation for this increased to NOK 116 million in 2009[23] and NOK 117 million in 2010, but conflicts persist.[24]

There is an *urgent need to find ways to increase public acceptance* of large carnivores.

3. Nature and biodiversity in sectoral policies

3.1. Aquaculture

Aquaculture *has grown rapidly in importance* in Norway. It now contributes more to GDP (0.6%) than traditional capture fishing (0.5%). It is a profitable industry that pays for its own monitoring. Total aquaculture production increased from about 200 000 tonnes in 1994 to almost 950 000 tonnes in 2009. Salmon accounts for by far the majority at 90% of the total production, followed by rainbow trout (8%) and cod (2%). The 2006 Aquaculture Act regulates salmon and trout farming through licensing, including the location and maximum output.[25] Cod farming is still in its infancy and yet not subject to a licence fee.

Aquaculture can influence biodiversity in a number of ways. Fish can escape, causing competition or interbreeding with the local populations. Antibiotics used to control disease and parasites impair water quality and thus affect the aquatic wildlife. Aquaculture can cause local eutrophication of rivers, fjords or coastal waters. The Ministry of Fisheries and Coastal Affairs (MOFI) has developed a strategy to address these issues (MOFI, 2009a).

The Directorate of Fisheries monitors the number of escapes and publishes related statistics. Compared to the total number of fish farmed, *the number of escapes is particularly high for cod* and, to a lesser extent, for trout. The number of escaped salmon more than tripled between 2001 and 2006 to 921 000, but then decreased sharply to an annual average of 200 000 in 2007-09. No trend can be discerned for rainbow trout and cod, for which numbers of escapes have varied widely in recent years.[26]

The amount of antibiotics applied in fish farming has decreased dramatically since the 1980s. In 2008, 905 kg was used, compared with more than 50 tonnes in 1987. *More than 60% of these antibiotics are used in cod production*, which accounts for less than 2% of the total aquaculture production (MOFI, 2009b). Controlling the development of parasites resistant to chemicals (*e.g.* sea lice) is an issue in salmon farming (Box 6.4). From 2011, bath treatment against sea lice using chemicals will be authorised only within completely closed-off farms.

Cases of local eutrophication have been described, for instance in the Hardanger fjord. To prevent eutrophication, new fish farms are located in waters with greater dilution capacity. Regulations from 2005 *setting maximum allowable biomass have been effective in addressing eutrophication* for older fish farms in several fjords. Forthcoming new regulations will increase the monitoring obligations (MOFI, 2009a).

Cod farming could replace some cod fishing, which is potentially facing a trend of cod stocks moving outside of Norwegian waters as a result of climate change. Meanwhile, *further efforts are needed to regulate cod farming*, given the magnitude of its environmental impact relative to the current size of the business.

A further concern about fish farming regards the feed being used. To minimise the chances of the feed coming from illegal, unregulated and unreported (IUU) fishing, its *origins should be certified* and traceability required.

3.2. Fisheries

Owing to its long coastline and climatic factors, Norway has for centuries been a major fishing nation. After China, it is the world's largest exporter of seafood (MOFI, 2009a). *Apart from North Sea stocks,*[27] *the resource situation of cod and herring in Norway's exclusive economic zone is considered good*. These two key species are in better shape than they have been for a long time (OECD, 2010a).[28] The principle of sustainability is a pillar of the new Marine Resources Act, which entered into force on 1 January 2009. The Act aims to ensure that Norway's living marine resources are managed for the benefit of both present and future generations.

A success story in the 2000s was *recovery of the North Arctic cod* to above safe biological limits. The species had been under particular pressure from illegal, unreported and unregulated (IUU) fishing in the Barents Sea, but such fishing has been reduced significantly for cod and haddock in the Barents since 2005. The reduction is largely due to measures to combat IUU fishing, including a new port state control regime within the North East Atlantic Fisheries Commission area (Chapter 4). *Whaling and sealing*, though internationally controversial, form a small part of Norwegian fisheries (Box 6.5).

Box 6.5. **Whaling and sealing**

Whaling

Norway sees whaling as a traditional and sustainable means of managing marine resources. For this reason, it *resumed whaling in 1993* after a five-year break following the moratorium set by the International Whaling Commission (IWC). That year Norway became the only state in the world to resume commercial whaling; it had objected to, and thus opted out of, the moratorium.

Norway limits *commercial whaling to minke whale, a species that is not considered threatened*. The IUCN Red List categorises the northern minke whale (the subspecies found in Norway) as of "least concern", though it is listed in CITES Appendix I (threatened). No commercial or scientific whaling of other species takes place, and the whaling industry does not receive direct subsidies.

The yearly quota is around 1 000 minke whales out of an estimated population of 103 000 in Norwegian waters. This whaling quota is within a range that researchers believe provides adequate security with regard to protecting the whale stocks. Moreover, the quota is based on scientific evidence from the IWC scientific committee. The quota for 2010 was composed of a basic annual quota of 885 and the addition of unused quota from 2009. In 2010, Norwegian whalers were permitted to catch up to 1 016 animals in coastal areas: the North Sea, along the coast from Stad to Finnmark, in the Barents Sea and around Svalbard. The rest of the quota could be caught in the zone surrounding Jan Mayen island.

In a bid to further restrict members' whaling and reduce the number of whales killed, *the IWC recently proposed that Japan, Norway and Iceland be allowed to hunt whales commercially for 10 years*, in exchange for temporarily narrowing loopholes such as hunting "by objection". Conservationists feared that legalising any form of commercial whaling would open the door to other nations and ultimately lead to more, not fewer, whale deaths (Morell, 2010). In the event, talks over the proposal broke down in June 2010.

Sealing

Like whaling, sealing is seen as a traditional way of life for the coastal population. Unlike whaling, *sealing is heavily subsidised*, with direct payments making up between 70% and 80% of hunters' income over the past ten years because of decreased demand for seal products, particularly fur. Norway believes the EU ban on imported seal fur breaks international trade rules and, with Canada, has lodged a complaint with the World Trade Organization (WTO). In July 2009 the European Parliament voted to ban the importation of seal products, reckoning that the hunt was cruel.

Norway's *commercial sealing is restricted to harp seal and hooded seal*. The International Union for Conservation of Nature (IUCN) Red List labels the harp seal as of "least concern" but cautions that the species is threatened by climate change due to its dependence on pack ice. The hooded seal is classified as vulnerable on the Norwegian 2006 Red List. Quotas are based on advice from the International Council for the Exploration of the Sea (ICES). In recent years, no quotas have been set for the hooded seal and the quotas for the harp seal have not been reached. Sealing takes place on the drift ice near Jan Mayen (Western Ice) and in the Russian exclusive economic zone (Eastern Ice).

Coastal grey seal and common seal are hunted for management purposes. The IUCN Red List labels the grey seal as being of "least concern" but the common seal is classified as vulnerable on the Norwegian 2006 Red List. Since 2003, bounty hunters have been killing coastal seals for bounty payments. The quotas are higher than scientists had recommended (MoE, 2009a) to reduce seal predation on fish stocks. Fishing interests claim that reducing the number of coastal seals would result in an increase in the amount of commercially landed fish. There is, however, no scientific evidence to support this argument. Furthermore, coastal seals are the final host of codworm, a parasitic nematode that infects coastal cod and other demersal fish. The quotas used to be set by the Directorate of Fisheries, but in 2010 this responsibility was transferred to local authorities.

Source: MOFI, 2009c.

An important tool to restore fish populations in Norwegian waters is output regulation, in particular total allowable catches (TACs).[29] Since most stocks in Norwegian waters are shared with other countries, TAC setting is based on international co-operation. *Total quotas are based on recommendations by the International Council for the Exploration of the Sea* (ICES). Member country researchers, such as Norway's Institute of Marine Research, give scientific input. National quotas are negotiated between the main partners – Norway, Russia and the European Union.[30]

The Norwegian part of the TAC is divided into quotas for each vessel group. Each group quota is shared between vessels within the group. Thus, the quota system is based on a three-stage process: the negotiated national quota, then the group quotas, and finally the *individual vessel quotas* (IVQs).[31] The IVQ regime differs from ordinary individual transferable quota (ITQ) systems: it is a bundled system in which quotas and vessels are integrated. Its aims are to reduce overcapacity; maintain a stable, diversified fleet structure; and decentralise ownership, avoiding a concentration of quotas to a "privileged few". Trading of IVQs is conditional on vessel scrapping so as to improve vessel profitability by reducing the number of vessels, and in the long run, enhance incentives to reduce fleet capacity. There are two trading systems: the structural quota system[32] allows the owner of two vessels to fish both quotas from one vessel if the other vessel is withdrawn from fishing. The quota exchange system[33] allows two vessel owners to team up, fishing both quotas on one vessel for three out of five years.

The individual vessel quota (IVQ) has led to a huge concentration of quota ownership and severe changes in fleet structure. This is *the same result as an ITQ model but with higher transaction costs* (Box 6.6). The OECD has recommended progressively allowing transfers of IVQs between vessels without conditions regarding change in ownership or vessel scrapping (OECD, 2010b).

Fishery subsidies have been substantially decreased since 1990, and most support is now in the form of general services that do not provide direct incentives to (over)fish (Chapter 2).

Box 6.6. **Individual vessel quotas and individual transferable quotas**

Since the introduction of quotas and licences as important fishery management tools, Norway has insisted on a regime of individual vessel quotas. Its main argument has been that *IVQs secure stability in regard to fleet structure diversity and decentralised ownership of scarce cod resources*. During the severe cod crisis in the early 1990s in Norway, fishery ministers proposed an individual transferable quota regime to solve the problems related to unprofitable overcapacity. That was strongly opposed by the fishery sector. The main argument was that an ITQ regime would concentrate the cod quotas on a "privileged few".

What the critics of an ITQ regime did not realise was that the *country's cod trawlers had been in a poor situation for too long*. The critics aimed to maintain the existing fleet structure but did not take into account the vessels' poor economy and the potential for changes in ownership – a situation that amounted to an invitation to big institutional investors to take over most of the trawler fleet in northern Norway.

Norway's experience shows, in fact, that *the final result of an IVQ system unavoidably ends up with the same concentration of quotas and fleet structure as is observed in ITQ regimes* like those of New Zealand and Iceland. The Norwegian management regime appears to be best suited for the strongest actors rather than small companies in rural fishing-dependent areas. Paradoxically, this is the opposite of what the egalitarian Norwegian IVQ model was originally intended to accomplish.

Source: Standal and Aarset, 2008.

3.3. Agriculture

Farmland covers just over 3% of Norway. Nevertheless, the farming landscape is home to many threatened species. Road construction, urban sprawl and other activities have led to fragmentation and other negative effects on farming landscapes in many areas. Some landscapes, such as mountain hayfields, pollard meadows and coastal heaths, are legacies of traditional farming systems. The *MAF Environmental Strategy 2008-15*, released in 2008, has as a goal to maintain landscape throughout the country by sustaining active agriculture. A complementary goal is to protect farmland (*e.g.* as part of municipal land use planning).

Steps taken to enhance protection of farming landscapes and biodiversity include payments to farmers to help them maintain grazing-dependant habitats and respond to counties' biodiversity objectives under the 2004 National Environment Programme (Chapter 2). Another is Norway's tax on pesticides, one of a very few taxes on agricultural pollution that are at least partly differentiated by toxicity (Söderholm, 2009).[34] Pesticide use has been subject to a tax since 1988. Initially designed as a value-added tax levied on wholesalers of pesticides, it amounted to 15.5% of the wholesale price in 1998. In 1999, the tax basis was amended to reflect the health and environmental impacts of pesticides and was changed from an *ad valorem* tax to a tax per normal dose. In 2003, evaluation of the 1998-2002 Action Plan for Reducing Risks Associated with Pesticide Use indicated that health and environmental risks both fell by at least 25% over the plan period. The plan's overall objective was thus achieved. An extended action plan for 2004-08 was drawn up to reduce the risks further.[35]

Organic farming is expanding in Norway. In 2008, total organic area (fully converted and under conversion) was 52 000 hectares or 4.2% of total farmland, close to the EU27 average (Rohner-Thielen, 2010). One goal in the MAF Environmental Strategy is that, by 2020, 15% of Norway's total agricultural area shall have been converted to organic farming methods,[36] and 15% of the country's food consumption, measured as market value in NOK, shall be based on organic products.[37] To this end, direct payments to organic producers have been increased. Organic dairy farmers are allocated additional milk quotas. A programme for organic sheep farming has also been established. Consumption of organic food is part of the government public procurement policy. The MoE, MAF and Ministry of Children and Equality support joint marketing and consumer information on Nordic ecolabelling (Swan label/EU flower logo), Max Havelaar (Fairtrade label) and Debio (Ø label, certifying organic production in Norway).

However, the *high level of support to the agricultural sector* (62% of gross farm receipts in 2008, the highest among OECD countries) counteracts the incentives provided by direct payments, pesticide regulations and taxes. In particular, there are still many policy incentives that make farmers more likely to take decisions based on production rather than environmental criteria (Chapter 2).

3.4. Forestry

Forests cover 32% of Norway and provide habitats for numerous species, including threatened species. The *2006 regulation on sustainable forestry*,[38] under the 2005 Forestry Act, contains provisions for ecological sustainability and clarifies forest owners' responsibilities, for instance by requiring environmental inventories before cutting can be allowed. One goal of the MAF Environmental Strategy is to "sustainably manage Norway's forest resources to enable the preservation of important environmental assets, while at the same time utilising forest resources for increased activity and value creation for the benefit of both local communities and the country as a whole".

In recent years, there has been a shift towards *voluntary forest protection*. This means that forest owners, through landowner organisations, can suggest which forests should be protected by law. The DfN evaluates these suggestions as a basis for recommendation to the MoE. This approach, however, does not require protection of the forests deemed most valuable from an environmental point of view. An evaluation of voluntary protection in 2010 concluded that this approach had created an efficient and informative forest protection process and dampened the level of conflict between forest owners and authorities. Voluntary protection is increasing the share of large protected forest sites, and it covers important nature types and habitats for red-listed species. Nevertheless, there are still gaps in forest protection, especially a lack of coverage of lowland forests and forest biodiversity in warm vegetation zones.

Increasingly, *forest policy in Norway has a climate focus* (MoE, 2009b). Sometimes this can interfere with biodiversity protection, as demand for renewable wood energy and carbon sequestration can lead to intensification of forestry practices.

Forest owners are required by law to allocate a portion of their forest income to a *forest fund* meant to support long-term investment in the sector through preferential loans. Since 2007, however, the fund has also been used to build or maintain forest roads (MAF, 2007), which can post a risk of further reduction in the extent of wilderness-like areas (MoE, 2005b).[39] While this risk is acknowledged, no provision has yet been made towards addressing it (MoE, 2007).

Most of Norway's forest is *certified* under the Programme for the Endorsement of Forest Certification Standard, which is also required for public procurement. Since 1998, Norwegian forestry has been conducted in accordance with the Living Forests standard for sustainable forestry, which was created by forest owners, industry, environmental organisations, trade unions and consumer interest groups. The Living Forests Standard was temporarily suspended in 2010 due to lack of agreement on revision of the standard.

3.5. *Land management and physical planning*

The Office of the Auditor General has found that *land use planning is not meeting the Storting's sustainability objectives* in many areas (OAG, 2007). There is no sign that building in coastal zones and along rivers is decreasing. More buildings are being constructed above the tree line, a particularly vulnerable zone. Large continuous natural areas are still being fragmented by new roads, other infrastructure and holiday homes. Municipal master plans are not produced in all municipalities, and where they exist, enforcement is lax. The Office of the Auditor General recommended that the MoE should be more proactive in supervising land use planning and infrastructure development.

Since that assessment was published, a *new Planning and Building Act* has come into force.[40] Its implementation will depend on sufficient funding, in particular to produce high-quality, consistent mapping of nature types (OAG, 2006) and to build regional and local capacity in environmental management.

3.6. *Integrated management plans for Norwegian sea areas*

Norway is developing strategies called sea management plans for all seas around the country.[41] The first, for the Norwegian part of the Barents Sea, was ready in 2006 and the second, for the Norwegian Sea, in 2009. Work on a management plan for the Norwegian

part of the North Sea is under way and the plan should be released by 2013. The plan for the Barents Sea also covers areas off the Lofoten Islands (MoE, 2006). It will be updated at regular intervals, the first time in 2011, with a view to an overall revision in 2020. The Norwegian Sea plan is to be updated in 2014 and given an overall revision by 2025 for the period until 2040 (MoE, 2009c).

This integrated management planning was initiated in 2002 to *reconcile sometimes conflicting objectives* between biodiversity protection and the interests of sectors such as maritime transport, aquaculture, fisheries, and oil and gas extraction (MoE, 2002). In the preparatory work executed by directorates and research institutes, environmentally important areas are being identified and delineated, as are important areas for commercial activities.

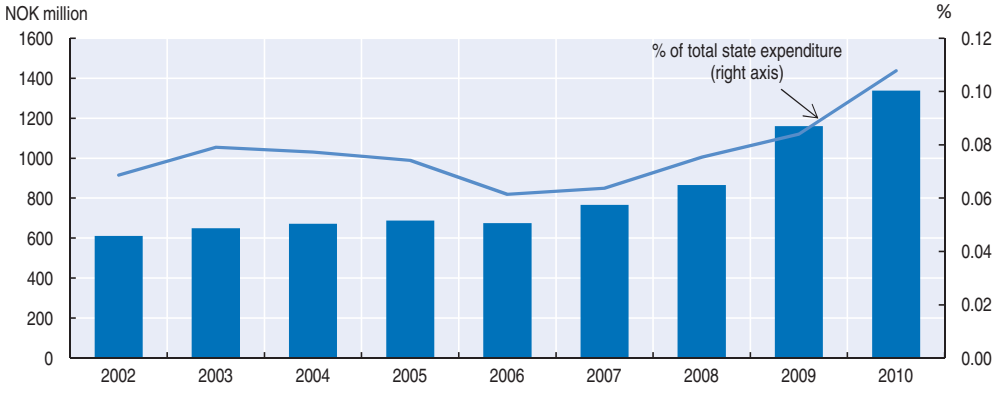
While integrated management plans are useful in providing a broad common understanding of the issues at stake, they have been criticised for not resulting in long-term protection of the most biologically valuable areas. There is *no legal instrument offering long-term protection* of areas in much of the Norwegian exclusive economic zone.[42] Site protection there can be achieved only through legislation regulating the activities of a given sector, such as fisheries, or oil and gas. Several NGOs fear that the update of the Barents Sea plan will lead to decreased protection of areas off the Lofoten Islands. Yet the scientific reports that would support the update do not seem to lead in this direction; rather, they reinforce findings of the original plan in pointing out threats to the most environmentally valuable areas (Institute of Marine Research, 2010).

4. Financing nature and biodiversity management

4.1. *Expenditure*

Since 2002, expenditure on biodiversity and outdoor recreation has been doubled, in nominal terms, to reach *NOK 1.3 billion in 2010* (Figure 6.4). It now accounts for about 0.1% of total state expenditure. By comparison, direct payments to farmers under the National Environmental Programme amounted to NOK 2.5 billion in 2008, though this included much more than biodiversity protection (Chapter 2).

Figure 6.4. **Total state expenditure on nature/biodiversity and outdoor recreation, 2002-10**

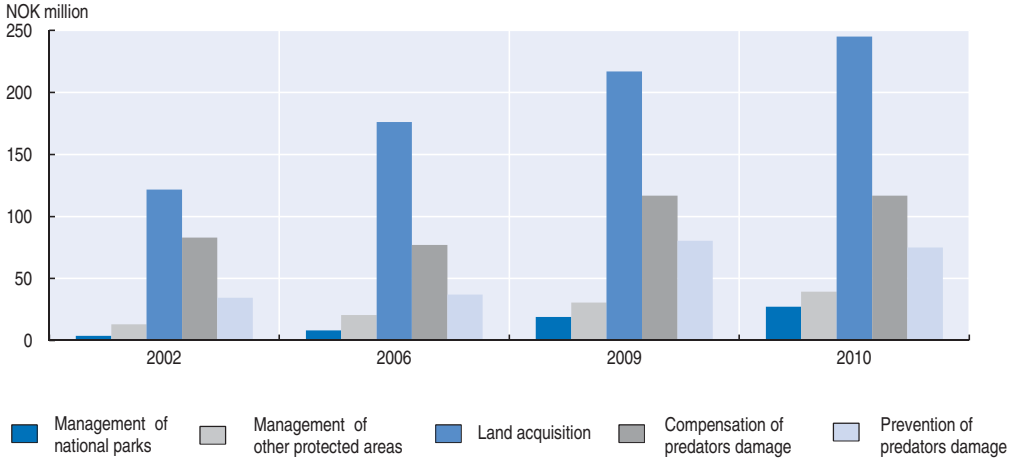


Source: MoF (2009), *The National Budget 2010.*

StatLink http://dx.doi.org/10.1787/888932374863

In 2009 and 2010 there was a *marked increase in expenditure for land acquisition of protected areas* (Figure 6.5). The increase reflected new measures for forest protection (which accounted for more than half the budget for land acquisition) and a rise in acquisition for national parks.[43] The budget for management of protected areas has also been increased since 2002, particularly for national parks, though protected area management is still the poor relative of expenditure on nature and biodiversity. Preventive measures to avoid damage caused by large carnivores continue to receive less funding than compensation measures, though the gap is shrinking.

Figure 6.5. **State expenditure on selected nature/biodiversity and outdoor recreation measures, 2002-10**



Source: MoF (2009), *The National Budget 2010.*

StatLink http://dx.doi.org/10.1787/888932374882

4.2. *Financing*

By and large, Norwegian nature conservation is financed by the *central budget*.

Everyone in Norway has a right of access to and passage through uncultivated land in the countryside, regardless of who owns it. *Access to national parks and nature reserves is free*. Access fees to natural areas can be charged only if there is tourist infrastructure, such as a campground or a beach equipped with sun beds, umbrellas, etc.

Svalbard has its own environmental protection fund that is primarily financed by donations and by fees for hunting and fishing licences. Since 2007, visitors to Svalbard have had to pay a fee of NOK 150 each to the fund, included in air and cruise fares.[44] The fund's aim is to protect Svalbard's environment by supporting various projects, many of which have a biodiversity focus. In 2010, the fund will have allocated some NOK 10 million to such projects.

Notes

1. COP 10 to the CBD was held in Nagoya, Japan, 18-20 October 2010.
2. Except the chapter on alien species, for which provisions have to be further developed.
3. Norway is not bound by the terms of these directives under the European Economic Area (EEA) Agreement.
4. In cases where Norway has a special international responsibility for the survival of a species, that species can also be so designated.

5. The World Future Council, an NGO, shortlisted the Act for its Future Policy Award 2010.
6. Established in 2002 by a United Nations and Dutch consortium, GLOBIO is a tool to assess past, present and future impacts of human activities on biodiversity. See *www.globio.info/*.
7. This is according to unpublished data from the MoE received in April 2010.
8. The territorial waters extend 12 nautical miles.
9. Based on unpublished MoE data from April 2010.
10. The first draft the Act applied to the whole exclusive economic zone, but the Parliament decided to limit the scope.
11. Based on unpublished MoE data from April 2010.
12. Funding for a full-scale study of Norway was never secured.
13. An extensive recent assessment of Norway's protected area system includes areas for which protected status is planned and those that will probably be protected in the near future. By these criteria, 17.7% of the land is considered protected.
14. In 2004, at the seventh Conference of the Parties to the CBD, it was decided that at least 10% of each of the world's ecological regions should be effectively conserved by 2010.
15. Some 23% of the alpine zone is now under protection.
16. On maps for the Intergovernmental Panel on Climate Change fifth assessment report, which can be said to represent productive land below the tree line, the forest types and productivity classes deemed insufficiently protected are coniferous forest (protection level 3.4%), wetland forest (4.9%) and very productive to intermediately productive land (1.3-2.2%).
17. Norway's six vegetation zones broadly represent latitude and altitude: nemoral, boreonemoral, southern boreal, central boreal, northern boreal, alpine.
18. Norway is also divided into six vegetation sections representing the transition from very oceanic to more continental.
19. The management status of about 7% of Norway's protected areas had been unknown.
20. In brackets are, first, the proposal from the government; and, second, the number of litters in 2003.
21. For lynx, reproduction is "tolerated" in an additional area.
22. Especially sheep and domesticated reindeer.
23. An additional NOK 19 million was paid in 2009 for losses of domesticated reindeer.
24. For example, the Storting has recommended decreasing the number of carnivores in areas where livestock losses are already high (Storting, 2004).
25. The licence fee is reduced in Finnmark.
26. Between 7 000 and 315 000 in 2007-09 for rainbow trout and 20 000 to 304 000 in 2004-08 for cod.
27. Despite improvement in the 2000s, stocks in the North Sea remain below safe biological limits (Chapter 4).
28. The fisheries are divided into two broad categories: cod (demersal) and herring (pelagic). The first includes cod, haddock and saithe, all of which are used in direct consumption. Fish in the herring category, which also includes capelin and mackerel, are mostly processed into oil and animal feed.
29. More specific output regulation can also be made, at the discretion of the Directorate of Fisheries (*e.g.* catch of certain species can be prohibited in certain areas or periods).
30. The final results do not always adhere to ICES recommendations. Norway, for example, did not follow ICES's advice to set the TAC for Norwegian coastal cod at zero.
31. For some fisheries, group quotas are divided equally among all vessels, while for others the vessel quotas depend on vessel length, tonnage or other technical criteria.
32. Established in 1984 for the coastal fleet and in 2005 for offshore vessels. Previously called the unit quota system, it applies to many vessel groups.
33. Introduced in 2005 for the coastal fleet, for vessels of less than 28 metres.
34. The pesticide tax consists of a control (or inspection) tax and an environmental tax. The former generates revenue covering the costs of the Norwegian Agricultural Inspection Services.

35. Norway has more stringent health and environmental standards than EU regulation requires.
36. The use of chemical-synthetic pesticides is not permitted in organic production.
37. Food consumption in this context covers both domestic production and imports, but the increase in consumption of organic food is to be based on domestic products, for those that can be grown in Norway.
38. FOR 2006-06-07 No. 593.
39. Remaining wilderness-like areas (defined as being situated at least 5 km from the nearest major infrastructure development) cover less than 12% of Norway's land area.
40. The new Nature Diversity Act also contains provisions to foster sustainable land management and physical planning.
41. This effort also feeds into work of the OSPAR Commission, which seeks to protect and conserve the North-East Atlantic and its resources.
42. The Nature Diversity Act applies to territorial waters (up to 12 nautical miles) and part of the EEZ beyond territorial waters.
43. Acquisition of land for other forms of protection (regional, nature reserves, recreation areas) is almost unchanged since 2002.
44. Svalbard residents also pay the fee but it is reimbursed.

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PART II

Chapter 7

Waste Management

Norway now has a simpler regulatory framework for waste management and is striving to reduce the significant increase in waste generation that it has experienced since the last OECD review. Efforts have been made to make the selective collection and treatment of household waste more cost-effective, and to improve the safety of landfill operations. The chapter also presents progress in reducing emissions of hazardous chemical substances, many of which were linked with disposal of end-of-life products, as well as addressing problems related to contaminated sites. Concerns remain however, over the volumes of hazardous waste and waste transfer across Norway's borders. How to effectively use the mix of instruments in managing waste, along with better implementation of waste management plans, is examined in this chapter, along with best ways of dealing with tax and other incentives that can improve performance.

Assessment and recommendations

In 2000, Norway established ambitious objectives for reducing waste generation and the amount of waste delivered for treatment and final disposal, and for assuring appropriate treatment of hazardous waste. These objectives were further strengthened in 2006. Growing importance was attached to the impact of hazardous chemicals, many of which were linked to disposal of end-of-life products.

Norway's regulatory framework for waste management, already well developed in the 1990s, was revised and simplified in 2004. A mix of instruments was applied to curb waste generation and stimulate waste recovery, including a tax on final waste disposal applied to landfills and incineration, and a ban on landfilling of biodegradable waste. These measures helped decouple waste generation from economic activity in some manufacturing sectors. Notwithstanding these efforts, the overall quantity of waste generated every year has been rising well above the growth of GDP since 2004 (17% *versus* 9%, in fixed prices). Thus Norway's objective of keeping growth in the quantity of waste generated below the rate of economic growth has not been met. Services and some manufacturing sectors, such as food processing, have experienced significant waste growth, in particular as regards wet organic waste (+40%).[1]

The cost-effectiveness of household waste collection and treatment services has been enhanced through increased use of intermunicipal waste management plans. Further efficiency gains have been achieved by outsourcing these services to private operators or to local-authority-owned entities operating on a commercial basis. In most municipalities, waste collection charges are at, or close to, cost-recovery levels. Even though Norway's reported household waste fraction of municipal waste is at about the OECD average, annual household waste generation appears to have grown considerably, by 40% over the review period. The volume of household waste grew faster than household consumption.

Efforts have been made to improve the safety of landfill operations and reduce their environmental impact. Between 2004 and 2009, all landfill permits were revised to give effect to a new classification system. The proportion of non-landfill methods of waste treatment increased at a pace in line with achieving the 2010 objective of recovering 75% of total waste generated. Rates of recovery of household and industrial waste are in line with OECD averages. Considerable progress has been made in effective resource recovery from household waste: the proportion of waste separated for material recovery increased from 40% in 2000 to 52% in 2008, though there is a room for improvement to match front-runner countries in this area. Energy recovery from waste has increased, including its use in district heating, while emissions of toxic chemicals from incineration have been reduced.

For a number of waste streams, extended producer responsibility (EPR) regimes have been introduced in conjunction with waste sorting at source. Most of the recovery targets established through agreements between the Ministry of the Environment and representatives of industry and business associations have been met, including those for used lubricating oil, electrical equipment with CFC refrigerants, batteries, end-of-life vehicles, tyres and waste packaging. Achieving targets within EPR regimes has been stimulated by the introduction of taxes connected with deposit-refund systems for end-of-life products. Norway is the first European country to provide free take-back for waste electrical and

electronic equipment (WEEE), going beyond the requirements of the corresponding EU directive. However, the government-industry agreement to achieve a minimum of 80% collection of WEEE entering the waste stream does not yet appear to have been met.

Reported volumes of hazardous waste increased by 50% over the review period and now account for 10% of waste generated. About 90% of hazardous waste is treated domestically, approaching the target of 100%. Cases of illegal export of hazardous waste have been discovered. However, the Climate and Pollution Agency, Customs, the Norwegian Maritime Directorate and Norway's environmental crime investigation unit, *Økokrim*, have increased collaboration to stop such exports.

There has been a notable increase in waste transfers across Norway's borders, with a fivefold increase in annual amounts exported between 2002 and 2009. An estimated 50-60% of Norway's combustible waste is exported to district heating incinerators, principally in Sweden and Denmark. To some extent, Norway is trading the energy content of its "non-hazardous" waste for hazardous residues of incineration.

Norway identified five hazardous chemical substances for "releases to be eliminated by 2005". Four were on target (reductions of 89% to 100%) and the fifth, PCBs, was reduced by 60%. Emissions of a number of additional substances have been reduced by over 50% from their 1995 levels, in line with 2010 targets. However, reductions in releases of arsenic and PAHs were below 50%, and releases of brominated flame retardants have increased; the 2010 targets are not likely to be met.

Progress has also been made in addressing problems related to contaminated sites. Out of the 100 most heavily polluted sites identified for cleanup by the end of 2005, 83 had been decontaminated before the target date, and all 100 are now remediated. The 2001 strategy for addressing contaminated sediments stimulated a series of pilot projects in 17 of 24 significantly contaminated fjord and harbour areas. In 2005, all priority coastal areas had action plans under implementation.

Recommendations

- Review and adjust, as necessary, the *current mix of instruments* so as to more effectively and efficiently prevent and reduce waste from the main waste-generating sectors; apply additional measures to reduce waste generation by government agencies, including through public procurement; monitor results, and report annually on progress.
- Investigate the *effectiveness of volume- or weight-based waste disposal fees* to provide further incentives for waste sorting and reduction by households; identify and promote the use of best practice models among municipalities.
- Encourage the development of *municipal and intermunicipal waste management plans* to achieve national targets for waste reduction more efficiently, in particular for biodegradable and hazardous waste.
- *Assess the implications of elimination of the incineration tax* on emissions of most hazardous substances from incinerators.
- Continue work towards further *reduction of hazardous chemicals in products* by drawing up proposals for additional substances that would be eliminated by 2020 and encouraging international action in this area; improve data collection on these substances through the product register.
- Redouble efforts to address problems associated with *contaminated sites and contaminated sediments* using reduction of negative impacts on human health, cost-effectiveness and public engagement as key guiding principles of the operations.

1. Policy and institutional setting

1.1. Policy targets

The 2000 white paper on Environmental Policy and the State of the Environment set out objectives and targets related to waste management for the review period.[2] The *priority commitments* included: *i)* significantly decoupling the growth in total waste generated from the rate of economic growth; *ii)* reducing the amount of waste delivered for final treatment to 25% of total waste generated; and *iii)* assuring appropriate treatment of all hazardous waste within Norway, either by recycling or sufficient and safe treatment and disposal (MoE, 2000). In 2005, the target for final waste disposal was tightened to 20% of waste generated in 2010 and beyond. In 2006, the commitment for reducing hazardous waste generation was extended to each type of hazardous waste with the time horizon of 2020 (MoE, 2006a).

Priority measures to achieve these targets, announced in subsequent white papers, included: *i)* expanding producer responsibility to assure sound waste collection and management routines and high recovery rates; *ii)* reducing landfilling of biodegradable waste and stimulating increased energy recovery from organic waste; *iii)* increasing research on safe uses of compost, sludge and other waste products in farming; *iv)* implementing requirements of compulsory waste plans for construction works; and *v)* increasing the collection and proper handling of hazardous waste (MoE, 2006).

The growing importance attached to addressing the impacts of *hazardous chemical substances*, many of which were linked with disposal of end-of-life products, led to the adoption of time-bound targets.[3] A list of 30 priority hazardous chemicals, first published in a white paper in 1997, was accompanied by national targets for their substantial reduction or elimination by 2005 and 2010 (MoE, 1996). In 2006, five additional toxic chemical substance were added to the list (MoE, 2006a). The 2008 revisions of the 2004-06 Hazardous Waste Strategy identified measures to achieve these targets. The key approaches included: *i)* providing extensive information and guidance to the public and industry to facilitate the purchase of more environmentally sound products; *ii)* increasing the collection of prioritised hazardous waste and ensuring environmentally sound treatment; *iii)* improving knowledge of hazardous waste quantities and identifying new types of such waste; and *iv)* developing new regulations and instruments to lead to reduced use of chemicals in new products.

Building on previous efforts to substantially remediate *contaminated sites* and mitigate the effects of *sediments in fjords contaminated by substances that are hazardous to health or the environment* remained important policy targets in the review period (MoE, 2006a).

Government waste management targets are tracked against *indicators* presented regularly in white papers. Key indicators include: total annual quantity of waste generated relative to economic growth (expressed by GDP); proportion of the total amount of non-hazardous waste that is recovered; quantity of hazardous waste exported for final disposal; and quantity of hazardous waste for which disposal is unknown (KLIF, 2010a).

1.2. Legislative and administrative framework

Waste management in Norway is governed by the 1981 Pollution Control Act, a unified law covering solid, liquid and gaseous discharges (Chapter 3). In 2004, several pieces of waste management legislation were unified under the *Waste Regulations* (*Avfallsforskriften*), which entered into force in 2004. This measure did not change the intent of the original legislation but aimed to simplify its use by the regulated community. The regulations covered landfilling, incineration, hazardous waste management and transboundary

shipment of waste. The Waste Regulations also strengthened the regulatory systems for managing particular waste streams, including waste electrical and electronic equipment (WEEE), batteries, end-of-life vehicles, tyres, beverage packaging, biodegradable municipal waste, construction and demolition waste, and waste containing hazardous chemicals.

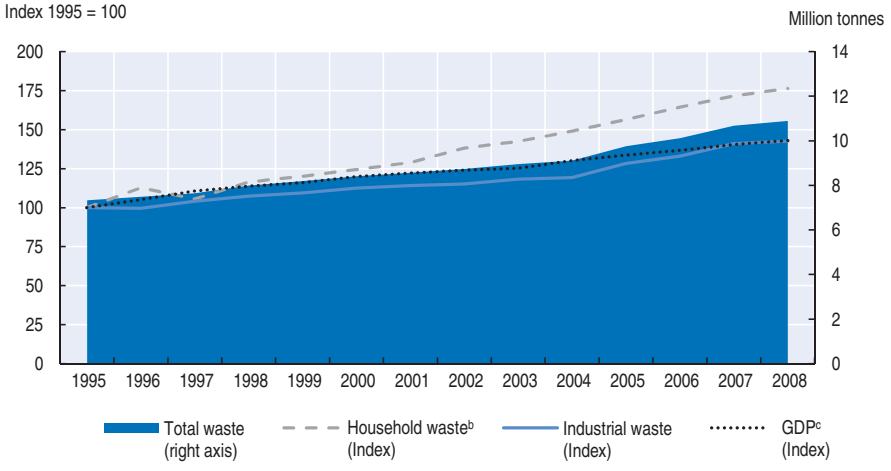
The *institutional framework* for waste management has not changed since the last review. At the national level, the Climate and Pollution Agency (KLIF) issues permits to firms that manage hazardous waste, including those operating incinerators and landfills. It also develops management guidelines for regional and municipal governments. County governors issue permits for non-hazardous waste management and for the reception and temporary storage of hazardous waste by specialised firms. The permits specify criteria that must be met to ensure that waste is properly handled. In co-operation with KLIF, county authorities provide technical support for municipalities, which arrange contracts for collection and management of household waste, enforce regulations such as the bans on littering and open fires, and handle other waste issues under local waste regulations adopted by municipal councils.

The Pollution Control Act used to require all municipalities to draw up *waste management plans*, but this provision was dropped. Norway maintains that it meets its obligations to prepare waste plans under EU waste directives through national documents rather than local plans. However, municipal autonomy is strong and several municipalities still develop local waste management plans. A growing number of municipalities collaborate on regional waste management plans to facilitate joint waste collection and treatment services and increase efficiency.

2. Trends in waste generation

The total volume of waste generated every year in Norway grew by nearly 30% over the review period, from around 8.4 million tonnes in 2000 to nearly 11 million tonnes in 2008 (Figure 7.1). Part of the increase was due to changes in waste classification introduced in 2004. However, the increasing trends continued afterwards and in spite of regulatory and

Figure 7.1. **Waste generation, trends 1995-2008**[a]



a) Preliminary data.
b) Includes scrapped cars and other waste not collected through the municipal collection scheme.
c) Constant prices.
Source: Statistics Norway.

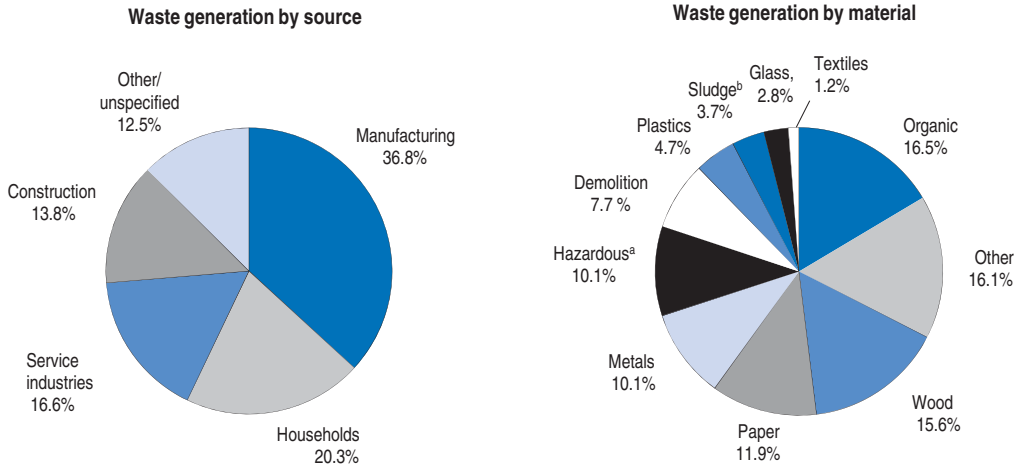
StatLink http://dx.doi.org/10.1787/888932374901

infrastructure development efforts, waste generation has grown by 19% since 2004 while GDP has increased by 10% (in fixed prices), a trend directly countering the 2000 objective of decoupling the waste generation and economic growth rates (Figure 7.1).[4]

The amount of *industrial waste* has increased in recent years, particularly in the second part of the decade. About a third of non-hazardous industrial waste is generated in *manufacturing* (37% in 2008) (Figure 7.2). There appears to have been some decoupling from economic activity in the manufacturing sector, in line with the 2000 objective, as manufacturing waste grew by 6% over 1993-2005 while production grew by 25%. When disaggregated by subsector, however, this apparent decoupling held for only some industries. Most notable was the wood and wood-product industry, where decoupling was much greater than the manufacturing average: it reduced its waste generation by 50% over 1996-2005, while income from production increased by 16% in fixed prices. In contrast, food processing waste increased by 32% over the period but production rose by only 1% (Statistics Norway, 2008). The *services sector* generated 1.8 million tonnes of waste in 2008, or 16% of the national total, and showed a strong upward trend, with growth since 1995 as high as 82%. However, part of the increase can be attributed to a new estimation method introduced in 2004. Just above half of the services waste was delivered as mixed waste. The quantity of *construction waste* rose by 28% between 2004 and 2008, and this category made up 14% of total waste in 2008.

Generation of *municipal waste* in Norway remains high by OECD standards, above the OECD and EU15 averages and on a par with the USA, Ireland and Denmark. This figure must be treated with caution, as not all countries report household waste and municipal waste separately and the composition of "municipal waste" varies.[5] Comparing the reported *household waste* fraction of municipal waste, Norway's results are at about the OECD average, and significantly less per capita than those of Denmark, the Netherlands, Spain and Germany. Nevertheless, annual household waste generation has grown considerably – by 40% over the review period, from 1.45 million tonnes in 2000, to more than 2 million in 2009 (from 330 kg per capita to 440 kg).

Figure 7.2. **Waste generation, state 2008**



a) Includes impregnated wood.
b) Includes water.
Source: Statistics Norway.

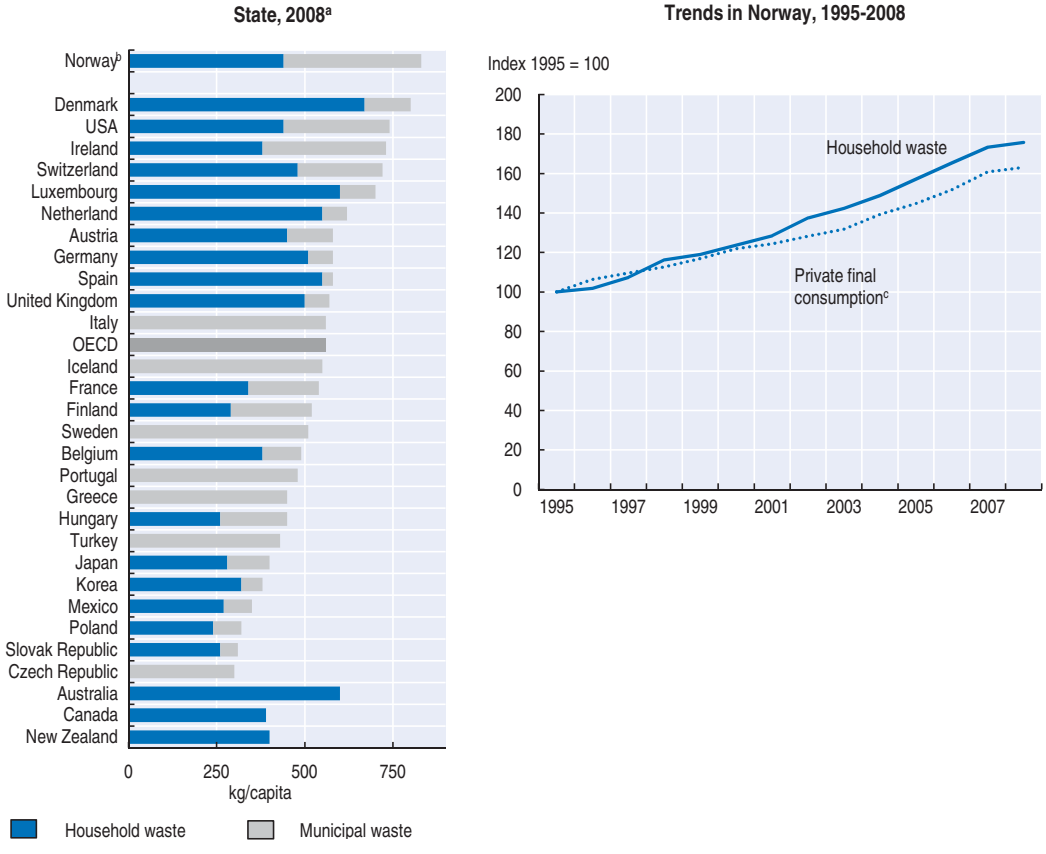
StatLink http://dx.doi.org/10.1787/888932374920

The volume of household waste grew faster than household consumption (Figure 7.3). Statistics Norway has estimated that 46% of the increase can be explained by population growth and 54% by growth in consumption (Statistics Norway, 2008).

Regarding particular *types of waste*, over the review period the volume of *wet organic waste* grew by 40% and now accounts for 17% of total waste (Figure 7.2). Some 1.8 million tonnes of wet organic waste was generated in 2008. Of this, around 40% came from manufacturing (mainly slaughterhouse waste, sludge from dairies and other production residue from the food industry) while households generated 30% (mainly cooking waste, food past its shelf life and other food waste, along with garden waste) and services, such as retail, hotels, restaurants and hospitals, generated 20%. Other types of waste that grew significantly included *wood waste* (up by 30%, to 17% of total waste generated); *other materials* such as concrete, slag, asphalt, sludge, glass, textiles, rubber and ceramics (by 30%, to 16% of the total); and *paper and cardboard* (by 20%, to account for 12% of total waste). *Glass waste* increased by 50% but at 300 tonnes, accounts for only a small fraction of the total.

About 1.1 million tonnes of *hazardous waste* was collected for approved treatment in 2008. The amount of hazardous waste increased by 64% during the review period and now accounts for 10% of all waste generated (Figure 7.2).

Figure 7.3. **Municipal and household waste generation**



a) Or latest available year.
b) 2007 data. Municipal waste includes production waste collected and handled by municipalities.
c) Based on values expressed in national currency at constant prices.
Source: OECD, Environment Directorate.

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The main cause of the increase is believed to be improved collection and reporting. The regulatory changes in 2004-06 also broadened the category of hazardous waste to include new types, such as plastic with brominated flame retardants, impregnated wood and asbestos fibre cement. In 2008, some 40 000 tonnes of the new types of hazardous waste were registered for approved treatment. Waste containing heavy metals (mainly slag) accounts for 50% of all hazardous waste, followed by oil-contaminated waste (22%) and corrosive waste (acids and bases, 21%) (Statistics Norway, 2009a). Manufacturing generates about 60% of hazardous waste whose sector of origin is known, including almost all corrosive waste, about 70% of all waste containing heavy metals and about one-sixth of other hazardous waste. Oil-contaminated waste comes mainly from oil and gas extraction, which accounts for about half of the total, while service industries (especially petrol stations, workshops and transport) account for about one-quarter of the total (Statistics Norway, 2009a).

Despite regulatory and technological efforts, and despite the longstanding objective of decoupling growth in waste generation and economic growth, the amount of waste generated continues to increase disproportionately to the growth of the population, consumption and economic activities. Areas of particular growth include waste generated by services and some types of manufacturing. Not only has household waste not been reduced, its volume has increased faster than consumption. With effects of the economic slowdown likely to be felt for a few more years, *the growth in amounts of waste generated may ease in some sectors*, such as construction, but the gap will not close quickly without more vigorous policy responses promoting efforts to reduce waste generation. The Norwegian Government has yet to study the drivers of waste generation and lessons that could be learned from household and industry experiences in waste generation and reduction. Such case studies could prove beneficial, both domestically and for other OECD countries.

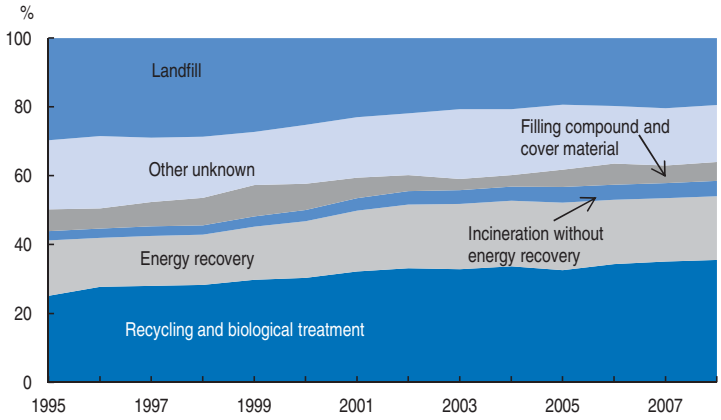
In order to engage market forces in reduction of waste, there is a need to create wider *markets for products and services that contribute to waste reduction*. Some companies that supply products to Norway voluntarily participate in the Nordic Swan and EU Flower ecolabeling systems and public awareness of these labels is high in Norway. Since 2001, the Public Procurement Act required public procurement operations to "have regard to the resource implications and environmental consequences of the procurement". The executive Regulations on Public Procurement specified further options for using life-cycle impacts and ecolabelling criteria (Chapter 3). However, government procurement does not yet overtly or consistently support waste and hazardous substances reduction policies and there is no data on waste generation or waste reduction by government agencies. Setting targets for waste reduction by all government agencies could help to stimulate procurement policies to drive waste reduction efforts. The implementation of the Action Plan for Environmental and Social Responsibility in Public Procurement adopted in 2007 provides such an opportunity.

3. Performance in managing non-hazardous waste

3.1. Trends in treatment and disposal

Norway has made significant progress in diverting waste from landfills. The proportion of *non-landfill methods of waste treatment* increased from around 73% of all waste generated at the beginning of the review period, to 77% in 2008 (Figure 7.4). This trend suggests that Norway is likely to achieve the long-term target of recovery of 80% of waste generated. Excluding portions of the waste stream that cannot be reused to any great extent, such as concrete, slag and contaminated soil/sediment, the recovery rate was 78% in 2008, already close to the target.

Figure 7.4. **Trends in waste treatment,[a] 1995-2008[b]**

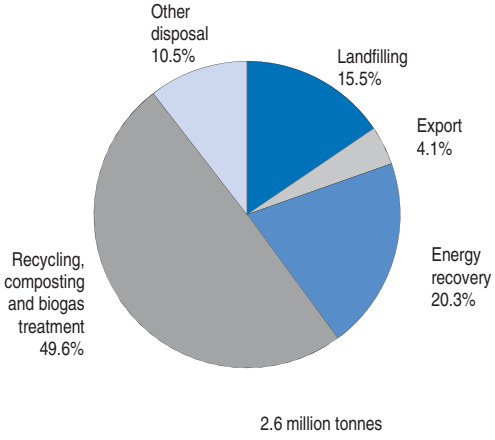


a) Exported waste is classified according to the known type of treatment or disposal it undergoes in the destination country. Export waste for which the treatment or disposal method is unknown is classified under unknown or specific handling. Imported waste is excluded.
b) Preliminary data.
Source: Statistics Norway.

StatLink http://dx.doi.org/10.1787/888932374958

Some 70% of *manufacturing waste* does not go to landfill but is rather subjected to recycling, composting or energy recovery (Figure 7.5). Considerable progress has been made in effective *resource recovery from household waste*: the proportion of waste separated for material recovery increased from 40% in 2000 to 52% in 2008 (Figure 7.6).[6] This share compares well with the achievements of many other OECD countries, though Norway would need further improvement to match countries leading in household waste recovery, such as Switzerland and the Netherlands. In terms of recovery methods, this progress includes increases in tonnes sent to composting (by 88%), material recovery (46%) and energy recovery (45%).

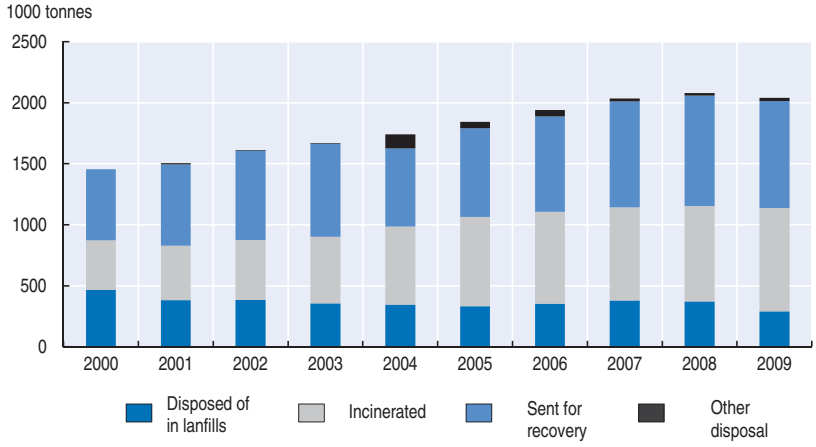
Figure 7.5. **Waste in manufacturing industries, by type of treatment,[a] 2005**



a) Excludes hazardous waste, waste sent for sorting (25 000 tonnes) or handled in unknown ways (370 000 tonnes).
Source: Statistics Norway.

StatLink http://dx.doi.org/10.1787/888932374977

Figure 7.6. **Household waste, by type of treatment,[a] 2000-09**



a) Break in time series in 2004.
Source: Statistics Norway.

StatLink http://dx.doi.org/10.1787/888932374996

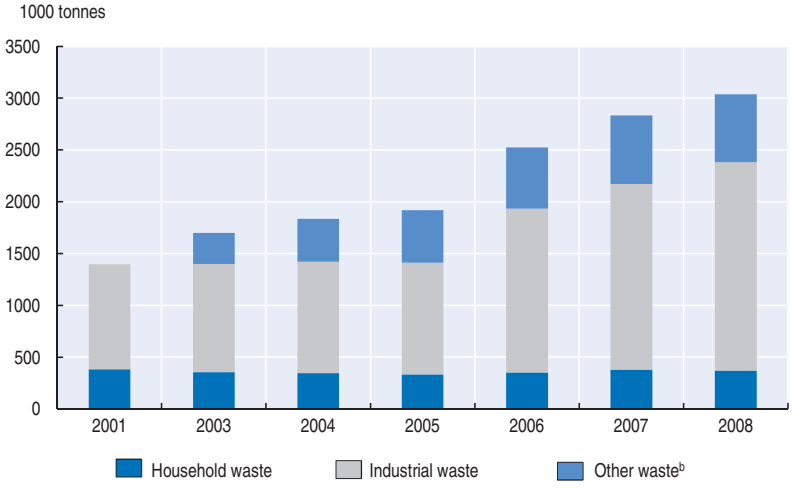
From 2001 to 2005, the amount of *waste deposited in landfills* was stable at about 1.4 million tonnes per year. Between 2005 and 2008, the tonnage of waste landfilled rose by nearly 70%, largely reflecting more deposition of contaminated soil from construction sites due partly to growth in the construction sector but also to increased attention by agencies and the industry (Figure 7.7) (Statistics Norway, 2010a). The annual amount of *household waste landfilled* also remained at the 2001 level (around 380 000 tonnes) even though total household waste generated increased by 43% between 2000 and 2008 (Figure 7.6).

The increase in landfilling in the latter half of the decade was accompanied by efforts to *improve safety of landfill operations and reduce their environmental impact*. Between 2004 and 2009, all landfill permits were revised to give effect to new classifications of hazardous waste, non-hazardous waste and inert waste. In addition, landfills now require gas collection systems for flaring or gas use, liners to prevent contamination of groundwater, and leachate management plans.[7]

There has been a notable increase in *transboundary waste transfers*. In 2009, Norway exported around 770 000 tonnes of waste after substantial growth from the beginning of the review period: the annual amounts exported increased fivefold between 2002 and 2009 (Table 7.1) (KLIF, 2010a).[8] Over 70% of Norway's combustible waste is exported for use in district heating incinerators, principally to Sweden, but also to Denmark. Norway imports around 300 000 tonnes of waste per year, with some fluctuation (Table 7.1).[9] The imports are dominated by hazardous aluminium-containing slag and by incinerator fly ash. To some extent, Norway is trading the energy content of its "non-hazardous" waste for hazardous incineration residue.

KLIF is the authority responsible for *authorising waste imports and exports* in Norway. In principle, it refuses exports of waste for disposal if there is an environmentally sound alternative in Norway (KLIF, 2010b). In collaboration with the Customs and Excise Directorate, KLIF carries out spot checks along the border and at larger ports to ensure that all waste exports and imports comply with regulations. Following a serious accident in May 2007 involving treatment of hazardous waste at the Vest Tank facility in Gulen, a

Figure 7.7. **Waste landfilling,[a] 2001-08**



a) Excluding landfilling by manufacturing industries at their own landfills.
b) Other waste used as cover material in between different layers of household and industrial waste, or as final cover.
Source: Statistics Norway.

StatLink http://dx.doi.org/10.1787/888932375015

Table 7.1. **Exports and imports of waste, 2002-09**

Tonnes

	2002	2003	2004	2005	2006	2007	2008	2009
Exports	134 052	220 798	229 865	323 874	376 159	306 735	491 600	770 235
Energy recovery	87 972	165 046	177 706	276 159	332 695	242 588	359 034	561 692
Material recovery	36 602	52 802	47 403	43 899	31 690	46 875	95 912	128 416
Final disposal	9 478	2 950	4 756	3 816	11 774	17 272	36 654	80 127
Imports	243 628	323 419	230 504	237 049	202 666	128 917	269 075	303 206
Energy recovery	3 330	8 693	2 242	3 325	8 639	15 289	20 867	13 128
Material recovery	61 421	14 597	9 351	29 660	60 924	23 889	97 392	104 976
Final disposal	178 877	300 129	218 911	204 064	133 103	89 739	150 816	185 102

Source: KLIF.

StatLink http://dx.doi.org/10.1787/888932375319

municipality in Sogn og Fjordane county, KLIF initiated a working group, with participation from the Directorate for Civil Protection and Emergency Planning, the Norwegian Coastal Administration, the Norwegian Maritime Directorate and the Customs and Excise Directorate, to improve controls over hazardous waste exports and imports by tankers and bulk carriers (KLIF, 2010c).

About half the *sludge* from wastewater treatment is treated in biogas plants, 25% undergoes other biological treatment, and the remaining 25% is landfilled. Some 80% of compost made from sludge is used in agriculture, public parks and green spaces, and topsoil products, and 10% is used as landfill cover (Statistics Norway, 2010a).

It is estimated that in 2007, 14% of all non-hazardous waste underwent *unknown treatment and disposal*. This includes disused material left *in situ*, such as old pipelines and underground cables, and Norwegian vessels in foreign trade that are scrapped abroad. The figures in this category are somewhat uncertain (Statistics Norway, 2009b).

3.2. Measures for improving non-hazardous waste management

Norway has taken several *important steps* to achieve objectives and targets set in national policy documents. The measures have included: *i)* strengthening municipal collection and treatment of household waste; *ii)* introducing a mix of instruments to reduce final waste disposal and promote recovery; and *iii)* strengthening management and reducing impacts of landfilling and incineration.

Strengthening non-hazardous waste collection and recovery

Municipal systems for *household waste collection* were well established before 2000. The services are primarily outsourced to commercial or municipal-owned waste operators, which collect and treat waste on multi-year contracts. The number of companies owned by local authorities rose from 1 560 in 1999 to 2 203 in 2004. Some neighbouring municipalities joined efforts to take advantage of economies of scale, developing joint management plans and delegating collection and treatment to inter-municipal companies. The number of such companies increased from seven in 1996 to 206 in 2004. Publicly owned companies continue to play an important role in waste collection and treatment; only 10-15% of the waste management service is provided by private companies. However, many municipal-owned services have been commercialised: the number of firms that are legally independent from the municipalities reached 1 728 in 2004, up from 773 in 1996 (Sørensen, 2008). In 2008, nearly 8 000 people were employed in waste activities and material recovery; of those, nearly 5 000 worked in waste collection (Statistics Norway, 2010b).

The 1981 Pollution Control Act requires *waste collection charges* that are applied to households to be set high enough to recover both capital and operating costs of local waste collection and source segregation systems.[10] In most municipalities the cost recovery ratio is at, or near 100% (Statistics Norway, 2009b). This suggests that households and others are taking part in the municipal waste collection systems to a larger extent than before and are shouldering the real environmental costs of waste management.[11] In 2009, the average annual fee per municipal subscriber was NOK 2 166, a substantial increase from NOK 1 476 in 2000 (Statistics Norway, 2010c). The fees vary by community, being higher in less densely populated areas such as Finnmark county (with an average of NOK 2 879) while municipalities in Østfold county have the lowest average annual fees (NOK 1 941) (Statistics Norway, 2010c).

While municipal waste management fees are likely to be based on the user pays principle, they do not necessarily provide "polluter pays" incentives at point of generation.[12] Only limited progress has been made in *differentiating charges by amount generated*: in 2009, some 56% of municipalities had annual waste fees that could be varied by waste bin size, 11% had fees variable by collection frequency and 9% charged different fees for households with home composting (Statistics Norway, 2010c). Expansion of differentiated charges according to weight or waste fractions could provide incentives for households to increase recycling and could stimulate waste reduction. Some analyses indicate that municipalities with relatively low waste charges have the highest percentage of recycling (Martinsen, Vassnes, 2004). This may indicate that a high rate of recycling, and a reduction in waste delivered to landfills and incineration, can result over time in lower waste charges.

The efforts of the national and local authorities in the review period focused on expanding arrangements for *waste sorting at the source*. In 2009, around 99% of Norway's population was covered by collection systems allowing sorting of at least one waste category (paper, glass, plastic, or wet organic waste). Some municipalities' systems allow

sorting of up to 10 categories. The best coverage for the country as a whole is for paper (95% of the population), followed by plastic (71%), and wet organic waste (68%) (Statistics Norway, 2010d).[13] In some counties, relatively high shares of the population can separate hazardous waste and waste electrical and electronic equipment (WEEE) for household collection; Rogaland, for example, has a rate of 47% for both, while Aust-Agder provides hazardous waste collection to 64% and electronic waste collection to 38% (Statistics Norway, 2010d). Such rates can be attributed to municipal leadership, as the obligation under producer-responsibility regulations is limited to provision of reception facilities for producer-collected material such as WEEE and chlorofluorocarbons (CFCs). High return rates have characterised paper recycling since the 1980s without any regulatory requirements. Such leadership should be further encouraged through recognition of municipal efforts in waste sorting. Award systems, in conjunction with wider organised sharing of effective approaches, could motivate local authorities to strengthen their efforts.

The expansion of waste sorting has been accompanied by a broadening of *extended producer responsibility* regimes, which require business and industry to collect and treat waste from products they put on the market. For some waste streams, the recovery targets were established through agreements between the Ministry of the Environment (MoE) and representatives of industry and business associations (Table 7.2).[14] Many targets have been met, including those for used lubricating oil, electrical equipment with CFC refrigerants, batteries, end-of-life vehicles, tyres and waste packaging (corrugated cardboard, cartons, glass, metal, beverage cartons, plastic packaging and one-way beverage containers such as cans and PET bottles). Despite a rapid increase in the amount of WEEE collected, the government-industry agreement to achieve a collection rate of at least 80% does not yet appear to have been met (Box 7.1).

In the last decade, *new extended producer responsibility regimes* have been introduced. Since 2001, Norway has run the world's only programme for the collection and recycling of sulphur hexafluoride (SF_6), a potent greenhouse gas widely used in power plants. The government's target of reducing emissions by 30% by 2010 was exceeded: the rate reached 55% in 2008. There are also new programmes for collection of particular materials containing hazardous substances, such as insulating window units made with sealants containing polychlorinated biphenyls (PCBs) (Table 7.2). However, it is too early to assess their success.

The achievement of producer responsibility targets was helped by the introduction of *taxes connected with deposit-refund systems* for end-of-life products. Some had been in place since the 1990s, such as deposit-refund systems for end-of-life vehicles; taxes and deposit refund systems for beverage containers (including non-refillable ones); and taxes and refund systems for used lubricating oil (Table 7.2). Taxes introduced in the review period included one on the use of the chlorinated solvents trichloroethylene (TRI) and tetrachloroethylene (PER), introduced in 2000.[15] Since 2003, a tax has been levied on the import and production of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) to reduce their emissions by stimulating use of alternative gases and development of new technology and products that do not use HFCs and PFCs (Table 7.2). Taxes have been an important source of revenue. Beverage container taxes generated NOK 649 million in 2008 (NOK 474 million for the basic tax on non-refillables and NOK 175 million for the variable tax), lubricating oil generated NOK 86 million and TRI and PER generated NOK 11 million (Næss and Smith, 2009).

Table 7.2. **Collection and recovery programmes for specific waste streams in Norway**

Year of introduction and modification	Waste stream or product	Type of programme	Instruments (2009 rates)	Impact on waste stream
			Introduced before review period	
1974 1994 2000	Beverage packaging (*refillable and non-refillable beverage containers*)	Extended producer responsibility (EPR) programme: tax on containers, deposit-refund system	Base tax on non-reusable containers (NOK 1.00 for PET bottles and cans up to 0.5 litres and NOK 2.50 over 0.5 litres) plus tax by material type (NOK 4.97 per unit for glass or metal, NOK 3.00 per unit for plastic, NOK 1.24 per unit for carton/cardboard). Tax reduced according to recycling rate, full rebate for recycling rates over 95%. Registered participation in take-back system entitles manufacturers and importers to benefit from reduced beverage taxes. Milk and juice packaging covered from 2006. Government-industry agreement on targets renegotiated in 2003. There are 13 approved take-back systems. Two take-back companies, Norsk Resirk (non-refillable plastic bottles and cans) and the Norwegian brewers and soft drink producers association (refillable glass and plastic bottles) use deposit-refund systems. For one-way cartons and non-refillable glass, no deposit-refund system exists. In both cases collection and reuse/recycling is financed through industry fees on the products.	Packaging with refund is collected at collection points, *e.g.* supermarkets. The system is run and financed by producers and importers of beverages. Coverage is national. Most municipalities provide collection services for some types of beverage packaging not covered by the refund system. Collection and recycling is partly financed by producers.
1995 2003	Other packaging (brown paper, cardboard, plastics, metal)	EPR: industry agreement	Voluntary agreements between the MoE and industry organisations set specific targets for recycling and total recovery. Industry established dedicated companies to assure meeting the targets. Collection through municipal waste collection and private waste management companies. Financing through industry fees on packaging.	Recovery rates (recycling + energy recovery) exceed industry-government targets at over 80% for glass, brown paper, plastic.
1978 2007	End-of-life vehicles (ELVs)	EPR: deposit-refund/ take-back system	Refund system for ELVs weighing less than 3.5 tonnes established in 1978 to motivate car owners to return hulks to a certified treatment plant. System also covers snow scooters and minibuses. A deposit of NOK 1 300 is applied on new cars, and a NOK 1 500 refund is given on delivery of cars for disposal. Industry-run system established in 2007 under EU ELV Directive (2000/53), but state refund system was retained. A transitional subsidy to vehicle dismantlers for vehicles not covered by the industry system (NOK 5 000 for some of the most polluting car types) was provided in 2008.	Return rate 93% and recovery of materials 86% in 2009.
1988 2006	Waste electrical and electronic equipment	EPR: take-back system, regulation and industry agreement	Under formal agreement with the MoE, producers aim to ensure that at least 80% of WEEE is collected and reduce the problems associated with WEEE. Producers had to establish take-back companies to manage WEEE in accordance with regulations. From 2007, membership in government-approved take-back company required for WEEE importers and producers.	Tonnage collected increasing; per capita, seven times higher than EU average. Industry target of 80% not met.
1988 (tax) 1994 (refund)	Waste lubricating oil	State administered programme: tax-refund system	Refund given for oil delivered to approved facilities. More types of oil added in 2000. Tax rate (2009) is NOK 1.77 per litre and refund rate is NOK 2.00 per litre.	Return rate estimated at 80-85%.
1990	Batteries	EPR: take-back system	Lead and nickel-cadmium batteries are covered.	Collection rates 99% for leaded batteries (2009), 196% for Ni-Cd batteries (2007).
Prior to 1994	Vehicle tyres	EPR: take-back system	System set recycling targets of 85% recovery by January 2006 and 95% by January 2015. System underpinned by ban on landfill disposal of tyres.	Collection rates exceeded 100% of estimated waste generated every year from 2001 to 2009 as some importers did not take part in the take-back system.

Table 7.2. **Collection and recovery programmes for specific waste streams in Norway** *(cont.)*

Year of introduction and modification	Waste stream or product	Type of programme	Instruments (2009 rates)	Impact on waste stream
			Introduced during review period	
2000	Chlorinated solvents	State administered: tax-refund system	System promotes return and phase-out of trichloroethylene (TRI) and tetrachloroethylene (PER). Tax NOK 60.96/kg;refund rate NOK 25/kg for waste containing TRI delivered to certified waste collector.	Emission reductions: TRI 92%, PER 91% between 1995 and 2005.
2003 (tax) 2004 (refund)	Hydrofluorocarbons, perfluorocarbons	State administered: tax-refund system	Tax on import and production of HFCs and PFCs. Tax NOK 204.99/tonne CO_2 eq, fully refunded on delivery to waste treatment facility.	In 2003, projected reduction in use was 40% by 2010. Recent data not available.
2004	PCB windows	State administered: take-back system, hazard plans	Requires producers and importers of double-glazed windows to participate in approved take-back programmes for insulating window units made with sealant containing PCBs. Also included in hazard mapping required under construction and demolition rules.	Over 2002-09, 416 065 units collected. Estimated total installed over 1965-75: 2.05 million.
2008	Construction and demolition waste	State administered: waste plans and sorting rules	Before demolition or renovation can proceed, municipality must approve waste management plan including survey of types and amounts of hazardous waste. At least 60% of waste must be sorted.	National monitoring and information campaign, 2009. Some evidence of success. Waste collection industry representatives consider construction and demolition rules to have been successful. Industry forced to sort waste for recovery, resulting in less waste generation, cleaner construction sites, development of systems to deliver goods without excessive waste. A 2009 review of private hazard mapping contractors provided anecdotal evidence that system has greatly reduced prevalence of small operators that did not manage hazardous demolition materials safely.

Source: Speck *et al.*, 2006, Lindhjem *et al.*, 2009.

Box 7.1. **Recovery of waste electrical and electronic equipment**

In 1998, Norway became the *first country in Europe* to pass legislation providing for free take-back of discarded electrical and electronic equipment. The following year, the MoE and producers and importers of electronic and electrical goods concluded an industry-wide agreement, setting a target of an 80% collection rate by 1 July 2004. Three co-operative return companies were later formed, covering 94% of WEEE collection-related activity: *Renas, Elektronikkretur and Hvitevareretur* (the last two merged in 2005, becoming one company under the name *Elretur*). Other take-back companies established independently of the agreement included *Eurovironment* and *Ragn Sells Elektronikkgjenvinning*. At first the various companies were assigned to collect different types of WEEE but as of 2007 all companies take all categories of WEEE.

The Norwegian WEEE system goes *beyond the requirements of the EU WEEE Directive* (2002/96/EC), as it covers all types of electronic and electrical machinery, including large and small household appliances, information and telecommunication equipment, photocopiers, medical equipment, fluorescent lamps, and cables and flexes.

WEEE collection systems include municipal waste treatment facilities and vendors of electronic and electrical products, which accept waste equipment at no charge. Public and corporate customers, such as hospitals and offices, can dispose of their equipment at any municipal WEEE collection point or conclude agreements with take-back companies to arrange pickup of WEEE. Distributors and vendors are required to take back WEEE and clearly inform consumers about this option. The cost of WEEE collection and treatment is covered by importers and manufacturers, which pay fees depending on the product and the overall cost of running the programme. The average fee is around 0.3% of net product value. After collection, WEEE is dismantled manually at specialised facilities. Components containing dangerous substances are treated as hazardous waste.

The *amount of WEEE* collected increased significantly over the review period, from around 40 000 tonnes in 2000 to more than 150 000 In 2009. The amount collected per capita increased from around 8 kg to 32 kg, eight times the level required by the EU directive. It is unclear, however, how much of the high recovery is attributable to the greater product range coverage of the Norwegian system, better diversion systems and participation, and/or higher waste generation rates.

The WEEE collection tonnage for several classes of equipment has been higher than the estimated total supply of goods in a given year (*e.g.* in 2008, the collection rate for small household appliances was 122% and that for computer monitors was over 300%). Yet the *overall collection rate for all types of WEEE* was 55% of estimated WEEE supply in 2008. Thus, the industry agreement to achieve at least an 80% collection rate does not appear to have been met. Of the recovered material, about 90% is reused, recycled or processed for energy recovery. The remaining 10% is landfilled or incinerated without energy recovery.

The *WEEE take-back system* has been modified to increase its effectiveness and to reflect provisions of the 2002 EU directive. The 2004 Waste Regulations require KLIF to approve each take-back company in a specially designed certification system. They also require producers and importers of electrical and electronic equipment to affiliate with an approved take-back company. To aid in tracking of producers and importers, a WEEE register was established in 2006. It provides information on the legislation and requirements with which producers and importers must comply, and makes it possible to identify companies that may not be meeting their obligations under the regulations. The register collects and collates data from the take-back companies on the amount of WEEE collected and processed.

Further improvements to the system should include better enforcement for retail outlets, as some major supermarket chains that sell electrical and electronic products do not accept WEEE. Given discovery of illegal exports of WEEE, better control at collection points may also be required. As a leader in the WEEE area Norway may wish to consider including in the recuperation system the computerised components of cars that enter the end-of-life vehicle system as current provisions are not made for safe disposal of their electrical and electronic components.

Waste final disposal taxes were introduced in 1999 on waste sent to landfills and incinerators. They were intended to reflect cost of environmental damage connected with final treatment of waste and to encourage increased source separation and recycling to reduce the amount of residual waste. The taxes were reduced for energy recovery at incinerators and later for good environmental practices at landfills. In 2003, the incineration tax differentiation was pegged to emissions of hazardous substances, such as dioxins, rather than the amount of energy recovered (Box 7.2).

Box 7.2. **Differentiated taxes on waste final disposal**

The 1996 Green Tax Commission, in Norway's first discussion on taxing waste, recommended a partial shift in the tax system from taxing labour to taxing the use of natural resources and harmful emissions. The commission noted that the worst environmental problems related to waste treatment concerned leachate from landfills and air pollution from incineration. It also pointed out that municipal waste charges did not fully reflect the costs of these problems.

In response, the *final disposal taxes* introduced in 1999 set a rate of NOK 300 per tonne for either landfilling or incineration, although the incineration tax was designed as a basic tax of NOK 82 and an additional tax of up to NOK 245 that could be deducted depending on the degree of energy recovery. Hazardous waste was exempted from the disposal tax to avoid creating a disincentive for proper treatment. Waste delivered for recycling and recovery was also exempted.

Reviews in 2003 concluded that the differentiated incineration tax did not effectively cover the environmental costs of incineration or provide an effective incentive for energy recovery. Thereafter, the incineration tax was *differentiated on the basis of air pollutant emissions* (*e.g.* dioxin emissions, NOK 2.7 million per gram; lead, NOK 74; mercury, NOK 24; and NO_x/SO_2, NOK 0.02). The tax is applied on actual emissions, monitored either continuously based on 24-hour average concentrations, or through manual monitoring or analysis every sixth month by an independent third party. There are detailed requirements about how to carry out the various monitoring or analysis activities. The average incineration tax amounted to about NOK 100 per tonne of treated waste.

The landfilling tax was also differentiated in 2003, linked to *landfill environmental standards*. Each tonne of waste delivered to landfills fulfilling EU requirements on sealing of the base and sides of the landfill faced a tax rate of NOK 327, while other landfills charged a tax rate of NOK 427 per tonne. The extra NOK 100 per tonne corresponded to the estimated environmental cost of leachate. The rates have been adjusted over time: in 2009 the tax was NOK 447 per tonne of waste delivered to landfills of high environmental standards and NOK 583 per tonne for the rest, and in 2010 the lower rate was reduced to NOK 275 per tonne to reflect the lower environmental costs expected from reduced methane emissions after a ban on landfilling of biodegradable waste was strengthened in 2009.

The landfilling and incineration taxes are paid by owners of landfills and incineration plants to the Customs and Excise authorities. Estimated *revenue from waste disposal taxes* was NOK 684 million in 2007, an increase from NOK 483 million in 2000 (current prices). The funds go into the general state budget and are not earmarked. The tax rates have mostly been adjusted for inflation since 2006. One exception was the rate for chrome emissions, which was substantially reduced between 2006 and 2007 because most chrome emissions from incineration plants are in the form of chrome (III), and not the far more damaging chrome (IV) as previously assumed.

Waste for incineration also attracts a carbon tax: in 2009 it amounted to NOK 62 per tonne of waste delivered, based on a carbon price of NOK 200 per tonne of CO_2 eq. The rate has been adjusted for inflation, except in 2007 when it was increased to put it on a par with the CO_2 tax on oil. Plants that can prove that they do not burn fossil fuels (*e.g.* those fired by biomass) are exempt from the carbon tax. The landfill tax is corrected for the additional tax exceeding a permit price in the CO_2 emission market of NOK 200 per tonne of CO_2.

Due to simultaneous effects of various factors, it can be difficult to *evaluate the effects of these taxes* on waste generation, recycling and emissions. However, the trends show that the amount of household waste entering municipal waste collection systems has gradually increased since the introduction of the taxes and the percentage of waste recovered (recycling plus energy recovery) has increased considerably (Figure 7.6). The relative increase in recovery is assumed to be at least partially an effect of the waste taxes. In the same period, there was a decrease in the amount of waste landfilled and an increase in the amount incinerated. This may be because the average tax per tonne has been higher for waste delivered to landfills than for waste delivered to incineration plants (Martinsen, Vassnes, 2004).

Even though the differentiated incineration tax linked to type of air pollutant seems to have led to significant reduction of emissions from incineration plants, especially of dioxins, Norway is considering *removing the incineration tax in 2010*. The proposal follows an increasing trend in exports of Norwegian waste to Sweden for incineration. The Swedish tax on waste incineration is lower, and many Norwegian waste service suppliers have signed agreements with Swedish incinerator operators, leading to a shortage of waste supplied to Norwegian incinerators. However, Sweden is also considering removing its incineration tax. Thus, halting the Norwegian tax might not create a significant economic incentive for keeping combustible waste in Norway. Instead, the change would remove tax differentiation that depends on the degree of hazard. It has been argued that conditions in emission permits provide adequate incentive against hazardous emissions (WtERT, 2010).

Strengthening non-hazardous waste treatment and disposal

A *ban on landfilling of wet organic waste*, which took full effect in 2002, was instrumental in reducing the amount of this type of waste delivered for final disposal. The ban reduced methane emissions, cut pollution from leachate and boosted efforts to use waste for district heating generation.[16] It was accompanied by extended efforts to encourage source separation and treatment of organic waste (Box 7.3). The ban was strengthened in 2009 by a prohibition of landfilling of all biodegradable waste. However, the regulations allow county governors to issue exemptions to the ban if processing capacity is deemed insufficient. Such exemptions have totalled around 400 000 tonnes in recent years; for comparison, the total annual amount of biodegradable waste going to landfill before the ban was one million tonnes. Most of the exemptions have been for municipalities that were in the process of building, or gaining access to, new incineration capacity. In light of the strong export trade in combustible waste with Sweden, KLIF has recommended to the governors that they stop issuing exemptions.

Recovery of energy from waste has been a priority of the Norwegian government. In 2008, half of the energy for district heating (delivery of hot water to buildings and industry) was produced from waste incineration, and the amount of energy from this source increased 46% between 2000 and 2008 (Statistics Norway, 2009c). *Enova*, a state enterprise established in 2002 under the Ministry of Petroleum and Energy, has indirectly supported energy recovery from waste incineration through investment support for district heating systems totalling NOK 1.7 billion over 2002-09. The support was expected to trigger further private and municipal investment of NOK 10.8 billion. Since 2009, *Enova* has also provided direct support for energy recovery from waste by financing the development of biogas plants; the amount available for grants in 2009 was NOK 24 million.

Box 7.3. **Household organic waste**

Regulations concerning organic waste

The main environmental threats from landfill disposal of organic waste are production of methane (a greenhouse gas 20 times more potent than carbon dioxide) and of leachate (contaminated liquid that can drain from landfills), and prevention of materials derived from the natural environment from re-entering important nutrient cycles.

Source separation of food waste started in Norwegian municipalities in the 1990s, spurred by a 1992 ban on landfilling of easily degradable organic waste. The ban was phased in as permits for each landfill were revised; it took full effect in 2002. It allowed landfilling of mixed municipal waste (whether or not it contained biodegradable waste) if a municipality had a system for source separation of wet organic waste. The landfilling ban was extended in 2009 by prohibiting landfilling of degradable waste with total organic carbon contents amounting to more than 10%.

The coverage of source separation systems for organic waste grew to 56% of the population in 2008. The amount of bio-waste (waste of vegetable or animal origin) collected increased from 151 000 tonnes in 2000 to 200 000 tonnes in 2008. Around 1% of the population composts organic waste (including garden waste) in home composters. In return for not having to collect the waste, the municipality grants the household a reduction in the waste collection fee and/or a reduced price for compost bins (such as those with the Nordic Swan ecolabel).

Trends in organic waste treatment

Norway has 62 centralised plants treating 455 000 tonnes per year of organic waste, including sewage sludge treated off-site and garden waste. This amount represents a rise of 60% since 2001. Composting is the dominant technology, accounting for 392 000 tonnes. Around 40% of the compost produced is used in private gardens, though the use of compost in landscaping and construction is rising, with this category now accounting for 33%. Only 17% was used in agriculture, with organic farming taking 4%. The low rate of use in agriculture is due to a combination of low demand for soil improvers and high-compost product development aimed at landscaping and construction.

Some 62 000 tonnes of organic waste is treated in anaerobic digestion plants for biogas production. Most aerobic treatment plants are small and operated in open facilities using turned windrows or static piles. A few plants use closed, in-vessel technology. The largest plant, situated outside Stavanger, has a design treatment capacity of 28 000 tonnes per year. Some municipalities are leading the conversion of bio-waste to energy. For example, Oslo has begun collection of household organics for biogas plant feedstock in a system that is to be expanded to the rest of the city and neighbouring municipalities. The city's two sewage plants produce biogas that is used to power 80 municipal buses. By producing biogas from household and restaurant food waste, the city expects to expand the programme to 400 city buses.

The transposition of EU Directive 2000/76/EF into the Pollution Control Act regulations created an expectation that thermal energy generated by incineration should be recovered as far as practicable, and incineration permits from county governors usually require a recovery rate of at least 50%. If that level cannot be reached initially, exemptions may be granted for a few years while district heating systems are constructed. The average energy recovery rate (heat and electricity) from incinerated waste was 78% in 2009. Since the beginning of 2008, there has also been a subsidy for electricity from biomass: NOK 0.10 per kWh (IEA, 2010).

4. Improving management of hazardous waste and substances

Hazardous waste

Norway's goal of treating all its *hazardous waste* domestically has nearly been realised: about 90% of such waste was treated in Norway in 2008.[17] Of the hazardous waste generated and treated as approved, 74% was landfilled, 15% recovered and 11% exported (KLIF, 2010d). Over 1 800 hazardous waste treatment facilities operated in 2009, were all subject to permitting and compliance assurance by KLIF.[18] For example, spot checks carried out by KLIF and regional authorities in 2010 uncovered regulatory violations in 123 of 149 municipal and private treatment facilities for hazardous waste, with more than half of the facilities falling short of operational requirements for receiving waste, particularly new types of hazardous waste, and another 50% breaching rules for waste handling and violating for internal control regulations.

About 6% of the hazardous waste generated every year appears to be going to "*unknown handling*".[19] In 2008, this share was estimated at 65 000 tonnes (KLIF, 2010d). Most of this is believed to be impregnated wood and waste containing oil. While the product life cycle analysis method tends to provide overestimates, there is nonetheless cause for concern. The amount of hazardous waste in the original regulatory categories that was treated in unknown ways has decreased, but 40 000 tonnes of new material was added to the hazardous waste treatment framework when the definition of hazardous waste was changed in 2004 (Statistics Norway, 2009a).

The fraction of *hazardous waste* that is exported from Norway for treatment in other OECD countries, even if it is minor (11%), nearly doubled over the review period, from 75 000 tonnes in 2001 to 123 000 tonnes in 2008. Of the exported waste, 60% was recycled, 13% used for energy recovery and 27% sent to landfill. Complex waste, such WEEE, waste containing PCBs and waste batteries, tends to be treated in specialist plants abroad. *Imports of hazardous waste* were stable over the review period at around 200 000 to 250 000 tonnes a year (Statistics Norway, 2010c).[20] The imports are dominated by slag containing aluminium and by incinerator fly ash. At the end of 2009, new regulations banned the import for recycling of waste containing mercury. This decision followed a near-total ban in 2008 on the use of mercury in Norway, though some exports are allowed where the waste is to be treated in a safe way.

Cases of *illegal export of hazardous waste* have been discovered, including 11 in 2008. Most have involved end-of-life vehicles, WEEE or old ships. In 2009, 63 containers were stopped at the border, but detection has been primarily through discovery in destination countries and tracking to Norway, and/or via domestic complaints. In general, Norwegian customs authorities have focused more on imports than on exports. In the last few years, however, KLIF has increased its collaboration with Customs and the Norwegian Maritime Directorate to stop illegal exports of hazardous waste. KLIF has a co-operation agreement with Customs to increase inspection of transboundary movements. Norway's environmental crime investigation unit, *Økokrim*,[21] has been active in prosecuting breaches of hazardous waste legislation, selecting a small subset of the known cases based on their significance of environmental impact and/or their deterrent value. Successfully prosecuted and well-publicised cases over the last decade have included a Norwegian firm breaching Basel Convention rules in exporting to Africa and a case of fraud in the product refund programme for waste oil.

Hazardous substances

Several persistent and accumulative hazardous chemical substances (also called eco-toxins) that may have a toxic effect in the environment are linked to waste streams. They include PCBs, dioxins, hexachlorobenzene (HCB), brominated flame retardants and heavy metals. Targets were set in 1997 to substantially reduce or eliminate the releases of such chemicals, and several measures have since been undertaken. In 2000, the *substitution principle* was added to the Product Control Act, requiring businesses to replace dangerous substances with less hazardous alternatives whenever possible, provided it does not entail unreasonable cost.

The government set *reduction targets* for five types of eco-toxin, aiming to eliminate their release by 2005.[22] Four were on target that year, with reductions ranging from 82% to 100%, and PCBs had been reduced by half. Additional substances were listed in 2006 to be "substantially reduced" by 2010, from 1995 levels.[23] Projections in 2007 indicated that most national emissions would be reduced by over 50% and up to 100% for some (KLIF, 2010e), suggesting that the targeted reductions would be achieved by 2010 in the majority of cases.[24] Progress on arsenic and polycyclic aromatic hydrocarbons (PAHs) was below 50%, however, and the use of brominated flame retardants has increased (Box 7.4).

Factors contributing to the achievement of targets include strict emission limits in industry, regulations on the amount of hazardous substance in products and requirements regarding safe handling of waste containing hazardous substances. Measures on eco-toxins include bans on PCBs in ballasts of vapour lamp fixtures and indoor fluorescent light fixtures (2005), PCBs in ballasts of outdoor fluorescent light fixtures, mercury in new products and perfluorooctansulfonate (PFOS) in firefighting foam, impregnation agents and textiles (2007), and the brominated fire retardant deca-BDE in new products (2008). Electrical bushings containing PCBs are banned from 2010 (KLIF, 2010e).[25] Norway also prohibits incineration of waste containing more than 0.25% mercury, and is phasing out PFOS.

Box 7.4. **Prioritised hazardous substances**

Total consumption of *brominated flame retardants* has increased significantly since 1995, from slightly less than 100 tonnes to 450 tonnes in 2007. A ban on penta-, octa- and decabrominated diphenyl ether (PBDEs) reduced emissions of these substances, but use of other products increased, notably hexabromocyclododecane (HBCDD) and tetrabromobisphenol A (TBBPA), the flame retardant used in printed circuit boards, thus raising emissions via routes such as municipal drainage systems, landfills and other waste treatment. A national action plan for brominated flame retardants was adopted in 2002, and updated in 2009 with measures aiming to reduce emissions in line with goals set for 2020.

National emissions of *arsenic* decreased by 23% over 1995-2007. The main source of arsenic emissions is wood impregnated with chromated copper arsenate (CCA). The use of CCA-impregnated wood is now strictly limited, but arsenic and chromium leach out of wooden structures predating the limits. Rebuilding all such structures is seldom cost-effective. Current waste management systems and procedures are considered adequate for environmentally responsible handling of waste containing CCA-impregnated wood.

Emissions of *polycyclic aromatic hydrocarbons* (PAH) fell by 46% between 1995 and 2007 due to modernisation of aluminium production processes. Diffuse emissions from residential heating with biofuel and wood, and from traffic, are expected to be the largest type of PAH emissions in 2010.

The country has set targets and drawn up development plans for reduction of *persistent organic pollutants* (POPs) and other persistent and bioaccumulative chemicals. The *Norwegian List of Priority Substances* contains the 12 POPs originally listed in the Stockholm Convention and some of the nine POPs added to the convention in 2009. Norway has been active in the Nordic monitoring programmes for potential new POPs, and in successful work towards the addition in 2009 of the flame retardant penta-BDE to the Stockholm Convention and the Convention on Long-range Transboundary Air Pollution. KLIF conducts yearly screening of the distribution of selected emerging pollutants in the environment, and in 2009 identified three brominated fire retardants and four polyfluorinated compounds as being of concern (KLIF, 2010f).

Norway continues to work towards further reduction of the use of hazardous substances, drawing up proposals for *additional substances to be eliminated by 2020* (MoE, 2006a). It is also focusing on improving data collection on such substances through the Product Register (Box 3.1). A multi-stakeholder committee was established and studies were commissioned, to be completed by 2011.

5. Contaminated sites

Norway has built its wealth on rapidly growing industrial development, but with this has come a legacy of *contaminated sites and contaminated sediments*.

Over 3 500 sites where the *ground is believed to be contaminated* have been identified. Clean-up operations at old landfills containing hazardous waste and industrial sites polluted with hazardous chemicals have been carried out for decades. Such efforts continued over the review period, focusing on 600 of the most contaminated sites. Out of the 100 most heavily polluted sites, scheduled to be cleaned up by the end of 2005, 83 were decontaminated before the target date and all have now been remediated. Of the 500 sites in the next most serious category, 166 had been remediated by 2009 and 334 awaited decontamination. Around 60% are industrial sites and 40% are old landfills.

A *nationwide database of contaminated sites*, including contamination and clean-up history, is available to the public. At the municipal and county levels, however, funding for monitoring, enforcement and technical expertise may be insufficient to allow proactive management and prevention of development on contaminated land.

After discovery of *contaminated soil at day-care centres, playgrounds and schools*, an action plan was announced in 2006 (SFT, GNU, 2007). Investigations of almost 2 000 day-care centres in the ten largest towns and five most polluted communities were completed in 2008. These confirmed contamination by lead, PAH (benzo(a)pyrene), arsenic and, at some sites, PCBs and mercury. The contamination was due to industrial activities, road traffic emissions and the use of contaminated soil in landscaping and CCA-impregnated wood for sandboxes. Although the concentrations were not so high as to pose an acute health hazard for children, actions were recommended to remove polluted soil or impregnated wood in nearly 70% of the centres investigated. Contaminated surface soil and CCA-impregnated sandbox frames were to be removed by summer 2010.[26]

Serious *contamination of marine sediment* has been found in more than 120 areas classed as hazardous for fish and shellfish harvest. They include areas receiving run-off from old shipyard sites, which typically contains high contaminant levels from sandblasting of PCB paint, and from fire training grounds, which may contain fluorobrominated compounds and PFOS. In response, restrictions were placed on the consumption of fish and fishery products

in 24 fjords and harbours covering 820 km^2. The cost of preventing further deterioration was estimated at USD 1.1 billion, and that of improving the situation to a level that poses no danger to the ecosystem was put at USD 3.5 billion (Breedveld *et al.*, 2009).

The MoE has identified the clean-up of contaminated coastal, fjord and harbour sediment as a top priority for the reviewing period and beyond. In 2001, a *strategy for addressing contaminated sediment* was put forward (MoE, 2001). As a follow-up, the ministry appointed a Norwegian Council on Contaminated Sediments in 2003 to identify gaps in knowledge and to make recommendations to the environmental regulators on sediment management. Pilot projects were launched for 17 fjord and harbour areas. KLIF began monitoring environmentally hazardous substances in sediment and in marine organisms. By 2005, all priority coastal areas had drawn up county action plans and begun implementing them (MoE, 2006b). Progress has varied among the sites; for example, remediation has been completed in Oslo's harbour, but in others, such as that of Stavanger, contamination is still spreading.

As *remediation projects are complex and costly*, the methods used need to be sustainable and provide assurance that the investment required will result in long-term improvement. Reducing impacts on human health, cost-effectiveness and the adaptation of measures to the local conditions are therefore key issues. The Oslo harbour remediation project drew considerable interest from non-government organisations and local interest groups, albeit mainly after the remediation had begun. Stakeholders need to be involved at an early stage in the development of remediation plans to ensure that all aspects are considered before decisions are made.

Notes

1. Some caution is needed in interpreting waste data due to the use of different national definitions and changes in some estimation methods during the review period.
2. White papers on the Government's Environmental Policy and State of the Environment, issued every two years, present the main elements and priorities in Norway's environmental policy and report on trends in eight priority areas (Chapter 3).
3. The Norwegian list of dangerous substances records some 3 500 substances that may lead to serious harm to human health and ecosystems when accumulated in the environment and in food chains. The list was drawn up according to Annex 1 to the EU Directive on Dangerous Substances (67/548/EEC).
4. In comparison, the population of Norway grew by 8% over the review period.
5. Until 2004, the Pollution Control Act referred to "consumption" and "production" waste, and attributed all consumption waste to municipalities regardless of its origin. The classification was changed in 2004 into "household" and "industrial" waste, and while household waste is still attributed to municipalities, the term "municipal" waste is no longer used.
6. The "sent for recovery" category comprises incineration (only incineration with energy recovery is included), recycling and composting. Analysis of municipal data for 2009 shows that 40% of household waste goes to incineration (32% mixed and 8% sorted; not all waste incineration is used to generate energy), 36% is recycled, 12% landfilled and 10% subjected to other treatment, while 2% is exported.
7. Inert-waste landfills are exempt from these requirements.
8. Sweden's full-scale waste incineration plants with district heating require high utilisation rates to run properly. Given this fact plus the higher electricity prices in Sweden and higher incineration costs in Norway, there is more incentive to export waste than to use it in Norwegian incineration plants.
9. A drop in imports recorded in 2007 probably reflected inadequacies in reporting.
10. The costs were expected to include collection of up to 400 kg of hazardous waste annually per household.

11. Revenue from waste fees must not exceed the cost of the service to the municipality. Municipalities are allowed to subsidise water and wastewater service by retaining a portion of the fees and providing service at below-cost prices.
12. User-pays fees, if averaged to a general charge, do not give clear information to the waste generator, in contrast with volume or weight based "pay-as-you-throw" systems.
13. Coverage rates nationwide in other categories are lower (*e.g.* glass 12%, metal 10%, hazardous waste 10%, WEEE 5%).
14. To facilitate operations of the various programmes and facilitate exchange of experience, producer responsibility organisations have formed a common platform called LOOP that aims to inform consumers, industry and commerce of the benefits of recovery and recycling. LOOP publishes newsletters and a website (*www.loop.no*) and runs information projects targeting schools, local government, industry and commerce.
15. The tax was also applied to recovered TRI and PER and products containing more than 1% TRI and/or 0.1% PER.
16. In 2006, methane emissions from landfills accounted for about 30% of Norway's total methane emissions and 2.5% of its aggregate greenhouse gas emissions.
17. The share is estimated at 84% if waste undergoing "unknown handling" is included in the hazardous waste total.
18. Out of 1 824 facilities, 274 hold permits under the EU Integrated Pollution Prevention and Control Directive.
19. The amount is determined by comparing estimated waste generation volumes with actual waste deliveries to approved treatment facilities.
20. The tonnage is recorded when the waste is received by approved facilities.
21. Økokrim, the Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime, was established in 1989 under the Ministry of Justice (Chapter 3).
22. The substances were short-chain chlorinated paraffin, nonyl- and octylphenol and their ethoxylates, pentachorophenol, certain surfactants (DTDMAC, DSDMAC and DHTMAC) and PCBs.
23. The substances include the brominated flame retardants penta-BDE, octa-DBE, deca-BDE, HBCDD, TBBPA; additional chlorinated paraffins; arsenic, lead, cadmium and their compounds; organic tin compounds; musk ketone and musk xylene; perfluorinated compounds; the surfactants DODMAC/DSDMAC and DHTDMAC; bisphenol, diethylhexylphtalate (DEHP); and triclosan.
24. "Substantially reduced" was defined as reduction of 50-90% from 1995 release levels. Reductions of 80-100% had been achieved for DEHP, EDC, HCB, PER, TBT, TCB, TRI and medium-chain chlorinated parafins. Reductions of 50-80% had been achieved for dioxins, Cd, CABs, and Hg.
25. Despite these and earlier bans, PCBs remain widespread in older building fixtures (sealant, filler, cement, paint, windows, lighting ballasts, electricity lead-ins, motorised appliances). A 2009 study estimated that 72 000 insulating window units containing PCBs were still in use. PCB waste identification and removal rules for building demolition and renovation were developed in consultation with business and labour organisations, and hazard management plans have been mandatory since 2008.
26. CCA-impregnated wood elsewhere is required to be varnished with oil every other year until it can be removed.

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I.A: SELECTED ENVIRONMENTAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	**NOR**	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD*	OECD*
LAND																																
Total area (1000 km^2)		9985	1964	9832	378	100	7741	268	84	31	79	43	338	549	357	132	93	103	70	301	3	42	**324**	313	92	49	505	450	41	784	244	35294
Nitrogenous fertiliser use (t/km^2 of agricultural land)		2.9	1.1	2.7	9.3	17.3	0.2	2.3	2.7	9.8	7.6	6.5	7.5	6.9	9.2	3.7	5.1	0.7	8.0	5.2	11.3	10.9	**10.2**	9.1	2.8	5.9	2.7	7.4	3.4	3.6	5.2	2.2
Pesticide use (t/km^2 of agricultural land)		0.05	0.04	0.07	1.18	1.32	-	0.04	0.11	0.51	0.11	0.12	0.07	0.25	0.19	0.22	0.17	-	0.07	0.61	-	0.56	**0.07**	0.09	0.47	0.20	0.15	0.07	0.09	0.04	*0.15*	*0.07*
Livestock densities (head of sheep eq./km^2 of agr. land)		139	252	168	723	1492	59	817	500	1586	244	824	321	470	649	388	159	58	1120	422	999	1982	**844**	312	425	211	307	380	765	244	*547*	190
FOREST																																
Forest area (% of land area)		34.1	33.5	33.2	68.5	64.3	19.7	31.5	47.0	22.3	34.3	12.7	72.9	29.0	31.8	29.8	22.4	0.3	10.5	30.6	33.5	10.8	**32.4**	30.5	37.7	40.2	35.7	68.7	30.8	14.4	11.8	30.7
Use of forest resources (harvest/growth)		..	..	..	0.2	1.0	..	0.7	0.6	0.8	..	..	0.7	..	1.0	..	..	..	0.9	..	..	..	**0.4**	0.5	..	..	..	..	..	..	0.5	..
Tropical wood imports (USD/cap.)	*2*	3.2	0.9	2.8	7.9	5.0	9.1	5.3	0.9	28.1	0.9	7.7	5.8	9.8	3.7	5.0	0.1	8.0	7.1	7.4	0.7	33.2	**4.0**	1.4	14.1	1.8	6.1	1.5	0.6	2.1	3.0	4.9
THREATENED SPECIES																																
Mammals (% of species known)		20.3	31.8	16.8	23.3	11.4	23.8	18.0	22.0	35.9	20.0	22.0	10.8	19.0	37.9	38.2	37.8	-	1.8	40.7	51.6	18.6	**18.2**	13.5	26.2	21.7	13.3	18.3	32.9	14.3	*15.8*	..
Birds (% of species known)		9.8	16.2	11.7	13.1	6.3	13.0	21.0	27.7	24.9	50.0	16.3	13.3	19.2	27.3	1.9	14.5	44.0	5.4	18.4	23.1	21.6	**14.5**	7.8	33.3	14.0	26.9	17.5	36.4	3.7	*16.2*	..
Fish (% of species known)		29.6	27.6	31.7	36.0	8.9	1.0	10.0	50.6	23.4	41.5	15.8	11.8	36.1	68.2	26.2	43.2	-	23.1	35.1	27.9	22.1	**-**	21.0	62.9	24.1	51.4	10.9	38.9	11.1	*11.1*	..
WATER																																
Water withdrawal (% of gross annual availability)		1.4	17.8	19.5	20.1	36.2	4.8	1.6	4.1	31.2	10.7	4.9	2.1	17.0	17.2	12.1	4.9	0.1	2.3	24.0	2.9	10.9	**0.8**	18.3	12.4	0.8	29.2	1.4	5.0	17.3	*12.0*	*11.2*
Public waste water treatment (% of population served)		86	40	68	74	89	..	80	93	69	76	90	80	80	95	65	57	57	65	94	95	99	**79**	64	70	58	92	86	97	46	*97*	*73*
Fish catches (% of world catches)		1.1	1.6	5.2	4.7	2.0	0.2	0.5	-	-	-	0.9	0.2	0.6	0.3	0.1	-	1.6	0.2	0.3	-	0.5	**2.6**	0.2	0.3	-	1.0	0.3	-	0.6	0.7	25.7
AIR																																
Emissions of sulphur oxides (kg/cap.)		52.0	25.9	34.2	6.1	8.3	122.9	18.7	2.7	9.1	16.8	3.6	12.9	5.8	6.1	39.8	8.8	48.1	10.1	4.9	6.4	3.1	**4.2**	26.2	10.0	12.8	11.6	3.3	1.8	15.1	8.3	20.4
(kg/1000 USD GDP)	*3*	1.4	1.8	0.8	0.2	0.3	3.5	0.7	0.1	0.3	0.7	0.1	0.4	0.2	0.2	1.5	0.5	1.3	0.3	0.2	0.1	0.1	**0.1**	1.6	0.5	0.6	0.4	0.1	-	1.2	0.2	0.7
% change (2000-2008)		-25	-5	-29	-15	-18	11	25	-29	-43	-34	-33	-15	-42	-22	-10	-82	74	-68	-61	134	-29	**-25**	-34	-64	-45	-64	-26	-15	-26	-58	-28
Emissions of nitrogen oxides (kg/cap.)		64.2	14.0	48.7	14.7	24.6	82.5	37.8	24.7	21.9	25.1	27.6	31.7	20.5	16.8	31.8	18.2	70.3	24.4	17.8	38.2	16.6	**36.8**	21.8	24.5	17.6	27.5	16.9	10.6	18.1	22.9	29.1
(kg/1000 USD GDP)	*3*	1.8	1.0	1.1	0.5	1.0	2.3	1.5	0.7	0.7	1.1	0.8	0.9	0.7	0.5	1.2	1.0	1.9	0.6	0.6	0.5	0.4	**0.7**	1.3	1.2	0.9	1.0	0.5	0.3	1.5	0.7	0.9
% change (2000-2008)		-15	4	-27	-11	6	17	16	-	-29	-18	-25	-20	-23	-25	7	-2	-17	-20	-27	12	-26	**-14**	-1	-13	-12	-11	-27	-18	24	-25	-18
Emissions of carbon dioxide (t./cap.)	*4*	16.5	3.8	18.4	9.0	10.3	18.5	7.8	8.3	10.4	11.2	8.8	10.6	5.9	9.8	8.3	5.3	6.9	9.9	7.2	21.5	10.8	**7.9**	7.8	4.9	6.7	7.0	5.0	5.7	3.7	8.3	10.6
(t./1000 USD GDP)	*3*	0.46	0.29	0.42	0.29	0.40	0.52	0.31	0.23	0.31	0.48	0.26	0.32	0.19	0.29	0.31	0.29	0.19	0.25	0.26	0.29	0.28	**0.16**	0.48	0.23	0.33	0.25	0.14	0.15	0.30	0.24	0.34
% change (2000-2008)		3	18	-2	-3	19	17	12	13	-6	-4	-4	4	-2	-3	7	-2	3	7	1	30	3	**12**	2	-12	-3	12	-13	5	31	-2	1
WASTE GENERATED																																
Industrial waste (kg/1000 USD GDP)	*3, 5*	..	..	..	40	30	10	10	..	40	30	10	100	50	20	..	30	-	30	20	20	30	**20**	90	40	80	20	100	-	20	20	40
Municipal waste (kg/cap.)	*6*	400	360	750	400	380	600	400	580	490	310	800	520	540	580	450	450	560	740	560	710	620	**830**	320	480	310	580	520	730	430	570	560
Nuclear waste (t./Mtoe of TPES)	*7*	6.3	0.1	0.9	1.4	2.9	-	-	-	2.2	1.8	-	2.0	4.3	0.9	-	1.9	-	-	-	-	0.1	**-**	-	-	3.3	0.8	4.9	2.3	-	1.8	1.4

.. not available. - nil or negligible.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates. Partial totals are underlined. Varying definitions can limit comparability across countries.

2) Total imports of cork and wood from non-OECD tropical countries.

3) GDP at 2005 prices and purchasing power parities.

4) CO_2 from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

Source: OECD Environmental Data Compendium.

5) Waste from manufacturing industries.

6) CAN, NZL: household waste only.

7) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

I.B: SELECTED ECONOMIC DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	**NOR**	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	OECD
GROSS DOMESTIC PRODUCT																																
GDP, 2009 (billion USD au 2005 prices and PPPs)		1167	1334	12987	3789	1243	775	108	289	348	232	178	164	1913	2630	299	171	11	161	1599	35	601	**230**	638	219	106	1244	301	287	836	1988	35882
% change (2000-09)		16.9	10.9	15.7	4.4	41.1	31.1	25.2	14.7	12.0	33.6	5.5	16.4	11.1	4.7	33.4	22.5	29.1	31.3	1.3	29.6	12.0	**17.6**	41.2	5.0	54.3	22.9	16.1	14.9	33.8	14.1	14.5
per capita, 2009 (1000 USD/cap.)		34.6	12.4	42.3	29.7	25.5	35.3	24.9	34.5	32.5	22.1	32.3	30.8	30.5	32.1	26.6	17.1	34.0	36.2	26.5	69.9	36.4	**47.7**	16.7	20.6	19.5	27.1	32.4	37.0	11.6	32.2	30.0
Exports, 2009 (% of GDP)		36.8	28.9	12.8	18.7	51.2	22.0	30.5	59.3	87.6	78.2	57.6	50.7	26.8	48.9	23.1	82.7	43.9	92.9	29.7	180.1	80.2	**50.8**	37.9	33.5	88.1	27.5	55.0	57.1	23.8	30.3	28.3
INDUSTRY	*2*																															
Value added in industry (% of GDP)		32	36	22	30	37	26	31	23	38	26	32	20	30	19	29	24	34	27	15	25	46	**32**	24	38	28	28	28	28	24	27	-
Industrial production: % change (2000-08)		-5.2	7.9	5.0	5.5	60.8	11.7	11.0	36.1	11.5	57.0	5.5	24.8	-0.4	21.1	0.3	55.9	..	42.2	-1.8	15.0	10.7	**-7.1**	63.4	-7.7	77.1	0.6	13.2	20.8	41.1	-6.5	10.3
AGRICULTURE																																
Value added in agriculture (% of GDP)	*3*	2.2	3.4	1.3	1.5	2.9	6.4	1.7	0.7	2.5	1.2	3.0	2.0	0.9	3.7	4.3	5.8	1.7	2.0	0.3	1.8	1.2	**3.7**	2.3	3.1	2.6	1.6	1.2	8.6	0.7	2.5	-
Agricultural production: % change (2000-09)		15.7	18.4	11.9	-5.0	-	-7.2	11.9	-	-7.7	..	8.1	2.0	-3.0	4.0	-22.0	7.5	5.9	-9.1	-4.0	-7	-6.0	**-3.1**	13.3	-6.0	4.3	-5.9	-1.0	2.0	10.6	-3.9	..
Livestock population, 2009 (million head of sheep eq.)		94	259	689	37	27	247	93	16	22	10	22	7	137	110	18	9	1	47	57	1	38	**9**	50	15	4	86	12	12	96	97	2320
ENERGY																																
Total supply, 2009 (Mtoe)		250	177	2172	474	229	131	18	32	56	43	18	33	253	319	29	25	6	14	163	4	77	**27**	94	24	17	128	43	27	92	198	5172
% change (2000-09)		-0.6	22.1	-4.5	-8.7	23.2	21.3	8.4	13.7	-4.7	7.9	-4.0	2.8	0.5	-5.5	7.2	-0.6	78.1	2.3	-5.1	17.5	5.5	**2.5**	5.0	-3.3	-3.9	5.1	-8.5	9.3	20.7	-11.4	-1.2
Energy intensity, 2009 (toe/1000 USD GDP)		0.21	0.13	0.17	0.13	0.18	0.17	0.17	0.11	0.16	0.19	0.10	0.20	0.13	0.12	0.10	0.15	0.51	0.09	0.10	0.11	0.13	**0.12**	0.15	0.11	0.16	0.10	0.14	0.09	0.11	0.10	0.14
% change (2000-09)		-14.9	10.1	-17.4	-12.6	-12.7	-7.5	-13.4	-0.8	-14.9	-19.2	-9.0	-11.7	-9.5	-9.7	-19.6	-18.8	38.0	-22.1	-6.3	-9.3	-5.8	**-12.8**	-25.6	-8.0	-37.7	-14.5	-21.3	-4.9	-9.8	-22.3	-13.7
Structure of energy supply, 2009 (%)	*4*																															
Solid fuels		8.3	5.0	22.4	21.5	28.1	42.5	9.0	9.3	5.7	42.1	22.3	17.0	3.9	22.7	28.0	10.7	1.4	14.8	7.7	1.6	9.7	**2.1**	54.8	12.1	22.3	8.5	3.5	0.6	30.9	15.3	19.7
Oil		34.9	56.3	36.9	42.7	40.0	30.8	34.9	39.0	41.1	20.6	35.6	27.5	31.2	32.5	55.6	27.6	15.2	50.1	42.1	64.4	38.3	**32.7**	25.4	48.3	19.9	47.2	27.6	42.5	27.2	32.7	37.2
Gas		30.7	27.7	25.1	17.0	13.5	21.6	19.6	23.4	26.3	15.1	21.9	10.9	15.1	23.9	10.4	37.3	-	30.7	40.2	30.9	45.5	**20.2**	13.1	18.0	29.8	24.2	2.6	9.9	31.3	39.5	24.2
Nuclear		9.3	1.5	10.0	15.4	16.8	-	-	-	22.0	16.0	-	19.2	41.8	11.0	-	16.5	-	-	-	-	1.4	**-**	-	-	22.1	10.7	30.4	26.7	-	9.1	11.3
Hydro, etc.		16.8	9.5	5.7	3.4	1.6	5.2	36.5	28.2	4.8	6.2	20.2	25.4	8.0	10.0	6.1	7.8	83.4	4.4	9.9	3.2	5.0	**45.0**	6.7	21.6	5.9	9.4	35.8	20.3	10.6	3.3	7.7
ROAD TRANSPORT	*5*																															
Road traffic volumes per capita, 2007 (1000 veh.-km/cap.)		10.1	0.7	16.3	6.8	4.7	10.1	13.7	10.3	9.2	4.6	8.2	10.1	8.5	7.0	10.1	2.3	9.6	10.1	9.3	8.8	8.4	**8.2**	4.2	8.9	2.9	5.2	8.6	8.3	1.0	8.3	8.7
Road vehicle stock, 2007 (10 000 vehicles)		1883	2569	24795	7413	1590	1417	273	513	575	483	262	299	3665	4922	608	349	24	226	4021	36	822	**269**	1702	573	166	2696	478	430	946	3316	67323
% change (2000-07)		7.2	67.7	12.2	4.8	31.8	19.4	17.4	3.6	9.8	29.5	16.3	21.1	8.4	7.9	42.1	26.9	34.4	46.5	11.2	20.8	11.7	**16.7**	41.2	20.6	15.6	25.8	9.0	11.9	58.6	17.1	14.9
per capita (veh./100 inh.)		57	24	82	58	33	67	65	62	54	47	48	56	59	60	54	35	78	52	68	75	50	**57**	45	54	31	60	52	57	13	54	57

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction; production: excludes construction.

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

Source: OECD Environmental Data Compendium.

I.C: SELECTED SOCIAL DATA (1) **OECD EPR / THIRD CYCLE**

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	**NOR**	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	OECD
POPULATION																																
Total population, 2009 (100 000 inh.)		337	1076	3070	1275	487	220	43	84	108	105	55	53	626	819	113	100	3	45	598	5	165	**48**	382	106	54	459	93	77	719	609	11936
% change (2000-09)		10.0	9.3	8.8	0.5	3.7	14.6	11.9	3.1	5.2	2.3	3.4	3.1	6.0	-0.4	2.9	-1.9	13.5	17.6	5.8	13.1	3.8	**7.5**	-0.4	4.0	0.5	14.1	4.8	7.8	11.9	4.9	6.2
Population density, 2009 (inh./km^2)		3.4	54.8	31.2	337.4	488.8	2.8	16.1	99.7	353.4	133.2	128.1	15.8	114.0	229.3	85.2	107.7	3.1	63.5	200.0	190.5	397.9	**14.9**	121.9	115.5	110.6	90.9	20.7	187.5	91.8	253.7	33.9
Ageing index, 2008 (over 64/under 15)		81.5	19.1	63.6	164.3	59.3	68.6	60.5	113.3	100.9	103.9	85.7	99.0	91.2	154.1	130.2	106.3	55.5	52.9	140.5	77.1	83.4	**76.8**	87.5	114.1	78.2	113.1	105.5	114.8	26.8	92.5	76.2
HEALTH																																
Women life expectancy at birth, 2007 (years)		83.0	77.5	80.7	86.0	82.7	83.7	82.2	82.9	82.3	79.9	80.7	83.1	84.3	82.4	82.0	77.3	82.9	82.1	84.0	81.9	82.3	**82.9**	79.7	82.3	78.1	84.4	83.0	84.2	74.8	81.1	..
Infant mortality, 2007 (deaths /1 000 live births)		5.0	15.2	6.7	2.6	4.1	4.2	4.8	3.7	3.7	3.3	3.8	2.8	3.8	3.8	3.6	5.9	2.0	3.1	3.7	2.5	4.1	**3.2**	6.0	3.4	6.7	3.8	2.5	4.4	17.6	4.8	..
Expenditure, 2007 (% of GDP)		10.1	5.9	16.0	8.1	6.8	8.7	9.2	10.1	10.2	6.8	9.8	8.2	11.0	10.4	9.6	7.4	9.3	7.6	9.0	7.3	9.8	**8.6**	6.4	9.9	7.7	8.5	9.1	10.8	5.7	8.4	..
INCOME AND POVERTY																																
GDP per capita, 2009 (1000 USD/cap.)		34.6	12.4	42.3	29.7	25.5	35.3	24.9	34.5	32.5	22.1	32.3	30.8	30.5	32.1	26.6	17.1	34.0	36.2	26.5	69.9	36.4	**47.7**	16.7	20.6	19.5	27.1	32.4	37.0	11.6	32.2	30.0
Poverty (% pop. < 50% median income)		12.0	18.4	17.1	14.9	14.6	12.4	10.8	6.6	8.8	5.8	5.3	7.3	7.1	11.0	12.6	7.1	7.1	14.8	11.4	8.1	7.7	**6.8**	14.6	12.9	8.1	14.1	5.3	8.7	17.5	8.3	10.6
Inequality (Gini levels)	*2*	31.7	47.4	38.1	32.1	31.2	30.1	33.5	26.0	26.0	25.0	25.0	26.0	26.0	30.0	34.0	26.0	28.0	31.0	32.0	27.0	28.0	**24.0**	32.0	37.0	24.0	31.0	23.0	27.6	43.0	33.0	30.3
Minimum to median wages, 2003	*3*	41.0	19.0	32.0	31.0	25.0	57.0	46.0	x	47.0	37.0	x	x	61.0	x	49.0	49.0	x	38.0	x	54.0	51.0	**x**	40.0	44.0	45.0	29.0	x	x	44.0	44.0	..
EMPLOYMENT																																
Unemployment rate, 2008 (% of civilian labour force)	*4*	6.1	4.0	5.8	4.0	3.2	4.2	4.2	3.9	7.0	4.4	3.4	6.4	7.8	7.3	7.7	7.8	3.0	6.0	6.8	4.8	2.8	**2.5**	7.2	7.8	9.5	11.4	6.1	3.5	9.8	5.6	6.1
Labour force participation rate, 2008 (% 15-64 years)		80.4	65.0	75.6	80.8	69.3	77.9	79.9	78.4	69.0	70.3	83.5	76.2	69.1	80.0	68.3	60.4	85.0	73.8	63.4	68.3	81.0	**82.0**	62.7	78.3	68.8	74.2	71.2	85.2	50.8	76.6	72.2
Employment in agriculture, 2008 (%)	*5*	2.4	13.0	1.5	4.2	7.2	3.3	7.0	5.6	1.8	3.3	2.7	4.5	2.9	2.3	11.3	4.5	4.0	5.8	3.9	1.4	2.6	**2.8**	14.0	11.5	4.0	4.4	2.2	4.0	23.7	1.5	5.0
EDUCATION																																
Education, 2007 (% 25-64 years)	*6*	87.1	33.6	88.7	84.0	79.1	69.9	72.1	81.0	69.6	90.9	75.0	81.1	70.0	85.3	61.1	79.7	64.1	69.5	53.3	67.9	73.3	**80.7**	87.1	28.2	89.9	51.2	85.0	86.8	30.3	69.6	71.0
Expenditure, 2006 (% of GDP)	*7*	6.1	5.7	7.6	4.9	7.0	5.2	5.9	5.4	6.1	4.6	7.1	5.6	6.0	4.7	..	..	7.8	4.7	4.5	3.1	5.6	**5.4**	5.3	5.6	-	4.8	6.3	5.6	..	5.8	5.7
OFFICIAL DEVELOPMENT ASSISTANCE	*8*																															
ODA, 2009 (% of GNI)		0.30	..	0.20	0.18	0.10	0.29	0.29	0.30	0.55	..	0.88	0.54	0.46	0.35	0.19	..	..	0.54	0.16	1.01	0.82	**1.06**	..	0.23	..	0.46	1.12	0.47	..	0.52	0.31
ODA, 2009 (USD/cap.)		119	..	93	74	17	126	72	137	243	..	509	241	198	146	54	..	..	224	55	816	389	**846**	..	48	..	143	489	298	..	186	108

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

REFERENCE II

Actions taken on the 2001 OECD recommendations

Recommendations	Actions taken
	ENVIRONMENTAL MANAGEMENT
	Increasing the effectiveness of environmental policies
Improve the *effectiveness of environmental policies* with respect to a number of priority environmental objectives adopted nationally or internationally.	Emissions of conventional air pollutants (SO_x, NO_x, NH_3, NMVOC and CO) decreased over the review period, despite the high rate of economic growth. These emission reductions have helped reduce acidification and eutrophication. Further efforts are needed to achieve the NO_x emission reduction target. Around 70% of river length and only a third of lake area are expected to have good ecological status by 2015. The EU Water Framework Directive commitment is thus still far off. The situation is better for coastal waters, with 90% of the coastal water area expected to have good ecological status by 2015. Since 2000, bird populations have at best stabilised (in forests and mountains) if not decreased (on farmland). The proportion of wilderness-like areas (areas more than 5 km from major infrastructure development) has remained fairly stable in recent years, covering 12% of Norway. The last decade has been marked by a significant expansion of national parks and other protected areas. There has been a sharp rise in waste generation over the last few years, especially as regards industrial waste. Norway is treating 90% of its hazardous waste domestically, getting closer to its 100% target. Hazardous pollutant releases from industrial sources have been greatly reduced. However, issues are arising in connection with new substances that prove to be ecological toxins.
Adhere to and continue to pursue established *long-term environmental objectives* while closing the implementation gap.	The National Sustainable Development Strategy, revised in 2007, identifies seven priority areas: *i)* international co-operation to promote sustainable development and combat poverty, *ii)* climate change and long-range transboundary air pollution, *iii)* biodiversity and cultural heritage, *iv)* natural resource management, *v)* hazardous substances, *vi)* sustainable economic and social development, and *vii)* Sami perspectives on environmental and natural resource management.
Strengthen implementation of environmental policies and legislation, with appropriate supervision of *enforcement* for both pollution abatement and nature protection.	The Climate and Pollution Agency and county governors are responsible for enforcing pollution abatement. Co-operation between them has been strengthened and the number of inspections by county governors increased. The environmental permitting procedure has been simplified and enforcement has been better targeted. There has been an increased focus on small and medmium-sized businesses that do not fall under the licence regime but must comply with national regulations on product and chemical safety. The Nature Diversity Act provides for enhanced enforcement. The MoE is given discretionary authority over minor contraventions while the police continue to deal with major contraventions.
Continue to extend *use of economic instruments* for environmental management, on the basis of the conceptual work carried out in the 1990s (*e.g.* tradable permits, green taxation); consider mechanisms to achieve better results concerning emissions of NO_x and VOCs and nutrient discharges.	A tax on CO_2, introduced in 1991, covers 55% of total Norwegian GHG emissions, with rates ranging up to NOK 371 (EUR 43) per tonne CO_2 eq. Exemptions apply mainly to emissions from energy-intensive and emission-intensive industries that are exposed to international competition. These industries are covered either by the national emission trading scheme (ETS) or by an arrangement with the government. Norway established its national ETS in 2005. Emissions subject to the CO_2 tax were not included. Over 2008-12, the Norwegian ETS was linked to the EU ETS and the total Norwegian cap was set at 20% below 2005 emissions. The offshore oil and gas sector has to buy allowances in the market. About half of all allowances will be auctioned by the government. In 2007, Norway introduced a tax on NO_x emissions. Norway's NMVOC emissions have been substantially reduced since 2001, due to technological improvement in offshore oil extraction.
Assess further the *economic rationale of exempting* some emitters from paying the full rate of the CO_2 tax, taking into account the environmental and social implications of these rate differences.	Since 2008, the widening of the ETS has led to reductions in the CO_2 tax rate for some installations, so as to maintain the same level of incentives to reduce emissions and avoid increased costs. Fish processing and wood processing have benefited from concessions on the CO_2 tax since its inception. They have also been covered by the Norwegian ETS since 2008.
Continue to provide *environmental information* and *economic analysis* to support environmental policy developments, including energy prices and environmental expenditure.	Norway is among OECD countries regularly providing data on pollution abatement and control expenditure, though data on private expenditure remain incomplete. Gas sales are left to commercial players and prices are determined through bilateral negotiations, so gas prices are not publicly known.

Recommendations	Actions taken
	Water
Reduce eutrophication by decreasing *nitrogen discharges*, particularly from households, agriculture and aquaculture; in particular, strengthen efforts to achieve the North Sea Conference targets.	Nitrogen discharges to the coast were reduced by 31% from 1985 to 2008. For phosphorus the reduction was 58%. Efforts to reduce eutrophication have focused on phosphorus, because it is the limiting factor to algal growth in freshwater and many Norwegian fjords. The North Sea target for the coast of Skagerrak has been achieved for phosphorus but not nitrogen.
Continue efforts to reduce *discharges of oil and other substances from offshore oil and gas operations*.	Produced water is the main source of discharges of oil to sea from offshore oil and gas activities. Reduction in the oil content of produced water has been offset by the rise in the total quantity of produced water. There has been no net reduction in total discharges of oil and naturally occurring substances with produced water on the Norwegian continental shelf. Accidental discharges of oil and chemicals remain of concern. Discharge of most hazardous chemicals added in offshore activities (black and red categories) was reduced by more than 99.5% from 1997 to 2008, primarily by substituting less hazardous chemicals.
Continue to invest in *municipal waste water treatment*.	In eastern and southern Norway, the main challenge is to rehabilitate the distribution network and old sewage treatment plants, taking climate change into account (hydraulic flows, flooding and urban drainage). Treatment efficiency is relatively high in the North Sea counties, where most treatment plants have chemical and/or biological treatment. Investments in municipal wastewater treatment plants will continue in the west and north, with a deadline for completion by end 2015 (less sensitive areas).
Continue to reduce the share of the water supply which is of *unsatisfactory quality*.	The quality of water in municipal, state-owned and private waterworks is generally very good or good. However, there have been cases of waterborne disease outbreaks in recent years.
Introduce *pricing* of water used in agriculture and industry; install *metering* for new consumers and progressively introduce it for other consumers.	There is a cost recovery policy for municipal water services. Households and industry pay user charges for public water supply and waste water treatment but there are no charges on direct water abstraction or direct pollutant discharges into Norwegian waters.
	Waste
Intensify efforts to *decouple waste generation from economic growth*.	Norway has not met its objective of decoupling waste generation from economic growth, particularly for waste from services and some manufacturing sectors, such as food processing. There has been a notable increase in waste exports to district heating incinerators in Sweden and Denmark, for which the final disposal tax on incineration was removed in October 2010.
Enhance implementation of *extended producer responsibility* schemes in various industrial sectors.	Extended producer responsibility programmes have been introduced in conjunction with waste sorting at source. Most national recovery targets have been met, in particular for used lubricating oil, electric equipment with CFC refrigerants, batteries, tyres, end-of life vehicles and waste packaging. This positive outcome can largely be attributed to tax incentives combined with deposit-refund systems. These programmes function well and have contributed to a significant increase in material and energy recovery of waste, to about 70% of all waste generated in 2007. About two-thirds of the waste recovered was through material recovery.
Conduct cost-benefit analysis of *material recovery schemes* and assess their environmental benefits compared to other forms of waste recovery and disposal.	There has been no overall cost-benefit analysis of all material recovery programmes since 2001. However, in assessment of individual waste policy instruments, the environmental benefits of material recovery compared to other forms of waste recovery and disposal are always considered.
Elaborate plans to ensure that *treatment and disposal of hazardous waste* are organised in an environmentally sound and economically efficient manner, and clearly identify infrastructure needs.	Norway has set for itself a target of treating all its hazardous waste domestically. A second two-year strategy for hazardous waste, launched in 2008, seeks to increase collection and secure sound treatment, and to regulate the amount of hazardous substances in products. So far, 90% of the hazardous waste produced annually in Norway is treated domestically, but several treatment facilities do not meet legal requirements for handling new types of hazardous waste. The Climate and Pollution Directorate has engaged in co-operation with Customs to increase inspection of transboundary movements in order to disclose and stop illegal exports.
Continue efforts aimed at *remediating closed landfills* and other contaminated sites.	The 100 contaminated sites that needed instant remediation have been remediated. Investigations are continuing on 334 other sites believed to be seriously contaminated. Although concentrations of contaminants were not so high as to pose an acute health hazard for children, an action plan for the remediation of contaminated soil at day-care centres and playgrounds has been carried out. A database with information on all contaminated sites in Norway has been established.
	Nature and biodiversity
Reinforce and accelerate efforts to *extend the area and representativeness of protected areas* in mainland Norway, meet adopted targets (*e.g.* doubling protected areas between 1994 and 2010, creating more nature reserves in forested areas), and link to the Natura 2000 network; complete and implement plans for *marine protected areas*.	Protected areas were extended from 24 557 km^2 (7.6% of the land area) in 2001 to 50 861 km^2 (15.7% of the land area) in 2010. Data on the representativeness of protected areas are lacking, but a report is being prepared by the Norwegian Institute for Nature Research. Nature management is not part of the EEA agreement and Norway cannot formally link to the Natura 2000 network. A similar network, the Emerald Network, was established under the Bern Convention. Norway has nominated 11 areas to the Emerald Network and further nominations are expected.

Recommendations	Actions taken
Continue efforts to maintain or restore populations of *threatened species* (*e.g.* large predators).	A 2001 regulation on threatened species prohibits removal, direct damage and destruction of about 60 species. In 2004, the Storting (parliament) set management goals for large carnivores in terms of numbers of yearly reproductions. Reproduction exceeds the goals for lynx and wolverine, is close to the goal for wolf, but lags considerably for bear. Compared to the situation ten years ago, all populations have grown. The Nature Diversity Act entered into force on 1 July 2009. It contains principles and instruments that are important when it comes to maintaining or restoring populations of threatened species. The precautionary principle is statutory, as is the principle of ecosystem approach and cumulative environmental effects. Regulations on 12 priority species are under preparation, and more will come.
Strengthen efforts to protect *wild salmon* stocks and their genetic biodiversity.	Activities harmful to wild salmon are prohibited in 52 national salmon rivers and 29 national salmon fjords, which cover about 95% of salmon resources in Norway. Even though Norway follows international guidelines agreed in the North Atlantic Salmon Conservation Organization, wild salmon stocks have been significantly reduced and remain threatened by escaped farmed salmon.
Continue efforts to integrate *fisheries management* policy with environmental policies, including managing fisheries on a sustainable and multi-species basis.	The most important effort to integrate fisheries management policy with environmental policy in recent years has been through the development of two regional integrated sea management plans: for the Barents Sea and the Sea Areas of the Lofoten islands, and for the Norwegian Sea. Work has started on a regional management plan for the Norwegian part of the North Sea.
Increase *support to local authorities* to enable them to face their increased responsibilities in nature and biodiversity management.	In line with the new Nature Diversity Act, which promotes local and knowledge-based management, the government has decided that municipalities will manage national parks and large-scale protected areas and participate in their management boards. The government is covering associated costs to municipalities.
	TOWARDS SUSTAINABLE DEVELOPMENT
	Integrating environmental concerns in economic and sectoral policies
Take further action to more effectively *decouple environmental pressures* from economic growth.	Goals were set for waste reduction. The CO_2-based registration tax on cars aims at decoupling CO_2 emissions from GDP and traffic growth, as does the tax on NO_x emissions. Subsidies for energy efficiency measures and renewable forms of energy aim at decoupling energy use from GDP growth.
Monitor progress in *sectoral environmental integration* and ensure that the targets set in sectoral environmental action plans (*e.g.* for energy, transport, agriculture, aquaculture, fisheries) are met.	All ministries developed sectoral environmental action plans between 1998 and 2003. The experiences in this round of plans, combined with recommendations by independent consultants, led to a decision not to continue the procedure, though some ministries have made new plans voluntarily. Ministries' environmental efforts are now followed up by annual reporting to the MoE through the ordinary state budget process.
Ensure *long-term reliability of fiscal policy measures* concerning sustainable management of renewable and non-renewable natural resources, as well as the transmission of wealth to future generations (*e.g.* through the Petroleum Fund, taxation).	Norway's substantial oil and gas production revenue has resulted in considerable savings in the Government Pension Fund. The fund's purpose is to manage oil and gas revenue in the long term so as to meet the rise in public pension expenditure. Established in 2006, the fund consists of the Government Pension Fund – Global, which is a continuation of the Petroleum Fund, and the Government Pension Fund – Norway, previously the National Insurance Scheme Fund.
Review and adjust *sectoral subsidies* with negative environmental implications, in order to achieve greater economic efficiency and environmental effectiveness.	In 2008, the Ministry of Finance commissioned a report to look closer into the issue of environmentally harmful subsidies.
Prepare a national *sustainable development strategy*.	The National Sustainable Development Strategy was prepared and presented in the National Budget 2008. The intention behind the strategy was to guide sustainable development efforts by the authorities, municipalities, NGOs, companies and individuals, and to mobilise support for joint efforts. It focuses on how Norway can contribute to sustainable development globally and assure sustainable development nationally.
	Integrating social concerns into environmental policies
Continue efforts to maintain and enlarge the national asset base, and to ensure fair and sustainable *transmission of wealth to future generations*.	According to an analysis by Statistics Norway, the country's national assets in 2006 consisted of human capital (76%), built capital (12%) and oil and gas resources (8%). The remaining 4% ("net assets") are funded by revenue from the oil and gas sector. The build-up of the Government Pension Fund is a mechanism for transferring oil and gas rent to future generations.
Continue to give consideration to the *distributive implications of using economic instruments* (*e.g.* green taxes, allocation of permits).	General rules for the preparation of government proposals, including taxes, require consideration of impacts, including distributive impacts. The most thorough consideration concerns impacts on industries exposed to world market competition. Former analyses indicated that there were no particular impacts on household welfare distribution from taxes on fossil fuels.
Seek societal consensus on managing natural resources (*e.g.* in fishing, forestry, farming) and biodiversity (*e.g.* with respect to large predators, reindeer herding), giving attention to the concerns of *indigenous populations and remote communities*.	In 2004, Norway was divided into eight carnivore management regions. In four of the regions, one of the management committee members has to be a Sami. The committees decide on areas where carnivores should be given priority over farming and reindeer herding, on carnivore hunting quotas and on compensation for loss of livestock to carnivores. The Nature Diversity Act has implications on Sami rights and interests in Norway. It was enacted following extensive consultations between the government and the Sami Parliament.

Recommendations	Actions taken
Ratify and implement the *Aarhus Convention*; introduce the necessary changes to Norwegian legislation concerning access to environmental information, access to courts and participation.	In 2003, Norway ratified the Aarhus Convention and enacted legislation on the right to environmental information and public participation in decision-making processes relating to the environment.
Continue to promote *Local Agenda 21* initiatives and encourage environmentally related co-operation among local communities.	More than 200 municipalities participate in the Livable Municipalities programme, launched in 2006 and funded by the MoE. The programme addresses issues related to climate and energy but also land use, quality of life, and production and consumption patterns. The aims are to strengthen local capacity, produce indicators (*e.g.* with Statistics Tool, see *www.livskraftigekommuner.no)*, identify best practices and promote closer intermunicipal co-operation on environmental and social development. Forty networks of municipalities have been formed, grouping five to seven municipalities each.
	Sectoral integration: energy
Set clear medium- and long-term *environmental objectives for the energy sector* and define mechanisms for their integration in energy planning.	The National Sustainable Development Strategy provides the framework within which sectoral policy, including energy policy, is developed, implemented and evaluated.
Set quantitative objectives for the new *Energy Efficiency Agency* (ENOVA) and reinforce *measures to encourage energy efficiency*, especially in the residential sector, industry and transport.	The government has set a target of 18 TWh in new electricity and heat production from renewable sources and energy efficiency by 2011, from a base of 2001. The target was set in an agreement between Enova and the Ministry of Petroleum and Energy. Enova decides on measures to meet the targets and reports on results to the ministry. The current agreement runs until the end of 2011. Public support to Enova has been significantly increased, reaching NOK 1.6 billion in 2010.
Take measures to *moderate demand for electricity* (*e.g.* review electricity prices, ensure their transparency, etc.).	Norway is part of the Nordic electricity market. Nord Pool Spot is the Nordic power exchange, where about 70% of annual consumption in the Nordic market is traded. Nord Pool Spot provides a neutral, transparent reference price for both the wholesale and retail markets. Since 1998 the Norwegian Competition Authority has contributed to price transparency for end-users by regularly publishing reviews of supplier electricity prices. The reviews facilitate comparison of suppliers, contribute to price awareness among consumers and make it easier to change to a competitive supplier. Measures to limit energy consumption have been part of Norwegian energy policy since the 1970s. In the last decade, growth in electricity demand has slowed. A system of informative electricity bills has been introduced. For all customers expected to consume more electricity than 8 000 KWh per year, their bills from the grid company show a year-on-year consumption comparison along with information on where to get advice on energy saving. Since 2005, all consumers using more than 100 000 KWh a year have had to have hourly metering. Work is under way on introducing smart metres to all end-users. This new technology will allow more types of contracts to be developed and will raise awareness about individual electricity consumption. The date for introduction of smart metres depends on the development of EU standards for the devices, however. Electricity consumption is subject to a consumption tax, levied through the grid tariff. In 2010, the tax was NOK 0.11 per KWh.
Implement firm and cost-effective measures to reduce *NO_x, VOC and GHG emissions*, particularly from oil and gas extraction, road transport and ships.	A tax on NO_x emissions was introduced in 2007, along with a voluntary approach to reduce NO_x emissions, including from ships and fishing vessels. Emissions of NO_x and NMVOCs from road transport have been reduced through EEA adoption of the new EU vehicle emission standards. NO_x emissions from oil and gas extraction are being reduced by increased use of low-NO_x gas turbines. Since 2005, CO_2 emissions have been subject to trading and/or taxation.
Take account of *ancillary benefits* (*e.g.* reduced emissions of pollutants other than GHG) in assessing measures to help achieve the Kyoto target.	The value of ancillary benefits, such as better local air quality and a healthier population, has been taken into account in the analysis of measures to achieve Norway's climate goals by 2020 (Climate Cure 2020 report), where feasible.
	International commitments
Set *national commitments for reducing greenhouse gas emissions*, and develop and implement reduction measures accordingly, independent of the status of the Kyoto Protocol.	Norway has set national goals for reducing GHG emissions that go beyond requirements of the Kyoto Protocol. Norway intends to meet its Kyoto-period commitments through a mix of domestic mitigation and the purchase of emission permits from abroad.
Elaborate, and implement with resolve, cost-effective *measures to reduce national NO_x and VOC emissions* (*e.g.* from offshore platforms, ships, gas-fired power plants and private vehicles), and ratify the *Gothenburg Protocol.*	Norway ratified the Gothenburg Protocol in 2002, three years before its entry into force.
Take further measures to *reduce fishing fleet capacity.*	The number of Norwegian fishing vessels has dropped significantly but fishing capacity has not declined because of increased vessel size and fishing technology improvements.
Work towards the establishment and implementation of an *international system of fisheries management* in the North and Barents Seas, which is based on an ecosystem approach and includes precautionary management strategies for specific stocks.	Work towards the establishment and implementation of an international system of fisheries management in the North and Barents Seas has continued with the management rules for cod, haddock and capelin in the Fisheries Agreement between Norway and Russia and the Harvest Control Rules in the Fisheries Agreement between Norway and the EU.
Ensure that *dismantling of offshore platforms* is carried out in conformity with relevant OSPAR regulations.	As of 2008, Norway had had 412 offshore installations, of which 46 had been decommissioned. Of the 46, three were granted derogations from the dumping ban in accordance with provisions of OSPAR Decision 98/3.

Source: MoE.

REFERENCE III

Abbreviations

ACFM	Advisory Committee on Fishery Management
BAT	Best available technology
BEAC	Barents Euro-Arctic Council
CBD	Convention on Biological Diversity
CCA	Chromated copper arsenate
CCS	Carbon capture and storage
CDM	Clean Development Mechanism (under the Kyoto Protocol)
CFCs	Chlorofluorocarbons
CH_4	Methane
CHP	Combined heat and power
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon monoxide
DAC	Development Assistance Committee, OECD
DfN	Directorate for Nature Management
DIFI	Agency for Public Management and e-Government
EEA	European Economic Area
EEZ	Exclusive economic zone
EFTA	European Free Trade Agreement
EIA	Environmental impact assessment
ETS	Emission trading scheme/system
EU	European Union
EUR	Euros
EPR	Extended producer responsibility
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GHG	Greenhouse gas
HFCs	Hydrofluorocarbons
ICES	International Council for the Exploration of the Sea
IEA	International Energy Agency
IMO	International Maritime Organization
IMR	Norwegian Institute of Marine Research
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated pollution prevention and control
ITQ	Individual transferable quota

IVQ	Individual vessel quota
IUCN	World Conservation Union
IUU	Illegal, unreported and unregulated (fishing)
IWC	International Whaling Commission
KLIF	Climate and Pollution Agency (Klima- og forurensningsdirektoratet)
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MAF	Ministry of Agriculture and Food
MARPOL	International Convention for the Prevention of Pollution from Ships
MEr	Ministry of Education and Research
MoE	Ministry of the Environment
MoF	Ministry of Finance
MOFI	Ministry of Fisheries and Coastal Affairs
MPE	Ministry of Petroleum and Energy
Mt	Millions tonnes
MTC	Ministry of Transport and Communications
Mt CO_2 eq	Million tonnes of CO_2 equivalent
NEAFC	North East Atlantic Fisheries Commission
NEP	National Environmental Programme
NGO	Non-government organisation
NH_3	Ammonia
NINA	Norwegian Institute of Nature Research
NMVOCs	Non-methane volatile organic compounds
NOK	Norwegian krone(r)
Norad	Norwegian Agency for Development Cooperation
NOU	Official Norwegian Reports
NO_x	Nitrogen oxides
NPD	Norwegian Petroleum Directorate
NSDS	National Sustainable Development Strategy
NVE	Norwegian Water Resources and Energy Directorate
ODA	Official development assistance
OSPAR	Convention for the Protection of the Marine Environment of the East Atlantic
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PER	Tetrachloroethylene
PFCs	Perfluorocarbons
PFOS	Perfluorooctansulfonate
PM	Particulate matter
POPs	Persistent organic pollutants
PPP	Purchasing power parities
PSA	Petroleum Safety Authority
R&D	Research and development
REDD	Reducing emissions from deforestation and forest degradation in developing countries
REP	Regional environmental programme
SEA	Strategic environmental assessment
SF_6	Sulphur hexafluoride

SO_x	Sulphur oxides
TAC	Total allowable catch
TFC	Total final energy consumption
TPES	Total primary energy supply
TRI	Trichloroethylene
TWh	Terawatt hour
UNECE	UN Economic Commission for Europe
UNFCCC	UN Framework Convention on Climate Change
USD	United States Dollar
VAT	Value added tax
VOCs	Volatile organic compounds
WEEE	Waste electrical and electronic equipment

REFERENCE IV

Selected Environmental Websites

Website	Host institution
Governmental	
www.regjeringen.no/en/dep/md.html	Ministry of the Environment
www.regjeringen.no/en/dep/fin.html?id=216	Ministry of Finance
www.stortinget.no/en/In-English/	The Storting (Norwegian parliament)
www.regjeringen.no/en/dep/oed.html	Ministry of Petroleum and Energy (MPE)
www.regjeringen.no/en/dep/hod.html	Ministry of Health and care services
www.regjeringen.no/en/dep/lmd.html?id=627	Ministry of Agriculture and food
www.regjeringen.no/en/dep/sd.html	Ministry of Transport and Communications
www.regjeringen.no/en/dep/kd.html?id=586	Ministry of Education and Research
www.norad.no/en/	Norwegian Agency for Development Cooperation
www.ssb.no/en/	Statistics Norway
www.klif.no/no/english/english/	The Climate and Pollution Agency (KLIF)
www.environment.no/	State of the Environment Norway website
www.erdetfarlig.no	Er det Farlig (Is It Dangerous?) website
http://english.dirnat.no/	The Directorate for Nature Management
www.nve.no/en/	The Water Resources and Energy Directorate (NVE)
www.riksantikvaren.no/English/	The Directorate for Cultural Heritage (Riksantikvaren)
www.nina.no/	The Norwegian Institute of Nature Research
www.imr.no/en	The Norwegian Institute of Marine Research
http://npweb.npolar.no/english	The Norwegian Polar Institute
www.enova.no/sitepageview.aspx?sitePageID=1001	Enova
www.transnova.no/english	Transnova
www.statkart.no/eng/Norwegian_Mapping_Authority/	The Norwegian Mapping Authority
Non governmental	
http://naturvernforbundet.no/engl/	Friends of the Earth Norway
www.wwf.no/	World Wildlife Fund Norway (Norwegian only)
www.bioforsk.no/ikbViewer/page/home	Bioforsk

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