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# **Case studies on climate change response policies and strategies of selected Annex I countries**

Norway and Sweden

**Stine Aakre and Asbjørn Torvanger**

December 2007

## **CICERO**

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## **Background and Context**

With financial support from the Korean ministry of environment, Korea Environmental Management Corporation (EMC) has commissioned a research project, 'Case studies on climate change response policies and strategies of selected Annex I countries'. The research project is implemented by the College of Environment of Keimyung University under a contract with EMC.

The project will help Korea to establish 'A Roadmap for National Climate Change Responses' by benchmarking selected Annex I countries. It examines and analyzes climate change response policies and strategies of selected Annex I countries and provides policy suggestions so that Korea can utilize the output of the project to develop its own roadmap. The project aims at producing a report on climate change response policies and strategies of selected countries, focusing particularly the use of the Kyoto mechanisms and carbon funds.

Five countries/regions are selected for the case study: the U.K., Japan, Norway and Sweden, the U.S. (North America), other OECD countries.

CICERO Center for International Climate and Environmental Research – Oslo has carried out the case study of Scandinavia, with a primary focus on Norway and a secondary focus on Sweden.

## **1 Introduction**

CICERO is responsible for carrying out the case study of Scandinavian climate change response policies and strategies, with a particular focus on Norway, but also including Sweden.

The study comprises six main sections. Section A covers the Norwegian and Swedish climate change response systems. Section B covers participation of local governments, industry, and civil society in climate change responses. Section C covers implementation of the Kyoto Mechanisms, Section D provides information on public and private sector carbon funds, while Section E covers cases of impact assessment of, and adaptation policies to, climate change. Finally, Section F covers policy suggestions to establish a national roadmap to respond to climate change.

## 2 National Climate Change Response System

### 2.1 Norway

#### 2.1.1 Country Context and Background Information

##### **Legal and Institutional Aspects**

Norway is a constitutional monarchy with a parliamentary system of government. The current government is a coalition of the Socialist Left Party, Labour Party and the Center Party. The three parties form a majority government.

##### **Population and Economic Indicators**

As of January 2007, Norway's population was 4 681 134. Population density is low on average. In 2005 nearly 78 per cent of the population lived in urban settlements.

Norway's energy and industrial profile is quite different from that of other industrialized countries (Report T-1453/2006). 50 per cent of energy use is from renewables, and nearly all electricity is hydropower (ibid.). Norway's income from the oil and gas sector is pivotal for the national economy. The oil and gas sector currently is Norway's largest industry; in 2001, the sector accounted for 22 per cent of gross domestic product (GDP), and 45 per cent of the country's export value. In terms of emissions, the oil and gas sector is responsible for approximately 25 per cent of total greenhouse gas emissions (Report T-1452/2006).

Norway's decentralized settlement pattern entails a relatively high demand for transport. Moreover, the Norwegian economy is largely based on the extraction of raw materials and export of goods, resulting in a large volume of goods transport (ibid.).

Norway has experienced economic growth since 1990, which explains the general increase in emissions of greenhouse gases (NIR 2007: 10). Oil and gas industry and domestic passenger transport and land transport have contributed most significantly to the overall increase in emissions of greenhouse gases since 1990 (Report T-1452/2006).

Figure 1 describes historic and current trends with regard to GDP, greenhouse gas emissions and greenhouse gas intensity. Table 1 provides a summary of indicators relevant to greenhouse gas emissions and removals for Norway.

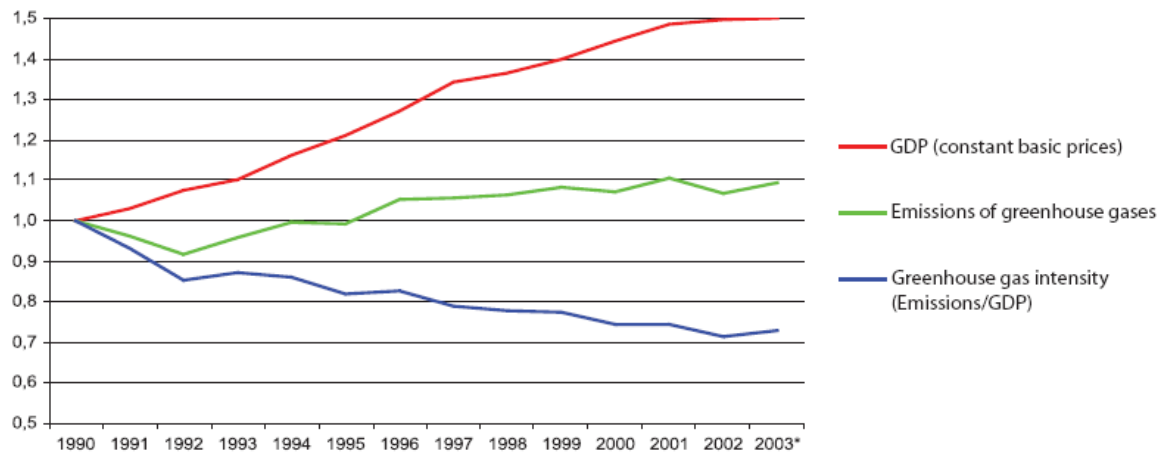
##### **Emissions Inventory<sup>1</sup>**

Norway's total emissions of greenhouse gases, expressed in CO<sub>2</sub> equivalents, were 54.2 million tons in 2005. For the period 1990-2005, the increase in emissions measured as CO<sub>2</sub> equivalents was approximately 9 per cent. According to the "with existing measures projections", Norway has a Kyoto gap to close that corresponds to 9 million tons CO<sub>2</sub> equivalents per year in 2008-2012 (TemaNord 2006: 539; Proposition No. 66 (2006-2007)). National greenhouse gas emissions will need to be reduced by 18 per cent in order to achieve the emission target of 1 per cent required by the Kyoto Protocol by the period 2008-2012 if the emissions stabilize at this level (Proposition No. 66 (2006/0766)).

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<sup>1</sup> The Norwegian Pollution Control Authority (SFT), Statistics Norway (SSB), and the Norwegian Forest and Landscape Institute are the core institutions in the national system for greenhouse gas inventories. The data presented here are based on this greenhouse gas inventory.

**Figure 1.** Change in greenhouse gas emissions and GDP 1990-2003.



Source: Norway's Fourth National Communication on Climate Change (Report T1452/2006).  
 \* Preliminary number.

**Table 1.** Indicators relevant to greenhouse gas emissions and removals for Norway.

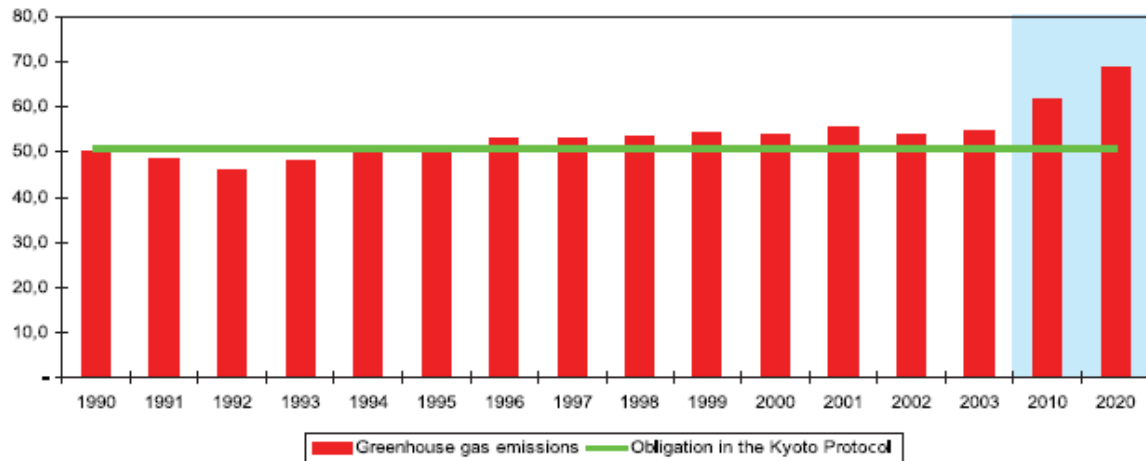
	1990	1995	2000	2003	Change 1990-2003 (%)
Population (million)	4.2	4.4	4.5	4.6	7.6
GDP (billion USD 2000 PPP)	113.1	136.6	163.0	170.5	50.7
TPES (Mtoe)	21.5	23.9	25.8	23.3	8.6
GDP per capita (thousand USD 2000 PPP)	26.7	31.3	36.3	37.4	40.0
TPES per capita (toe)	5.1	5.5	5.7	5.1	0.9
GHG emissions without LULUCF (Tg CO <sub>2</sub> eq)	50.1	49.6	53.8	54.8	9.3
GHG emissions with LULUCF (Tg CO <sub>2</sub> eq)	36.7	36.2	33.0	33.8	-7.8
CO <sub>2</sub> emissions per capita (Mg)	8.11	8.54	9.16	9.47	16.7
CO <sub>2</sub> emissions per GDP unit (kg per USD 2000 PPP)	0.30	0.27	0.25	0.25	-16.7
GHG emissions per capita (Mg CO <sub>2</sub> eq)	11.82	11.39	11.99	12.00	1.5
GHG emissions per GDP unit (kg CO <sub>2</sub> eq per USD 2000 PPP)	0.44	0.36	0.33	0.32	-27.5

Total primary energy supply (TPES), GDP, and population data are from the IEA. GHG emissions data are from Norway's 2005 National Inventory submission.

Source: UNFCCC (2006)

Figure 2 provides historic and current emissions, as well as projected emissions.

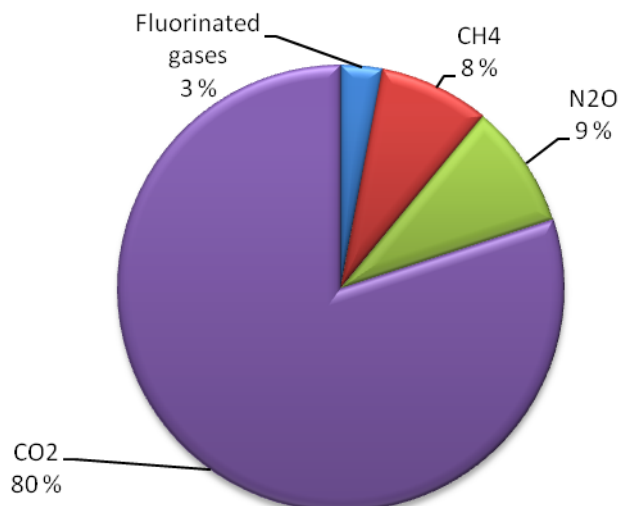
**Figure 2.** Emissions of greenhouse gases in 1990-2003 and projections for 2010 and 2020 (Mt CO<sub>2</sub> equivalents).



Source: Norway's Fourth National Communication on Climate Change (Report T-1452/2006).

In 2005, CO<sub>2</sub> contributed to 80 per cent of the total greenhouse gas emissions, while CH<sub>4</sub> and N<sub>2</sub>O contributed 8 and 9 per cent respectively (NIR 2007). PFCs, HFCs and SF<sub>6</sub> together accounted for approximately 3 per cent of the total greenhouse gas emissions in 2005 (ibid.). Figure 3 illustrates the distribution of emissions by gas.

**Figure 3.** Distribution of emissions of GHGs in Norway by gas, 2005.

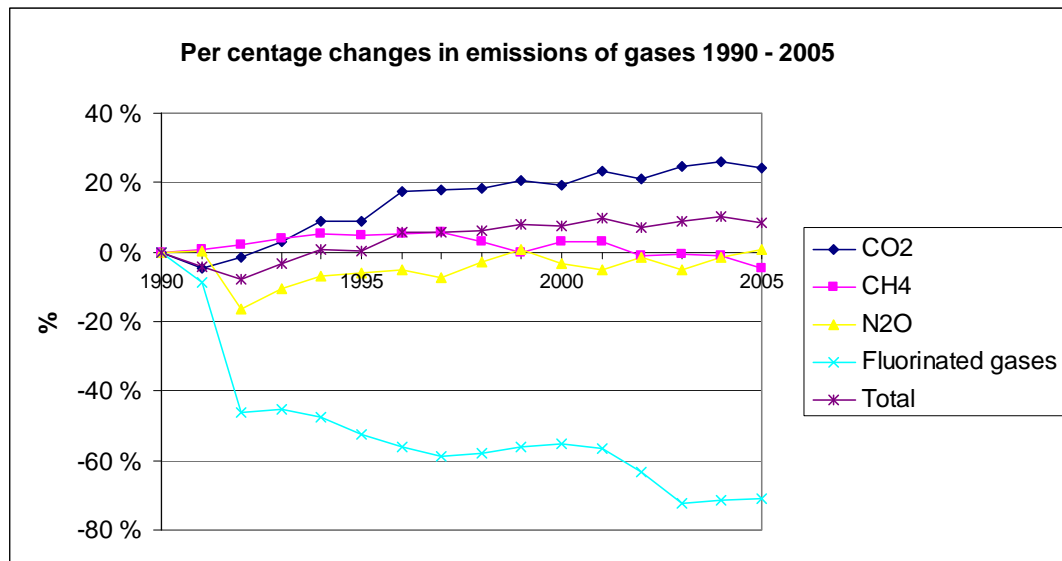


Source: Norwegian National Inventory Report (NIR) (2007).



The proportion of CO<sub>2</sub> emissions to the total greenhouse gas emissions has increased from approximately 70 per cent in 1990 to approximately 80 per cent in 2005. This increase is due to growth in CO<sub>2</sub> emissions as well as a reduction in emissions of PFCs and SF<sub>6</sub> gases (NIR 2007). The reduction in emissions of the latter gases can be attributed to implemented environmental measures and/or technological improvements (*ibid.*). Changes in per cent for the different greenhouse gases in the period 1990 to 2005 is illustrated in Figure 4.

**Figure 4.** Changes in emissions of greenhouse gases by gas in Norway 1990-2005, compared to 1990.

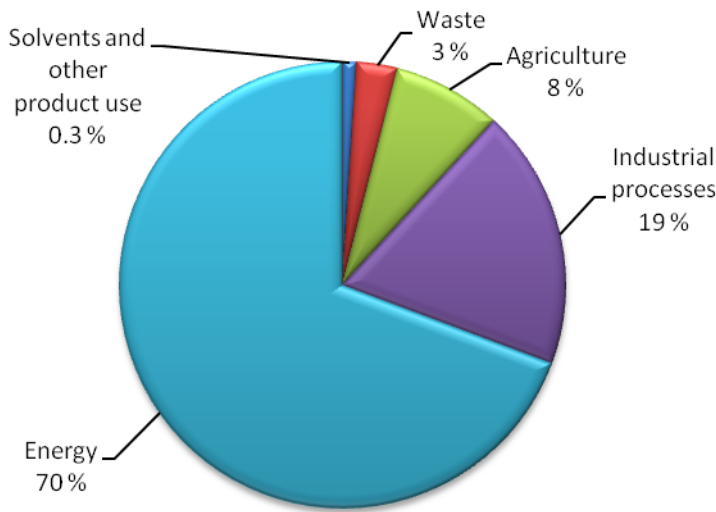


Source: Norwegian National Inventory Report (NIR) (2007).

The most important sector with regard to emissions of greenhouse gases is the energy sector, accounting for 70 % of total emissions in 2005 (NIR 2007). The energy sector, as defined in Norway's National Inventory Report (NIR), includes five sub-sectors: Fuel combustion in energy industries, fuel combustion in manufacturing industries and construction, fuel combustion in transport, and fuel combustion in other sectors (*ibid.*). Fuel combustion in the transport sector accounts for the largest share, 38 per cent, of total emissions in the energy sector (*ibid.*).

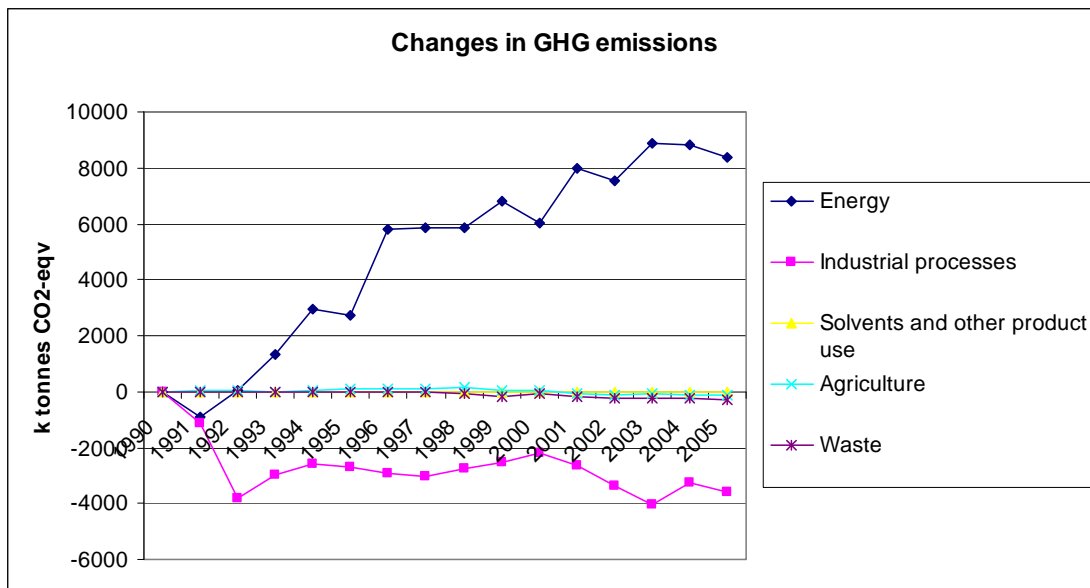
Figure 5 illustrates the total emissions of greenhouse gases in Norway in 2005 by sources, and Figure 6 illustrates the development of emissions of greenhouse gases from various sectors (disregarding LULUCF) compared to 1990.

**Figure 5.** Total emissions of greenhouse gases in 2005 by sources.



Source: Norwegian National Inventory Report (NIR) (2007).

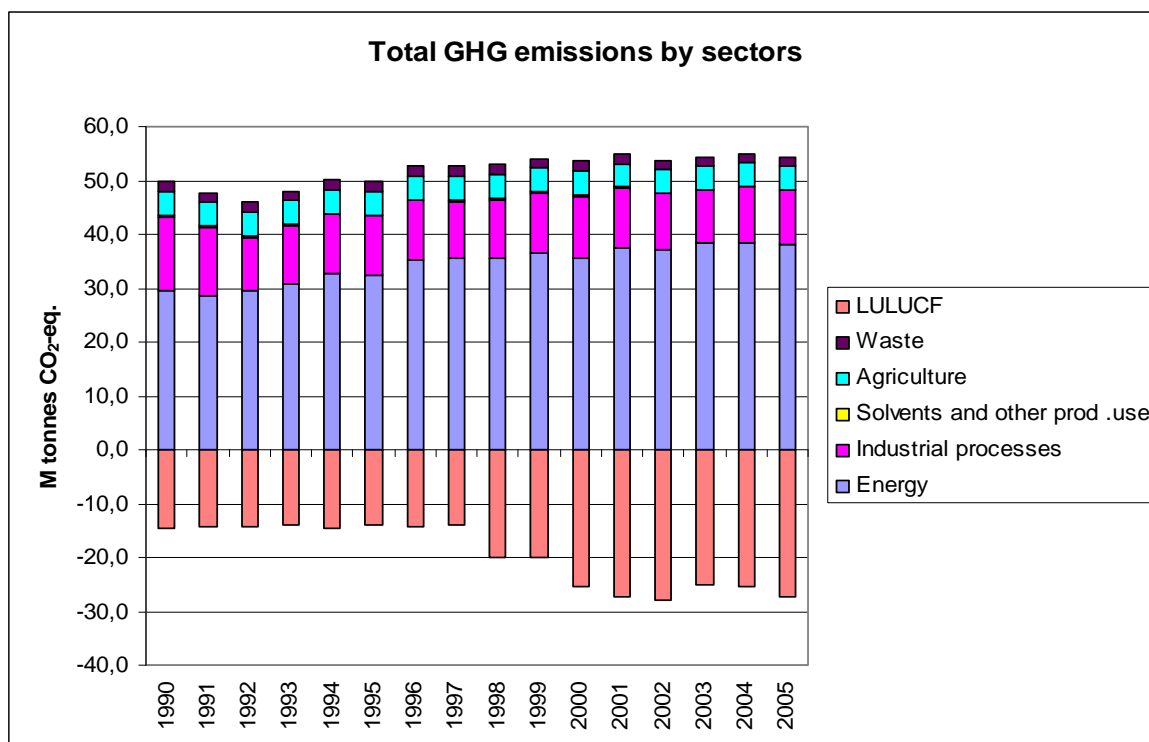
**Figure 6.** Changes in GHG emissions by sector 1990-2005 compared to 1990.



Source: Norwegian National Inventory Report (NIR) (2007).

The total net sequestration from the land-use, land-use change and forestry sector (LULUCF) was about 27.2 million tons CO<sub>2</sub> in 2005 (NIR 2007). In 2005, the land-use category “forest land remaining forest land” was the sole contributor to the total amount of sequestration (29.9 million tons CO<sub>2</sub>), while all other land-use categories showed net emissions (ibid.). The total contribution from different sources from 1990 to 2005 is illustrated in Figure 7.

**Figure 7.** Total emissions of GHG calculated as CO<sub>2</sub>-equivalents from the different sectors.



Source: Norwegian National Inventory Report (NIR) (2007).

## 2.1.2 National Climate Change Response System

### Structure of the National System

The Storting (parliament) sets the overall national climate change policy, while the government is responsible for implementing and enforcing the most important policies and measures, such as economic instruments and direct regulations (Report T-1452/2006; Lafferty et al. 2004).

It is difficult to estimate government spending on climate change related ends since estimates would depend on how narrow or wide climate change ends are defined. Support for renewable energy sources could for example in part be considered as climate change related. If we include money spent on climate change related research (where the lion's share of the money is for CO<sub>2</sub> capture and storage) and government purchase of emission quotas, this amounts to about 0.06% of GDP in 2005. In addition the government is investing 10 Billion NOK in a capital stock for the purpose of supporting renewable energy and energy efficiency (this amount is equivalent to 0.46% of Norway's GDP in 2006).

#### The Ministry of the Environment

Responsibility for implementing and enforcing climate policy is divided between several ministries. The Ministry of the Environment has a particular responsibility for developing and carrying out the environmental policies of the government. In addition, the ministry is responsible for coordinating the government's environmental policy objectives. The sectoral ministries are responsible for avoiding unnecessary environmental pressure in their own sphere of responsibility and for integrating environmental considerations into sectoral policies (Report No. 58 (1996-1997)). Environmental efforts in all sectors must be in line with the

strategic objectives and national targets of Norway's environmental policy (Report No. 21 (2004-2005); Proposition No. 1 (2006-2007)).

#### Environmental agencies

Responsibility for implementing and enforcing climate policy is further divided between the ministries and subordinate agencies. For example, the Norwegian Pollution Control Authority (SFT), a directorate under the Ministry of the Environment, is responsible for providing the professional basis for decisions for the Ministry in connection with pollution issues and for monitoring pollution in air and water. Another example is Enova SF, a public enterprise owned by the Ministry of Petroleum and Energy. Enova's main mission is to "contribute to environmentally sound and rational use and production of energy, relying on financial instruments and incentives to stimulate market actors and mechanisms to achieve national energy policy goals" (Enova 2007, April 25). A third agency of relevance is the Directorate for Civil Protection and Emergency Planning (DSB), which is responsible for maintaining an overview of risk and vulnerability for society in general. In the context of climate change DSB shall provide an overview of vulnerability and promote adaptation measures.

#### Local government

Finally, responsibility for implementing and enforcing climate policy is divided between national and local government. Local government (i.e. municipalities and counties) is responsible for implementing and enforcing policies at the local level. Examples include waste management, local planning and transportation (Vevatne et al. 2005). In each county a county governor, who is the representative of the King and the government, supervises that national policy is carried out.

### **The Roles and Function of Each Ministry**

According to Guri Bang (2004), the "Norwegian state bureaucracy is centralized in structure, with much power and influence concentrated in the ministries. Consistent recommendations from bureaucratic expertise within the ministries have important bearing on policy".

The Norwegian government currently consists of 18 ministries, including the Office of the Prime Minister. The Ministry of the Environment has the overall responsibility for environmental policy, including climate policy. Other ministries that have been the strongest involved in the climate policymaking process are the Ministry of Foreign Affairs, the Ministry of Petroleum and Energy, the Ministry of Trade, and the Ministry of Finance (Bang 2004). The Ministry of the Environment is the smallest in terms of staff and budget among the ministries most involved in climate change policy issues (ibid.). In this section, we discuss the roles of relevant ministries in more detail. The section to a large extent relies on information provided in the most recent budgetary bill as well as the bi-annual White Paper "The Government's Environmental Policy and the State of the Environment".

In addition to initiating and carrying out its own measures, the *Ministry of the Environment* is responsible for coordinating the climate policy implementation and enforcement of the other sectoral ministries, as well as for ensuring follow-up and monitoring of results (Report No. 58 (1996-97)). Among the subordinate agencies whose activities the ministry is responsible for overseeing are the Norwegian Pollution Control Authority (SFT). SFT's fields of responsibility include regulation of onshore and offshore industry, waste management, air pollution, and climate change. The SFT exercises regulatory authority under the Pollution Control Act, the Product Control Act and the Greenhouse Gas Emissions Trading Act. The SFT is currently divided into four departments, with a total staff of 250. Climate change is addressed in the Section for Climate and Energy, organized under the Department of Industry. The Section for Climate and Energy currently has 12 employees. The Ministry of the Environment is also in charge of cooperation and dialogue with the industry. The ministry is currently organized into six departments, and has a staff of approximately 250. Climate

change is addressed by the Section for Climate and Energy, organized under the Department for Pollution Control. As of January 2007, the Section for Climate and Energy has a total staff of 11.

The *Ministry of Finance* is responsible for planning and implementing economic policy; coordinating the work with the Fiscal Budget; maintaining and developing the system of taxes and duties; and monitoring financial markets and drawing up regulations. Based on estimates from the 2006 budget, 4.2 per cent of central government tax revenue is due to environmental and energy taxes (e.g. CO<sub>2</sub> and sulphur taxes), equivalent to 1.6 per cent of GDP. The Ministry of Finance has been given an increasingly important role in the policy process, emphasizing cost-effectiveness as a governing principle of Norwegian environmental policy, both at the national and the international level (Reitan 1997). The Ministry is currently organized into seven departments, and has a total staff of approximately 300.

The *Ministry of Petroleum and Energy* is responsible for ensuring a coordinated and integrated energy policy, including efficient and environmentally-friendly management of the country's energy resources. Among the subordinate agencies whose activities the ministry is responsible for overseeing are Gassnova and Enova SF. Gassnova was established to stimulate the development of technology for natural gas power generation with Carbon Capture and Storage (CCS). Gassnova administers the state-owned NOK 2 billion Gas Technology Fund, and provides financial support to national and international enterprises amounting to roughly NOK 90 million per year. Gassnova currently has a staff of 6. *Enova SF* at present has approximately 30 employees, and is responsible for managing the state-owned Energy Fund, which will distribute grants within a framework of up to NOK 5 billion over a ten-year period. Enova's main objectives are "improved energy efficiency, more flexibility in the energy supply and decreased dependence on direct electricity for heating, and an increased share of renewable energy sources, other than large hydropower, in the energy supply mix are key features of Norwegian energy policy." (Enova 2007, April 25).

The Ministry partakes in several cooperative arrangements focusing on CCS, including the Carbon Sequestration Leadership Forum (CSLF). The Ministry is also responsible for Norway's participation in the Testing Ground Facility<sup>2</sup>. The ministry is organized into five departments, and currently has approximately 140 employees. Climate change is addressed by the Section for Climate Change and Emissions to Air, organized under the Technology and Industry Department. In addition to being responsible for the Ministry's engagement in national climate policy, the Section for Climate Change and Emissions to Air is responsible for the follow-up of international environmental issues regarding emissions to air, including international climate negotiations and regional cooperation on climate change, carbon capture and storage (CCS), the development of emission forecasts, and analysis of measures as well as assessment of instruments in use (MoPE 2007). As of January 2007, the Section for Climate Change and Emissions to Air has a total staff of 5.

The *Ministry of Foreign Affairs* is responsible for the government's foreign policy and development cooperation. Sustainable development, including environmental considerations, is an explicit priority in Norwegian development aid. The ministry is responsible for the funding of the World Bank's Prototype Carbon Fund and for supporting capacity and knowledge building on climate issues in countries with economies in transition and developing countries (Report No. 54 (2000-2001); Report T-1452/2006). The Ministry of Foreign Affairs is responsible for the co-ordination of foreign policy in general, and thus also for the Norwegian performance in international environmental negotiations (Reitan 1997). The Ministry is organized into eight departments, and at present has a staff of approximately

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<sup>2</sup> The Testing Ground Facility (TGF) is a regional carbon fund with investors from the Nordic governments and Germany. The TGF provides carbon finance to cleaner energy investments in the Baltic Sea Region through the Joint Implementation (JI) mechanism of the Kyoto Protocol.

740. Climate change is addressed by the Section for Environment and Sustainable Development, organized under the Department for UN, Peace and Humanitarian Affairs. The Section for Environment and Sustainable Development has a particular responsibility for global environmental issues and work on sustainable development in international organizations, including the UN Commission on Sustainable Development, The Global Environment Facility (GEF), the United Nations Environment Programme (UNEP), global cooperation in the fields of e.g. climate change, desertification and biodiversity. As of January 2007, the Section for Environment and Sustainable Development has a total staff of 10.

In terms of responsibility for climate change policy, the *Ministry of Transport and Communications* has the overriding responsibility for issues relating to transport, for instance measures aimed at improving public transportation and measures aimed at regulating road traffic. The *Ministry of Fisheries and Coastal Affairs* is responsible for sea transport and coastal administration. The *Ministry of Agriculture and Food* is responsible for agricultural policymaking. Emissions from the agricultural sector and emissions and sequestration of greenhouse gases in forests are mainly dependent on general agricultural and forestry policies (Report T-1452/2006). The Ministry of Transport and Communications has a total staff of roughly 170, the Ministry of Fisheries and Coastal Affairs has a total staff of 110, while the Ministry of Agriculture and Food has a total staff of 180.

### **A brief look at areas of potential conflict between climate change policy objectives and other environmental policy objectives**

One example that may be used to illustrate the potential conflict between climate policy objectives and other environmental policy objectives is the recent restructuring of the passenger vehicle purchase tax. In 2006, the government proposed letting CO<sub>2</sub> emissions replace engine volume as a criteria for determining the tax levied on passenger vehicle purchases (Press Statement No. 70/2006). The changes were put into effect in January 2007. One result has been that average CO<sub>2</sub> emissions from new cars have been reduced from 177 g/km in 2006 to 157 g/km in the period January to May 2007 (Press Statement No. 66/2007). However, while CO<sub>2</sub> emissions might be expected to decrease as a result of the introduction of the new taxation scheme, other pollutants (e.g. particles, NO<sub>x</sub>, etc) might be expected to increase. Diesel cars use less fuel and emit less CO<sub>2</sub> than gasoline cars, and accordingly, are rewarded in the new system. Emissions per km of both SO<sub>2</sub> and NO<sub>x</sub> and particles, however, are significantly higher in the former than in the latter (Rypdal 2006). Thus, changes made to the purchase tax may result in an effort to reduce CO<sub>2</sub> emissions may potentially conflict with other commitments and goals; in this case, relating to local air quality and local health. It is worth noting, however, that the described effects can be counteracted (ibid.) Moreover, appropriate measures to remedy such undesired effects are currently being considered, some of which are expected to be put into effect starting 2008 (e.g. alterations to the annual vehicle tax) (ibid.).

### **Legal and Institutional Background to Develop and Implement National Response System**

In Norway, most decisions made by the executive power are taken by a minister in his or her capacity as head of ministry. Any decision which a minister does not have the authority to make will be made by the Council of State, i.e. by the government assembled as the King's Council. Examples of matters dealt with in the Council of State are legislative bills, reports to the Storting (white papers) and sanctioning of legislation passed by the Storting.

Before the Ministry of the Environment was established in 1972, the administration of environmental issues was divided among different ministries (Reitan 1997). While the Ministry of Environment has a role as a coordinator vis-à-vis the other ministries, it is organized as a sectoral ministry with the same type of sectoral status as other ministries, and formally it does not have powers to exert particular influence over other ministries (Lafferty

et al. 2004). Most policies and measures in the area of climate policy are developed through interministerial processes before the political proposals are tabled (Report T-1452/2006). Conflicts are sometimes unavoidable when widely different interests and cultures, representing ministries as distinct as the Ministry of the Environment and the Ministry of Petroleum and Energy, are to agree on a joint approach (Bang 2004).

Throughout the 1990s, Norwegian authorities established a number of different committees and groups to address issues relating to environmental policy (Hovden and Torjussen 2002). Some of these groups have been *ad hoc*, with responsibility for reporting on single issues such as environmental taxes, climate policy and environmental instruments. The intention has been to build consensus around particular problems and how they should be addressed (ibid.). In addition, a number of more permanent committees, for instance the State Secretary Committee for Environmental Issues, have been established (ibid.). Currently, sectoral climate action plans are being prepared. This work, too, is coordinated by an interministerial group led by the Ministry of the Environment.

The Storting (parliament) is responsible for passing new laws and amending or repealing existing ones. In addition, it is responsible for adopting the fiscal budget, i.e. to fix the annual revenues (taxes, charges, etc.) and expenditures of the State, authorizing plans and guidelines for the activities of the State through discussions of political issues of more general character, taking a stand on plans for reform, and approving major projects.

There are several acts and regulation of relevance in the field of climate policy. First of all, the 2005 Greenhouse Gas Emissions Trading Act and the Greenhouse Gas Emissions Trading Regulations cover the Norwegian emissions trading scheme. The HFC and PFC refund schemes are covered by regulations relating to the recycling of waste (Waste Regulations), sections 8-4. The Pollution Control Authority monitors and administers the refund schemes. Emissions of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, SF<sub>6</sub> are all regulated by the *Pollution Control Act* (§ 7). The *Planning and Building Act* supplements the national climate change policy instruments (Vevatne et al. 2005). The Planning and Building Act requires that all major projects (infrastructure, settlements) have to go through a planning and approval procedure in which environmental impacts are emphasized (Report T-1453/2006).

Norway is not a member of the EU. However, since 1994, Norway has been part of the European Union's internal market through the Agreement on the European Economic Area (EEA Agreement). Most EU legislation in the environmental field is also EEA-relevant, which means that Norway to a large degree has the same obligation to implement EU environmental legislation as the member states (Report T-1452/2006).

### **2.1.3 Major Policies and Strategies**

#### **Major Targets and Future Roadmap**

Norway's climate policy is founded on the objectives of the United Nations Framework Convention on Climate Change and the Kyoto Protocol, and the scientific understanding of the greenhouse effect set out in the reports from the Intergovernmental Panel on Climate Change (Report T-1452/2006). With the adoption of the Kyoto Protocol, Norwegian GHG emissions may not be more than 1 % above the 1990 level during the commitment period 2008-2012.

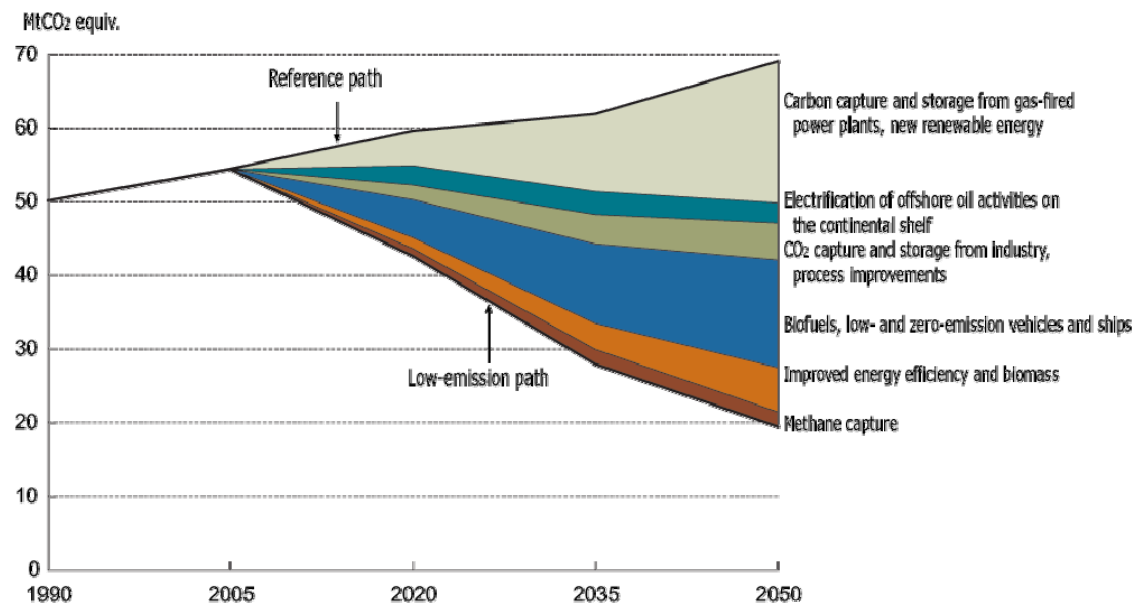
On 22 June 2007, the government presented a new white paper on national climate policy, contained in Report No. 34 (2006-2007). The white paper contains proposals for new measures to reduce greenhouse gas emissions, as well as new targets. The following targets were proposed: (1) to reduce emissions of GHGs equivalent to 30 per cent of emissions in 1990 by 2020; (2) to improve on emission cuts obligations under the Kyoto Protocol by ten percentage points in the period up to 2012; and (3) to make Norway carbon-neutral by year

2050 (i.e., that Norway should undertake to reduce 100% of own emissions by 2050). Commitments are to be achieved “both by substantially reducing Norway’s emissions and by paying for cuts in other countries. The whole of the 10 per cent will be accounted for by reductions outside Norway” (Press Release 22.06.07).

The white paper also contains proposals for targets and action plans for the main sectors responsible for greenhouse gas emissions. The main purpose of this has been to identify measures that will result in cost-effective emissions reductions that are not currently being implemented in the sectors concerned (Press Release 22.06.07). The sector targets are based on estimates, and will have to be reviewed in response to any changes in projections, costs, technological advances and other relevant factors. If the trend is not positive, the Government will consider further measures (ibid.).

The Commission on low emissions was established in 2005. The Commission delivered a report in 2006 with a description of how Norway can reduce emissions by 50-80 per cent by 2050 (NOU 2006: 18). The Commission emphasized that mitigation measures should to the greatest degree possible be: few in numbers and large in scope; based on relatively familiar technology; politically feasible; contribute to international technology development; robust; cost-effective (Alfsen and Eskeland 2007; Report No. 34 (2006-2007)). On the basis of these principles, a number of measures were proposed. Figure 8 illustrates the Commission’s general solution.

**Figure 8.** Emissions of greenhouse gases in the past, in the Commission’s reference path, and in the proposed low-emission path 1990–2050.



Source: Norwegian Government Official Report (NOU 2006: 18).

### Major Mitigation Policies, Their Progress of Implementation and Expected Effects

At present, most sources of GHG are addressed through economic measures; taxes and emissions trading. Norway has advocated cost-effectiveness across emission sources, sinks, sectors and greenhouse gases both domestically and internationally (Report T-1452/2006). Below, we provide a brief overview of some of the key policies and measures.



A tax on CO<sub>2</sub> was first introduced in 1991, and presently covers approximately 68 per cent of CO<sub>2</sub> emissions (Report T-1452/2006). High rates apply to petrol and petroleum activities and lower rates to the use of mineral oils (ibid.). The tax rates deviate far from the cost-effective levels based on emissions of CO<sub>2</sub>. The most significant effects have probably been in the offshore petroleum industry, where the tax has contributed to making investments in more energy efficient technology profitable (ibid.). A tax on import and production of HFCs and PFCs was introduced in 2003, and has since been supplemented by a reimbursement scheme which applies to all HFCs and PFCs delivered for destruction (Report T-1452/2006). It is estimated that the effect of the tax on import and production of HFCs and PFCs will be 0.5 Mt CO<sub>2</sub> equivalents in 2010 (ibid.) An environmental tax on *final disposal of waste*, introduced in 1999, is also used to limit emissions from waste and increase utilization for energy purposes (ibid.).

The *Greenhouse Gas Emission Trading Act* entered into force on 1 January 2005. In the period 2005-2007, the system covers industrial sources that account for 10-15 per cent of Norway's GHG emissions. The main features of the scheme are the same as those of the EU emissions trading scheme. However, one difference for the period 2005-2007 is that Norwegian installations that pay CO<sub>2</sub> tax are not included in the trading scheme even if they would come within the scope of the EU emissions trading scheme (Report T-1452/2006). It is estimated that the trading scheme will reduce emissions by about 0.5 million tons annually in 2005-2007, but these reductions may not all be realized domestically (ibid.).

According to estimates by the Ministry of the Environment (see Table 2), voluntary measures and agreements with industry have led to considerable reductions in emissions since 1990. In 2004, for instance, the government and the energy-intensive process industry established an arrangement to reduce emissions. See Norway's Fourth National Communication on Climate Change (Report T-1452/2006) for a discussion of these agreements and their expected effects.

Since the 1970s, Norway has had a comprehensive program on energy efficiency and the promotion of new renewable energy sources. Enova SF, established in 2001, is responsible for promoting an integrated strategy for renewable energy and energy saving (Report T-1452/2006). Enova's long term goal is to achieve 12 TWh in new renewable energy production and energy savings by 2010 (Report T-1453/2006).

Currently, Norway is giving priority to developing new technologies for abatement, including carbon capture and storage (CCS) by means of funding for research and development and subsidies to planned gas-fired power stations (Report T-1452/2006; Report T-1453/2006; Report No. 21 (2004-2005)). The establishment of Gassnova in 2005 forms part of this priority.

Finally, local initiatives, long term physical planning and climate action plans also form part of current Norwegian climate policy. For instance, the Planning and Building Act requires that all major projects (infrastructure, settlements) have to go through a planning and approval procedure in which environmental impacts are emphasized. A number of municipalities, including major cities, have prepared local plans for mitigation of climate change. In 2007, the government introduced climate action plans for all relevant sectors of society, including specific targets for each sector (Report T-1452/2006).

The estimated effects of measures that have been implemented or adopted are summarized in Table 2 below, taken from Norway's Fourth National Communication on Climate Change (Report T-1452/2006). Assessments of aggregate effects indicate that, in the absence of current policies and measures, emissions of GHGs would be approximately 8.5 to 11.1 million tons CO<sub>2</sub> equivalents higher in the baseline scenario in 2010. Compared with the 1990-level, these estimates represent an increase in GHG emissions of 17-22 per cent (Report T-1452/2006).

**Table 2.** Effect on greenhouse gas emissions of selected measures implemented or adopted since 1990, Mt CO<sub>2</sub>-eq.

	1995	2000	2003	2005	2010
<b>Directly related to climate change:</b>					
CO <sub>2</sub> tax offshore <sup>1)</sup>	0.6	3.0	3.0	3.0	3.7 <sup>3)</sup>
CO <sub>2</sub> tax onshore <sup>2)</sup>		0.8	0.8	0.8	0.8 <sup>3)</sup>
Requirement to collect landfill gas	0.25	0.4	0.45	0.5	0.6
Other measures in the waste sector		0.07	0.2	0.25	0.3
Tax and recycling schemes on HFC			0.2	0.3	0.5
Climate change agreement with aluminium industry <sup>4)</sup>	0- 1.6	0.6- 3.0	1.2- 4.0	1.4 - 4.0	1.4 - 4.1
Agreement on SF <sub>6</sub> emissions			0.05	0.06	0.06
<b>Other regulations:</b>					
VOC regulation offshore			0.17	0.2	0.25
VOC regulation at the Sture terminal		0.01	0.17	0.02	0.005
<b>Voluntary reductions:</b>					
SF <sub>6</sub> reduction, magnesium production	1	1.4	0.5 <sup>5)</sup>	0.5	0.5
N <sub>2</sub> O reduction, production of nitric acid	0.4	0.3	0.3	0.3	0.3
Use of bicarbon in cement production		0.02	0.03	0.1	0.1
Sum effect of implemented measures in baseline	2.3-3.9	6.6-9.0	7.1-9.9	7.4-10.0	8.5-11.1
<b>New policies and measures post 2004</b>					
Emission trading scheme 2005-2007				0-0.5	0-0.5 <sup>6)</sup>
Consensus with the processing industry					0.6
Additional measures addressing the waste sector					0.15
Total emission reductions	2.3-3.9	6.6-9.0	7.1-9.9	7.4-10.5	9.3-12.4

1) Based on reports from companies operating on the Norwegian Continental Shelf and the Norwegian Petroleum Directorate.

2) Based on an equilibrium analyses for 1990-1999. Bruvoll, A and B.M.Larsen (2004) "Greenhouse gas emissions in Norway. Do carbon taxes work" Energy Policies 32 (4), 493-505, and assessment made for the Third National Communication.

3) The role of the CO<sub>2</sub> tax scheme may change from 2008 as a consequence of a revised national emission trading system for 2008-2012.

4) Lowest number reflects direct effect of the agreement, while highest estimate includes voluntary measures taken before adopting the agreement in 1997.

5) A part of a factory was shut down in 2001. The associated emission reductions are not included.

6) A revised national emission trading scheme for 2008-2012 may include other effects.

Source: Norway's Fourth National Communication on Climate Change (Report T-1452/2006).

The recent white paper on national climate policy contains proposals for new measures to reduce greenhouse gas emissions, including prohibiting landfilling of biodegradable waste from 2009; prohibiting the installation of oil-fired boilers in new buildings from 2009; introducing a new scheme to support the conversion of oil-fired boilers to boilers using renewable energy; measures to expand the production of bioenergy; in a dialogue with the manufacturing sector, to consider what measures should be taken in those industries that are not obliged to take part in the emissions trading scheme or not subject to the CO<sub>2</sub> tax, including the introduction of a requirement for some or all of the industries to take part in the ETS and/or voluntary agreements (Report No. 34 (2006-2007)).

## **2.2 Sweden**

### **2.2.1 Country Context and Background Information**

#### **Legal and Institutional Aspects**

Sweden is a constitutional monarchy with a parliamentary system of government. Since the election in 2006, Sweden has been governed by a centre-right majority government.

#### **Population and Economic Indicators**

The Swedish population passed 9 million in 2004, and is expected to rise by an additional 0.7 million by 2020. 84 per cent of the population lives in urban areas (Ds 2005:57).

Sweden's economic growth has been 2 to 4 % per annum since 1994. Population growth since 1990 has been lower than economic growth, which has led to a stable increase in prosperity measured as GDP per capita (ibid.).

Crude oil and oil products account for around 1/3 of the primary energy supply, while nuclear fuel and hydropower together account for 40 %. The share of biomass fuels and natural gas amounted to approximately 17 % and 2 % of primary energy supply respectively in 2003 (ibid.)

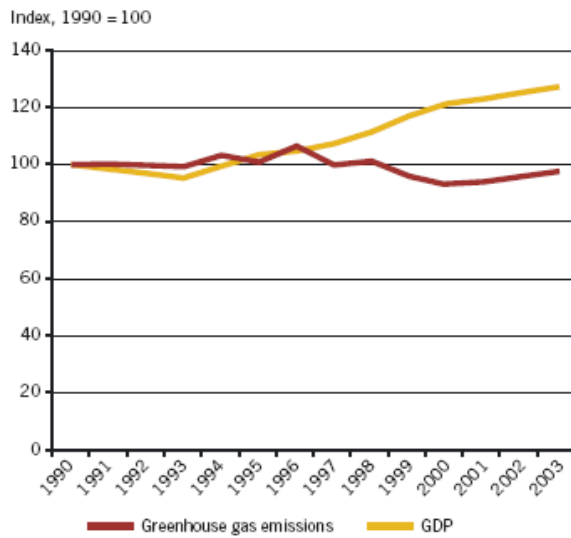
The Swedish industrial structure is characterized by activities in the forestry industry and metal production based on raw materials and energy, as well as by knowledge-based activities in the chemical industry and the engineering industry (ibid.). A structural change towards more knowledge-intensive production has taken place over the last decade.

Swedish manufacturing industry, which accounts for 20% of GDP, is capital-intensive and highly export-oriented. The engineering industry accounts for almost half the value of production.

Intensity of emissions calculated per capita and per GDP was lower in 2003 than in 1990. Emissions of greenhouse gases have decreased by 7 per cent between 1990 and 2005, while the economy has grown by 36 per cent during the same period.

Emissions of greenhouse gases and the development of GDP in the period 1990 to 2003 are summarized in Figure 9. Table 3 provides an overview of indicators relevant to greenhouse gas emissions and removals for Sweden.

**Figure 9.** Greenhouse gas emissions and the development of GDP 1990-2003.



Source: Swedish Ministry Memorandum Ds 2005:57.

**Table 3.** Indicators relevant to greenhouse gas emissions and removals for Sweden.

	1990	1995	2000	2003	Change (%) 1990-2003
Population (million)	8.56	8.83	8.87	8.96	4.7
GDP (billion USD 2000 PPP)	196	204	239	250	27.4
TPES (Mtoe)	47.6	51.0	48.5	51.5	8.3
GDP per capita (thousand USD 2000 PPP)	22.9	23.1	26.9	27.9	21.7
TPES per capita (toe)	5.6	5.8	5.5	5.8	3.5
GHG emissions without LULUCF (Tg CO <sub>2</sub> eq)	72.2	73.4	67.3	70.6	-2.3
GHG emissions with LULUCF (Tg CO <sub>2</sub> eq)	51.9	52.1	40.0	49.1	-5.5
CO <sub>2</sub> emissions per capita (Mg)	6.6	6.5	5.9	6.3	-4.9
CO <sub>2</sub> emissions per GDP unit (kg per USD 2000 PPP)	0.29	0.28	0.22	0.22	-21.9
GHG emissions per capita (Mg CO <sub>2</sub> eq)	8.4	8.3	7.6	7.9	-6.7
GHG emissions per GDP unit(kg CO <sub>2</sub> eq per USD 2000 PPP)	0.37	0.36	0.28	0.28	-23.3

Source: UNFCCC (2006)

### Emissions Inventory

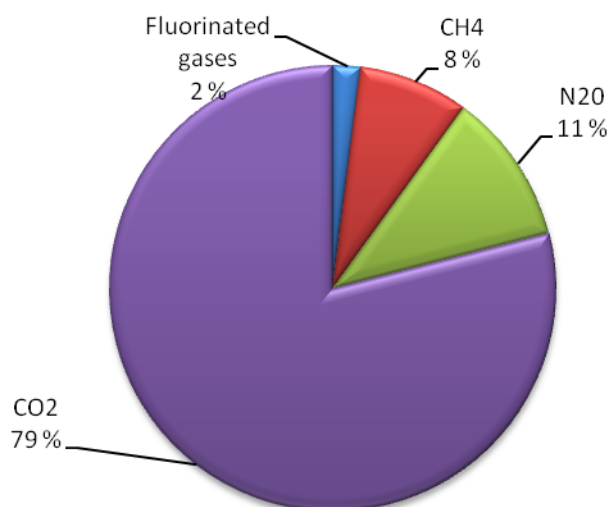
Sweden has introduced a national system for inventory of the emissions and removals of greenhouse gases in accordance with the demands of article 5.1 of the Kyoto Protocol.<sup>3</sup>

The total Swedish greenhouse gas emissions in 2005, expressed in CO<sub>2</sub> equivalents, were 67 million tons (NIR 2007). Emissions have decreased by approximately 7.3 per cent, or approximately 5 Mt CO<sub>2</sub> equivalents, between 1990 and 2005. In the emissions statistics for 1999-2005, total emissions of greenhouse gases were consistently under 1990 levels (ibid.). The reductions of emissions are found in particular in the residential and service sector, in agriculture and the waste sector (Alfsen & Eskeland 2007).

CO<sub>2</sub> accounts for approximately 79 % of total emissions. The energy sector, including transport, is the largest source of carbon dioxide emissions in Sweden, accounting for more than 90 % of total CO<sub>2</sub> emissions (NIR 2007). Emissions of methane mainly come from agriculture and landfill sites, and were approximately 5.6 Mt, calculated in CO<sub>2</sub>-equivalent, in 2005. Total emissions of nitrous oxide were almost 7.7 million tons CO<sub>2</sub>-equivalent in 2005. Emissions mainly come from agriculture. Total emissions of fluorinated gases (PFCs, HFCs and SF<sub>6</sub>) in 2005 were approximately 1.2 million tons CO<sub>2</sub> equivalents.

Figure 10 illustrates emissions of greenhouse gases in 2005 broken down by gas while Figure 11 illustrates emissions of greenhouse gases in the period 1990 to 2004.

**Figure 10.** Greenhouse gas emissions broken down by gas (2005).

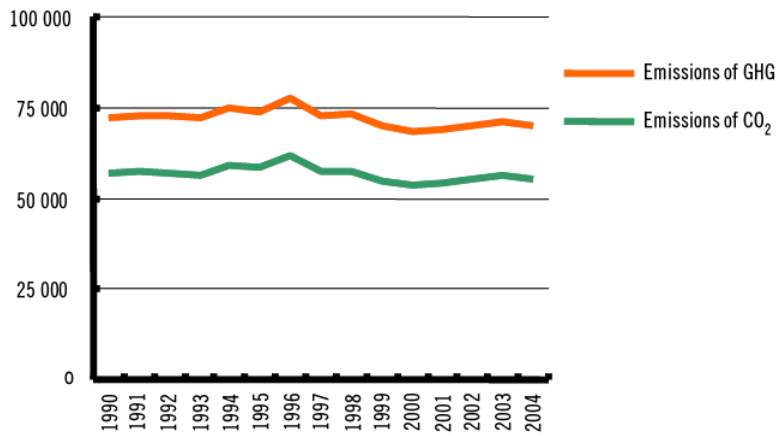


*Source: Swedish National Inventory Report (NIR) (2007).*

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<sup>3</sup> A brief description of the system is presented in Appendix 5 of Sweden's Fourth National Communication.

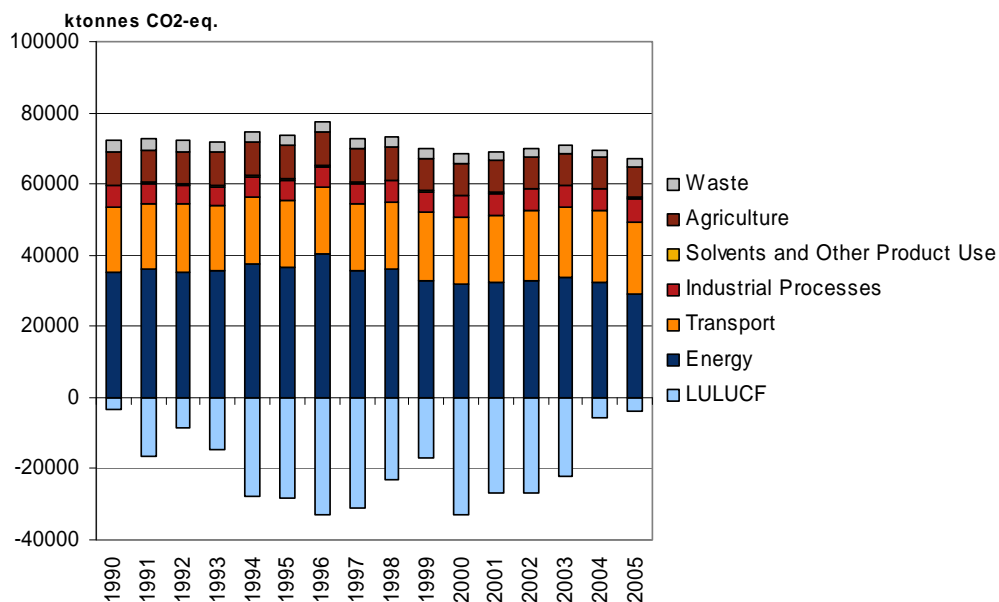
**Figure 11.** Emissions of greenhouse gases in Sweden 1990-2004.



Source: Swedish national inventory report (NIR) (2006), cited in Alfsen and Eskeland (2007).

Removals by sinks amounted to 22 Mt CO<sub>2</sub> in 2005, and CO<sub>2</sub>-emissions from soil were approximately 18 million tons, which gives a net CO<sub>2</sub>-removal from the Land-Use Change and Forestry sector of 3.9 million tons. Figure 12 illustrates total emissions and removals of greenhouse gases from the different sectors.

**Figure 12.** Total emissions and removals of all GHG calculated as CO<sub>2</sub> equivalents from the different sectors.



Source: Swedish National Inventory Report (NIR) (2007).

Emissions from the energy sector excluding transport accounted for 46% of total emissions in 2003 and are dominated by CO<sub>2</sub> emissions. The transport sector accounts for just below 30 % of emissions. Agriculture accounted for 12 %, industrial processes for 8%, waste accounts for 3% and solvents for less than 1% of GHG emissions (ibid.).

## **2.2.2 National Climate Change Response System**

### **Structure of the National System**

Work on climate change is carried out at several levels; partly at national, regional and local levels in Sweden, partly in the European Union and partly globally. Developments in recent years have led to a greater degree of integration with EU policy, for instance through the introduction of the EU Emissions Trading Scheme (MoE 2007). A second trend in recent years is that the division of tasks between central government and municipalities has gradually changed, with activities primarily transferred from central government to municipal bodies. The Government has recently appointed a parliamentary committee, the Committee on Public Sector Responsibilities, whose mandate is to look into the division of responsibility between different levels of government (MoE 2007).

The most important political decisions relating to climate change policy and energy policy are taken by the Riksdag (parliament) (Ds 2005:57). The government implements parliamentary decisions, directs state administrative activity and represents Sweden in the European Union.

Swedish administration is organized into three levels; central, regional and local. With regard to the regional and local level, Sweden is divided into 21 counties and 290 municipalities. The municipalities have far-reaching self-government (ibid.). Regional and local governments play a role in climate policy by formulating and implementing local plans for land use, energy management, transport and waste.

The Swedish Environmental Protection Agency and the Swedish Energy Agency constitute examples of important government agencies with regard to implementation, monitoring and evaluation of the climate policy decisions (ibid.) The former agency is responsible for monitoring the national environmental objective of reduced impact on climate, while the latter agency is responsible for implementing the majority of decisions on energy policy (ibid.). The Environmental Protection Agency reports to the Ministry of the Environment, while the Energy Agency reports to the Ministry of Enterprise, Energy and Communications.

Sweden has been a member of the European Union since 1995.

Since 1998 the Swedish government has supported local investments related to ecologically sustainable development and to climate change. Money has also been spent on grants for renewable energy and a national information campaign in 2002-2003 on climate change. Added together this climate change related funding amounts to about 0.04% of GDP.

### **The Roles and Function of Each Ministry**

The Swedish government currently consists of 13 ministries, including the Office of the Prime Minister. The Swedish Government takes decisions collectively, with the Ministry of the Environment preparing decisions on environmental policy matters, including climate policy matters. As in Norway, all ministries have responsibilities for environmental consequences in their field. The ministries are comparatively small and policies and programs are often implemented by government agencies with the help of regional offices in the county administrative boards (MoE 2007). Municipalities have broad responsibility for the

enforcement of environmental regulations at local level (*ibid.*). Below, we provide a brief overview of the ministries with a particular responsibility for climate policy.

The *Ministry of the Environment* has overall responsibility for coordinating the Government's work on the environment and sustainable development. In addition to climate policy, the ministry's areas of responsibility include recycling and waste, environmental legislation, environmental technology and research, nuclear safety and radiation protection, chemicals, international cooperation on the environment, sustainable planning and housing environment, sustainable development and the Environmental Quality Objectives, nature conservation and biological diversity, and water and seas. The Ministry of the Environment has approximately 170 members of staff, distributed among nine departments. In terms of the total number of staff, the Swedish Ministry of the Environment is relatively small compared to the other ministries of relevance in the field of climate policy.

The *Ministry of Enterprise, Energy and Communications* is responsible for regional development, primary industries, R&D (within e.g. technology, energy and transport), forestry, transportation and energy. In the field of energy, the ministry is responsible for areas such as renewable energy, wind power, electricity certificates and improved energy efficiency. The Ministry of Enterprise, Energy and Communications currently has a staff of 360.

The *Ministry of Finance* is responsible for matters relating to economic policy, the central government budget, taxes, international economic work. The Ministry of Finance has approximately 470 members of staff, distributed among nine departments.

Other ministries of relevance are the Prime Minister's Office, which directs and coordinates the work of the Government Offices. It is furthermore responsible for coordination of Sweden's EU policy, coordinates sustainable development work in the Government Offices and is responsible for constitutional policy and election issues.

## **Legal and Institutional Background to Develop and Implement National Response System**

The tasks of the Riksdag (parliament) include passing laws and taking decisions on budgets for areas of state responsibility.

A growing proportion of legislation affecting Sweden is enacted by the European Union. Some of these laws apply directly, without prior sanction by the Riksdag, while others must be implemented in existing Swedish legislation before they can take effect.

### Environmental Code

Overall legislation in the environmental field has been compiled in the Environmental Code since 1999. The overriding objective of the Environmental Code is to promote sustainable development. The Code contains several general "rules of consideration", i.e. factors serving as a basis for decisions by regulatory and licensing authorities, including the precautionary principle; the "polluter pays" principle and the product choice principle.

### Committees

The government may appoint a commission or committee of inquiry on a given policy issue before proposals are drafted and submitted to the parliament. Committees normally include experts, and in some cases, politicians. A broad-based expert council, the Commission on Oil Independence, was appointed in December 2005. The government will also launch a Commission for Sustainability during the spring of 2007, with the objective of promoting cooperation and creating a cohesive approach for action to prevent climate change. A Government official report on climate change impacts and adaptation was released by the Commission on Climate Change and Vulnerability in 2007 (SOU 2007:60).



### Hearings/referrals

After a committee has submitted its report, contents are referred for consideration to relevant authorities, advocacy groups and the public. These are given an opportunity to express their views on the conclusions of an inquiry before the Government formulates a legislative proposal.

In December 2006 the government took three steps to broaden and deepen cooperation between business, scientists and politicians by setting up three new institutions; a Commission for Sustainable Development, a Scientific Council on Climate Issues and a parliamentary drafting committee. Hopefully these initiatives will make possible a deeper analysis of climate-related challenges and opportunities on which to base conclusions, goals and concrete action. One of the outcomes will be the Climate Policy Bill which the Government plans to present in 2008 (Swedish EPA 2007, April 25).

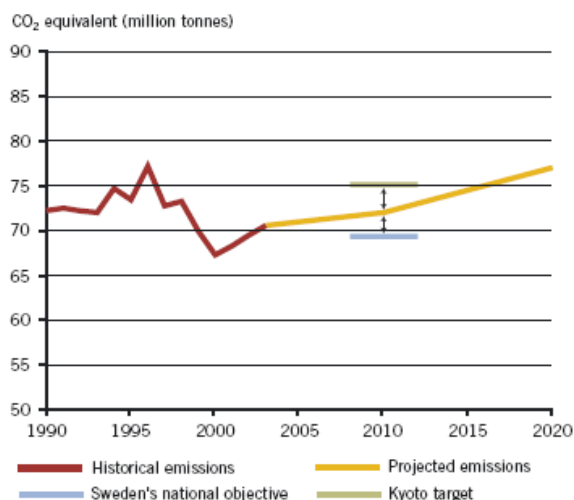
## 2.2.3 Major Policies and Strategies

### Major Targets and Future Roadmap

Under the EU Burden Sharing agreement, Sweden has committed to ensuring that emissions of greenhouse gases do not exceed 1990 levels by more than 4 per cent in the period 2008-2012.

In addition, Sweden has a separate and stricter *national target*. More specifically, Swedish emissions of greenhouse gases for the period 2008-2012 are to be at least 4 per cent lower than emissions in 1990. The target is to be attained without compensation for absorption in carbon sinks or by flexible mechanisms. Figure 13 illustrates historical and projected emissions (excluding LULUCF), the Kyoto target and Sweden's national objective.

**Figure 13.** Historical and projected emissions, the Kyoto target and Sweden's national objective.



Source: Swedish Ministry Memorandum Ds 2005:55

The long-term Swedish climate target is based on emissions in the longer term being evenly distributed among the world's population. In the long term, Swedish greenhouse gas emissions are therefore to fall to a level below 4.5 tons CO<sub>2</sub> equivalents per capita per year (Swedish EPA 2007, April 25). International work and initiatives in all countries are essential if the target is to be attained (ibid.).

The Swedish Parliament in 2006 adopted Bill 2005/06:172 ("National Climate Policy in Global Cooperation"). Complementing the abovementioned national short-term target, this Bill states that greenhouse gas emissions in 2020 should be 25 per cent lower than 1990 emissions (Swedish EPA 2007, April 25). In addition, sector guide targets for 2015 are to be drawn up (ibid.). The environmental quality objective according to the Bill should also be supplemented by a temperature target of a maximum average rise in temperature of 2 degrees compared with the pre-industrial level.

In May 2007, the Swedish environment minister announced he wanted Sweden to take on a unilateral target to reduce greenhouse gas emissions by 30 per cent below 1990 levels by 2020 (Point Carbon 2007). The EU in March set a unilateral target for the bloc to reduce greenhouse gas emissions to 20 per cent below 1990 levels by 2020, or a 30 per cent cut with a wider international agreement.

The Swedish Government's Commission on Oil Independence in 2006 presented proposed measures and orientation targets to create the conditions necessary to eliminate Sweden's dependence on fossil fuels for transport and heating by 2020 (Swedish EPA 2007, April 25).

Sweden is aiming at 60% renewable energy sources in electricity production by 2010. In 2004 the percentage was 46%, but it has decreased the last years. In terms of energy content the target for bio-fuels is 5.75% by 2010, compared to 2.23% in 2005. There is also a target for wind power at 10 TWh by 2015, which can be compared to an average annual production of about 140 TWh, which is dominated by hydro and nuclear.

### **Major Mitigation Policies, Their Progress of Implementation and Expected Effects**

The current Swedish climate strategy comprises a number of policy instruments intended to contribute towards reaching the abovementioned targets. The policy instruments are both cross-sectoral and sector specific. Grants for the local investment programs Local Investment Programme for Ecologically Sustainable Development (LIP) and its successor Local Climate Investment Programmes (Klimp), climate information campaigns and the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) constitute examples of the former type of instruments, while the electricity certificates system ("green certificates") and tax relief for carbon dioxide-neutral transport biofuels constitute examples of the latter (Ds 2005:57).

Studies of the overall effect of the policy instruments introduced since the early 1990s suggest that emissions in 2010 would be approximately 20 % higher if the policy instruments had remained unchanged since 1990 (Ds 2005:57). In the energy sector, economic instruments such as energy and CO<sub>2</sub> taxes, green certificates and the EU ETS are expected to be of particular importance in limiting emissions from the sector (Ds 2005:57, p. 21). In the transport sector, energy and carbon taxes are important policy instruments, along with the tax relief for biofuels and the system of carbon dioxide-differentiated vehicle taxes (Ds 2005:57, p. 33-36). The climate investment programs and information campaigns complement the climate strategy's economic instruments and are expected to reinforce and add to the overall effect by increasing awareness of the climate issue and acceptance of the climate strategy (Ds 2005:57, p. 25).

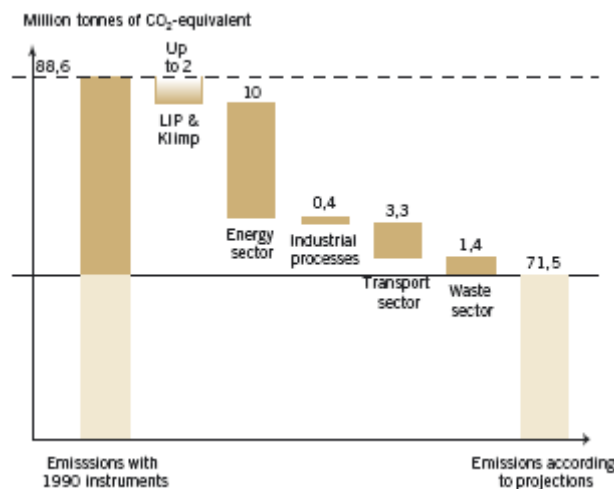
Taxes and the EU emissions trading scheme are important measures in Swedish climate policy (Alfsen and Eskeland 2007). The energy tax makes up 5.9 per cent and the CO<sub>2</sub> tax 2.9 per cent of the total tax revenue in Sweden. According to a 2004 review of Swedish climate policy, it is the CO<sub>2</sub> tax in particular that has contributed to a decrease in emissions in Sweden in the last decade (ibid.). The EU ETS covers just below 30 per cent of the total Swedish emissions in 2000. The emissions trading scheme is described in more detail in section C.S.2.

Grants for the local investment programs Local Investment Programme for Ecologically Sustainable Development (LIP) and its successor Local Climate Investment Programmes (Klimp), are described in more detail in section B.S.1.

The electricity certificate system, a trading system which aims to increase the supply of electricity from renewable energy sources, was introduced in May 2003. In the system, electricity producers receive an electricity certificate for each MWh of renewable electricity produced. The certificates are then sold to electricity consumers who are obliged to purchase certificates equivalent to a given percentage of their usage. The quota is increased annually (Ds 2005:55). The objective of the system is to increase renewable electricity production in Sweden by 10 TWh between 2002 and 2010.

The effect of policies and measures on GHG emissions towards 2010 is illustrated in Figure 14, taken from Sweden's Fourth National Communication on Climate Change (Ds 2005:55).

**Figure 14.** Contributions by the sector and the cross-sectoral instruments LIP and Klimp in 2010 and the aggregate effects of introduced instruments in comparison with 1990 instruments.



Source: Swedish Ministry Memorandum Ds 2005:55

Emissions from the waste sector have declined steadily since the early 1990s. According to the Swedish Report on Demonstrable Progress (Ds 2005: 57), this decline is partly due to increased collection and management of methane gas from landfills and partly due to a decline in the amount of organic material in landfills. Important policy instruments in the waste management sector include demands for municipal waste planning, regulations on producer responsibility for a number of different product groups (e.g. packaging, waste paper, stationery and tires), a tax on landfill waste, and a ban on landfill disposal of combustible waste and other organic waste (Ds 2005:55; Ds 2005: 57).

A demand for municipal waste planning was introduced in 1991, and is believed to have contributed to the expansion of methane collection and to the reduction of the amount of degradable material deposited in landfills (Ds 2005:55). A tax on landfill waste was introduced in 2000. Bans on the landfill disposal of combustible waste and organic material have subsequently been introduced, and have already begun to have an effect (ibid.). In 2003 and 2004, the amount of household waste deposited decreased by 30 and 34 per cent respectively compared with the preceding year.

Emissions from combustion in the residential and service sector have declined steadily since 1990 (Ds 2005:55). The decrease in emissions from combustion in 2003 amounted to a total of approximately 4.3 million tons CO<sub>2</sub> equivalent. According to Sweden's Fourth National Communication on Climate Change (Ds 2005:55), the reduction over the period 1990-2003 is mainly due to increased use of biomass fuel-based district heating. The use of heat pumps and wood pellet boilers has also increased in recent years.

Energy and CO<sub>2</sub> taxes are the instruments which have provided the greatest individual effect on emissions in the residential and service sector. A variety of grants (e.g., from LIP) have also encouraged the trend in the sector (Ds 2005:55). Examples of the several forms of investment support introduced in the residential and service sector in recent years include tax discounts for investments in more energy-efficient windows and deductions for investments in measures designed to improve energy efficiency in public premises (Ds 2005:55).

See Sweden's Fourth National Communication on Climate Change (Ds 2005: 55), Chapter 4 Policies and Measures, for an overview of the energy and carbon dioxide taxes, the various investment grants, and the large number of instruments directed towards increased energy efficiency improvement and reduced use of energy have had an impact more generally in the energy sector.

Emissions of methane and nitrous oxide from the agricultural sector have declined since 1990. According to Sweden's Fourth National Communication on Climate Change (Ds 2005:55), the reduced emissions of methane are mainly due to decreased livestock farming, while the reduction in nitrous oxide emissions is largely related to lower use of commercial fertilizer and farmyard manure. At present, there are no instruments in the agricultural sector that are *directly* aimed at reducing emissions of methane and nitrous oxide. Some of the instruments which indirectly affect emissions include: the EU Common Agricultural Policy; the Swedish environment and rural development program and; the Swedish Board of Agriculture action program for reduced losses of crop nutrients. See Sweden's Fourth National Communication on Climate Change (Ds 2005:55) for a more detailed discussion of the instruments, and how they may indirectly affect emissions of methane and nitrous oxides.

### 3 Participation of Local Government, Industry and Civil Society in Climate Change Responses

#### 3.1 Norway

##### 3.1.1 Case of climate change responses of the local governments

###### **The role and function the local governments and linkage with the policies of the central government**

Local government is responsible for implementing policies and measures at the local level, for example through waste management, local planning and transport measures. Local governments possess financial and legal instruments in sectors contributing to a substantial share of greenhouse gas emissions in Norway (Vevatne et al. 2005). Below, we briefly present some of the key instruments available at the local level when addressing climate change.

*Legal instruments:* Through the Planning and Building Act, the municipalities have an overall and long term responsibility for planning at the local level. The Act requires that all major projects (infrastructure, settlements) go through a planning and approval procedure in which environmental impacts are assessed. Through the Act, local governments have the authority to make binding decisions in the field municipal area planning, within the framework of national policy. Municipal area planning steers transportation patterns, residential construction, and energy consumption, and as such, can be expected to have an important effect on future emissions levels (Vevatne et al. 2005). Local governments may also affect local greenhouse gas emissions through the active application of the Pollution Act, Road Transport Act and Municipal Health Act (ibid.).

*Economic instruments (taxes, fees):* Local governments possess economic instruments in the waste and transport sector (e.g. toll road fees and waste fees).

*Other instruments:* Municipalities possess instruments that can help motivate behavioral and attitude changes, e.g. through local information campaigns and stakeholder processes.

According to a recent study by Vevatne et al. (2005), municipalities play an important role in reducing GHG emissions, particularly in the choice of housing patterns and energy consumption in buildings, from mobile sources, the waste sector, and agriculture, as well as reducing emissions from municipal activities. The authors argue that the municipal instruments can help fill “gaps” left by national policy instruments, for example in agriculture and waste sectors, as well as in activities run by a municipality.

At present, between 40 and 50 municipalities have implemented local climate action plans. Thus far, the energy sector has been the primary target of local government efforts. However, major cities have also implemented measures in the transport sector (Report No. 34 (2006-2007)).

In the recently introduced government white paper on climate policy (Report No. 34 (2006-2007)), the government signaled a commitment to further develop one of the key long-term climate policy tools that the local government possesses - the Planning and Building Act - as well as a general strengthening of the range of policy tools available, in an effort to ensure that national targets are met.

**Support programs of the central government for the local governments**

One example of a state government support scheme includes the grants available for efforts aimed at *energy efficiency and renewables*, managed by the Energy Fund. The Energy Fund was established on January 1 2002, and Enova SF is responsible for its implementation and administration. The long term goal is 12 TWh new renewable energy production or energy savings by 2010 (Enova 2007, April 25). To achieve the objectives of the support program, the Storting has indicated grants within a framework of up to app. €80 million over a ten-year period. Enova focuses its efforts on both the energy supply and the energy demand side. The most important criteria for project selection will be kilowatt-hours saved (energy saving projects) or new capacity installed (energy supply projects) in relation to funding (ibid.).

According to Enova's 2005 Annual Report, disregarding Enova's operating budget, 88% (NOK 657 million) of the Energy Fund's grants in 2005 was spent on programs for energy use and energy production (Enova 2007, April 25). Of these funds, 12% (NOK 86 million) was allocated to the areas information and communication (including the campaign aimed at children and young people), analysis and international activities (ibid.). Enova manages a project portfolio that at 31 December 2005 consisted of in all 2,035 projects totaling NOK 2,891 million.

In 2005, Enova drew up a new program for municipal energy and environmental planning. The program provides support for the preparation of municipal energy and environmental plans and for analyses of the pre-projects for heat production and infrastructure. The program's objective was to support good initiatives that may subsequently result in applications in one of Enova's programs. Enova's program, Municipal Energy and Environmental planning offers financial support of up to 50 per cent of project costs, up to a maximum of NOK 100,000. Municipalities may then subsequently choose to apply for financial support in order to realize actual projects

Since 2004, a reward scheme for public transportation in major cities has been financed by the Ministry of Transport and Communications. The purpose of the scheme has been to improve accessibility, local environment and health by reducing the growth in transportation needs and by increasing the share of public transportation. In the 2007 budget, a total of NOK 107.2 million have been allocated to the reward scheme.

In 2007, the Ministry of Local Government and Regional Development and the Ministry of Petroleum and Energy introduced a project called "Grønne Energikommuner" ("Green Energy Municipalities"). 10-12 municipalities will be asked to participate in the project, and the objective is to facilitate the move towards greater energy efficiency, a greater share of renewables, and reduced greenhouse gas emissions. Participating municipalities will receive professional, administrative and financial support (Haga 2007).

**3.1.2 Case of climate change responses of the industry****The role and function of the industry in climate change response**

Norwegian industry associations – often in cooperation with trade unions - have been engaged in climate change policymaking process from the start (Bang 2004). Examples of business organizations involved in lobbying to meet the challenge of climate policy regulations include NHO (Confederation of Norwegian Business and Industry), PIL (the Federation of Norwegian Process Industries) and OLF (The Norwegian Oil Industry Association).

*Taxes and fees*

See Norway's Fourth National Communication on Climate Change (Report T-1452/2006) for an overview of Norwegian green taxes 1997-2005. Kasa (1999) provides an excellent review

of the several attempts to tax mainland emission intensive industries during the 1990s. Kasa sheds light on the somewhat puzzling fact that while the mainland emission intensive industries have become “winners” in the regulatory contest, labor intensive industries and the service sector as well as other emission intensive sectors like transportation, petroleum exploration and private consumption have become “losers”, carrying a higher CO<sub>2</sub>-tax burden (ibid.).

#### *Agreements and voluntary measures with the government*

The government has concluded a number of agreements with specific sectors of industry concerning the reduction of greenhouse gas emissions. For instance, the aluminum industry agreed to reduce GHG emissions per unit aluminum produced by 50 and 55 per cent in 2000 and 2005 respectively, compared to the 1990 level (Report T-1452/2006). The Federation of Norwegian Process Industries signed an agreement to reduce GHG emissions from the process industry by 20 per cent in 2007 compared to 1990 (ibid.).

See Norway’s Fourth National Communication on Climate Change (Report T-1452/2006) for a more detailed overview of the different types of agreements that exist between central government and the industry.

### **Support programs of the central government for the industry**

Gassnova, a subsidiary of the Ministry of Petroleum and Energy, was established in 2005 to stimulate the development of technology for natural gas power generation with Carbon Capture and Storage (CCS). Gassnova administers the state-owned NOK 2 billion Gas Technology Fund, and provides financial grants to both national and international enterprises of approximately NOK 90 million annually. Gassnova offers project support to prototype and demonstration projects. In order to be eligible, projects must relate to development and testing of sustainable natural gas power technologies and solutions for capture and handling of CO<sub>2</sub>.

Industry may also apply for funding from the state-owned Energy Fund, administered by Enova SF. So far, Enova’s activities for the period 2002 to 2004 have resulted in energy savings of 1.4 TWh/year (TemaNord 2006: 539). Enova is working to boost the competitiveness of Norwegian industry through environmentally friendly and efficient energy use (Enova 2007, April 25). In the course of 2005 Enova has extended its main program oriented towards Norwegian onshore industry. Via the programme “Reduced energy use – industry”, all companies that have projects with total potential energy results of more than 0.5 GWh can apply for investment support. Support is granted to energy-efficient solutions, measures for energy recovery and conversion to renewable energy sources (ibid.).

Vevatne et al. (2005) have conducted a study of Norwegian industries vulnerable to international competition. Their main conclusion is that Norway, like most OECD countries with an active climate policy, has taken the needs of the competitively challenged industries into account to a significant degree in its formation of climate policy; the industries in question are mainly either exempted from or only mildly affected by climate policy measures (ibid.) They are subjected to lower climate or energy taxes, are not covered by the early quota systems from 2005 to 2007, or are in some cases covered by environmental agreements that have little effect on competitiveness or emissions (see Kasa 1999 for an excellent review of the history of tax exemptions).

### **3.1.3 Case of climate change responses of civil society**

#### **Activities by civil society and linkage with the policies of the central government**

*Political pressure:* Norwegian non-governmental organizations (NGOs), e.g. Natur og ungdom and Bellona, have been engaged in the climate change policymaking process from

the start (Bang 2004). For instance, NGOs have been active in the debate over natural gas-fired power plants (ibid.).

*Hearings/referrals:* Civil society may exert influence through the system of public hearings/referrals. Norway has a long tradition of hearings, a process in which reports are referred for consideration to relevant authorities, advocacy groups and the public when the government wants to hear the opinion of those likely to be affected by future legislation. In this way, the relevant groups are given an opportunity to express their views on before the government formulates a legislative proposal.

*Consumer choices:* Household energy efficiency measures and choice of modes of transportation are some of the areas in which households may affect emissions of greenhouse gases.

### **Support programs of the central government for civil society**

Examples of support programs of the central government for civil society include the *funding of household energy saving measures* and *non-electric heating alternatives*. Enova SF announced in 2006 that a total of NOK 46 million had been set aside for funding household energy saving measures. Purchases are reimbursed up to 20% of documented expenses, up to a specified maximum amount. A similar reimbursement scheme for households was successfully carried out in 2003. The state-owned Norwegian State Housing Bank offers financial incentives for new homes incorporating non-electric heating technologies. Loans are available for builders to incorporate technologies such as heat pumps, solar systems and biofuel boilers in their work.



## **3.2 Sweden**

### **3.2.1 Case of climate change responses of the local governments**

#### **The role and function of the local governments and linkage with the policies of the central government**

Local governments are responsible for implementing central government climate policy locally. However, studies have shown that local initiatives are often equally as important as central government initiatives in local governments' day-to-day work on climate change (Swedish EPA 2007, April 25). See Section A.S.2 for information about the division of labor between central and regional/local government, as well as a brief description of some of the central tasks of the latter levels of government. Below, we briefly describe some of the climate change responses of the local governments.

Examples of local government efforts include the project involving the five "challenger municipalities" Lund, Växjö, Sjöfjärden, Uppsala and Övertorneå, which ran from 1998-2000, initiated by the Swedish Society for Nature Conservation. The participating municipalities set targets and drew up programs to minimize the use of fossil fuels over time. In addition to this initiative, several other municipalities have adopted local climate targets.

The Swedish Network of Municipalities on Climate Change, whose main objective is to support local efforts to reduce emission of greenhouse gases, was established in 2003 and now comprises 20 municipalities and one county council. Work includes enhancing competence on climate change (e.g. through arranging workshops, education days), influencing the public opinion (e.g. through lobbying) and cooperation (e.g. through coordinating activities).

The Environmental Objectives Council was established by the government in 2002 to promote consultation and cooperation in implementing the Swedish environmental quality objectives. The Council consists primarily of representatives of central government agencies and county administrative boards. It is assisted by a group of experts representing local authorities, county councils, environmental NGOs and the business sector.

#### **Support programs of the central governments to support local governments to address climate change: the name of programs, specific activities, budget if available, etc.**

The Swedish parliament has set aside SEK 6.2 billion for Local Investment Programmes (LIP) and SEK 1.5 billion for Climate Investment Programmes (Klimp) (Swedish EPA 2007, April 25). Thus far, a total of 306 investment programs in more than half of Sweden's municipalities have been initiated. Some of these are still in progress, while others have been completed. The programs consist of more than 2500 projects and a total investment of more than SEK 30 billion.

Local governments have received subsidies for Local Investment Programmes (LIP) for ecological sustainability since 1998. LIP grants, covering up to 1/3 of the investment cost, were made over the period 1998-2002 and contained many measures aimed at reducing GHG emissions (Ds 2005:57). Approximately 45 per cent of the grants awarded have been for investments in energy conversion and energy efficiency (ibid.). From 2003 LIP was replaced by Klimp, which is dedicated to actions programs to limit climate change.

Support for Climate Investment Programmes, Klimp, was commenced in 2003 and gives municipalities, companies and others the opportunity to apply for grants for measures that reduce greenhouse gas emissions (Ds 2005:57). With regard to Klimp, Government grants

account for a minority share of the investments made, while applicants are responsible for providing the bulk of the investment (ibid.). Of the SEK 410 million awarded in 2007, just over 50% was awarded to local government projects (of the 147 projects that received state grants in 2007, 114 were local government projects (municipal or county projects)).

In total, the LIP and Klimp investment programs have generated environmental investments of roughly SEK 23 billion. In addition, state grants thus far amount to approximately SEK 6.1. Key figures are summarized in Table 4, taken from the Swedish Environmental Protection Agency's web portal "Green Investments in Sweden", available at: <http://klimp.naturvardsverket.se/mir/index.jsp?lang=en>.

Another example of central government support programs is the "Sustainable Municipality" (Uthållig kommun) program, launched in 2003. The Swedish Energy Agency is responsible for administering the program, which aims at "placing energy restructuring in a wider community perspective" (Swedish Energy Agency 2007, April 19). The five participating municipalities are Borås, Solna, Ulricehamn, Vingåker and Örnsköldsvik. The role of the Swedish Energy Agency is to ensure a continuous exchange of experiences between the participating municipalities. The agency also contributes with research grants, environmental scanning, basic data and method support.

**Table 4.** Investments in Sweden within the Local Investment Programmes (LIP) and Climate Investment Programmes (Klimp).

Type of program	Number of programs	Number of projects	Grant (MSEK)	Environmental investment (MSEK)	CO <sub>2</sub> -reduction (tons/year)
LIP in progress	34	343	1,047	3,150	98,659
LIP completed	177	1,502	3,608	13,822	1,152,031
Klimp in progress	95	721	1,463	6,178	853,302
Klimp completed	0	0	0	0	0
Total	306	2,566	6,118	23,150	2,103,992

Source: Swedish Environmental Protection Agency (2007)

### 3.2.2 Case of climate change responses of the industry

#### Activities and strategies by the industry to respond to climate change

In 2006 the government took three steps to broaden and deepen cooperation between business, scientists and politicians by setting up a Commission for Sustainable Development, a Scientific Council on Climate Issues and a parliamentary drafting committee. One of the aims has been to "make possible a deeper analysis of climate-related challenges and opportunities on which to base conclusions, goals and concrete action" (Swedish EPA 2007, April 25). One of the outcomes will be the Climate Policy Bill which the Government plans to present in 2008.

**Support programs of the central government for the industry**

Swedish energy intensive industry may be exempted from the electricity tax (i.e. from the minimum electricity tax) if they enter a 5-year program for greater energy efficiency. The program was introduced in 2005 (TemaNord 2006: 539).

Sweden uses subsidies through investment programs with an explicit focus on climate measures, for example subsidies to renewable energy production and energy conservation. Within these programs, municipalities and industry can apply for subsidies for investments that have a long-term effect on emissions of GHGs. Furthermore, Swedish renewable electricity production using wind power receives investment support. In addition, wind power produced electricity receives an “environmental bonus”, and large-scale wind power receives a subsidy in order to facilitate market introduction. Some or all of these grants may, however, be phased out due to the introduction in 2003 of the green (renewable energy) certificate system (TemaNord 2006: 539).

Sweden’s Fourth National Communication on Climate Change (Ds 2005:55) provides other examples of support programs, including government subsidies for technology procurement in the energy sector (excluding transport), and tax relief for the transport sector on biomass fuels.

**3.2.3 Case of climate change responses of civil society****The role and function of civil society and linkage with the policies of the central government**

The use of referrals/hearings is common in Swedish climate policy making, giving relevant authorities, advocacy groups and the public an opportunity to express their views on a given policy proposal. See section B.N.3 for information about hearings/referrals. In Sweden, referrals must be in writing and the referral bodies must be given at least three months in which to submit their opinions.

Another means by which civil society may attempt to exert influence on climate policy issues is through lobbying. For instance, apart from opinion-making and urging greater consumer power, the work of the NGO Swedish Society for Nature Conservation is principally geared towards political lobbying (Ds 2005: 55). In 2005, the Society arranged exhibitions, lectures and a national bicycle challenge known as “Klimattrampet”. Civil society may also affect emissions of greenhouse gases more directly through consumer choices; see section B.N.3 for a brief list of examples.

**Support programs of the central government for civil society**

One example of central government support program is the campaign “Värme I Villan” (“Heat in the Home”), launched by the Swedish Energy Agency in collaboration with the Association of Swedish Regional Energy Agencies, the municipal energy advisers, the Swedish Association of Plumbing, Heating, Insulating, Refrigerating and Ventilation Contractors and the Swedish National Association of Master Chimneysweeps in 2002. The program provided information to house owners about alternative heating systems to reduce their dependency on oil and electricity.

A system of tax relief for green cars and for biofuels was adopted in 2002. CO<sub>2</sub>-neutral motor fuels have been exempt from tax in Sweden since 2004. See also B.S.1 on subsidies to energy conservation.

A total of 23 environmental NGOs received a total of SEK 8.4 million in financial support from the Swedish Environmental Protection Agency in 2007. Work in the field of climate change was one of the areas given priority when ranking eligible applications (Swedish EPA 2007, April 25).

## **4 Implementation of the Kyoto Mechanisms**

### **4.1 Norway**

#### **4.1.1 Utilization of the CDM and JI**

##### **Contribution of the Kyoto Mechanisms to Complying with the Kyoto Commitments**

Norway anticipates that the emissions reductions attained through domestic policies and measures will not be sufficiently large to reach its Kyoto commitment, and the use of flexible mechanisms will hence be an important part of the strategy (TemaNord 2006; Report T-1453/2006). According to the “with existing measures projections”, Norway has a Kyoto gap to close that corresponds to about 9 Mt per year in the period 2008 to 2012. The Norwegian government has indicated that credits from Joint Implementation (JI) and the Clean Development Mechanism (CDM) will be used if necessary in order to fulfill the Kyoto commitments (Report T-1453/2006, Report No. 34 (2006-2007)).

On the background of the recent White Paper No. 34 on climate policy there has been an ongoing debate on the share of domestic actions and use of Kyoto mechanisms to meet Norway’s Kyoto commitment. According to a press release by the Ministry of the Environment, made in connection with the introduction of the abovementioned white paper, the proposed targets of improving on Norway’s commitment under the Kyoto Protocol by 10 per cent and of reducing emissions of greenhouse gases by 30 per cent compared to 1990 levels by 2020, are to be achieved “both by substantially reducing Norway’s emissions and by paying for cuts in other countries. The whole of the 10 per cent will be accounted for by reductions outside Norway” (Press Release 22.06.07).

The Norwegian Emissions Trading Regulation and Emissions Trading Act allows for the use of CDM in the Norwegian emissions trading system in the period 2005-2007, based on the same criteria as in the EU ETS trading system (TemaNord 2006; Report T-1452/2006). However, there is still no decision made regarding the use of credits from JI and the CDM in the period 2008-2012. A decision also remains to be taken with regard to share of reductions by firms included in the Norwegian quota system (see section C.N.2) and other firms and sectors, and the share of government v. s. private purchase of quotas and credits through the Kyoto mechanisms.

##### **Operational Procedures to Procure Carbon Credits from the KM**

(Do not yet exist).

##### **The Roles and Functions of Each Ministry in Project Approval and Coordination of Relevant Ministries**

(Do not yet exist).

##### **Government Support Programs to Promote the KM and Best Practices, if Any**

(Do not yet exist.)

#### **4.1.2 Emissions Trading Scheme**

Norway established a national emissions trading system in January 2005, lasting until end of 2007. The second phase will last from January 2008 till end of 2012, coinciding with the Kyoto period. Since early 1990-ies and the negotiations leading up to the Kyoto Protocol Norway has favored and been promoting flexible mechanisms as an integral part of international climate agreements. This policy has been based on assumptions that mitigation

costs are high in Norway (e.g. because electricity production is close to 100% hydro) and more general that mitigation costs vary substantially between both industrialized and developing countries. Therefore a large global cost saving potential should be available if flexible mechanisms allow a de-linking of whom pays for mitigation and where the least expensive measures are found and efforts should first take place.

#### *Phase 1, 2005-2007*

Norway introduced an early emissions trading 1<sup>st</sup> January 2005, which coincided with EU emissions trading system (EU ETS). This emission trading system (ETS) lasts till end of 2007. It is a narrow ETS covering only CO<sub>2</sub> and about 12% of Norway's emissions of greenhouse gases (GHG) (varies between 10 and 15% over the period), covering 51 firms. The included sectors are by 2/3 energy-related, that is oil refineries, gas refineries, petrochemical industry and gas-fired power stations (at the time there were no existing, only planned plants). In addition coke, iron and steel, cement, chalk, glass, glass fiber, and ceramic products are included. The quotas are free and allocated based on emissions in the period 1998-2001. The allocation of quotas is equivalent to 95% of estimated need in the period 2005-2007. The final allocation of free quotas turned out to be 91% of the emissions applied for by the firms. New firms must apply for quotas. CDM and JI credits, and EUAs (European Allowances) are allowed. Penalty for non-compliance is 40 Euro per ton of CO<sub>2</sub>. Emission data compared to the freely allocated quotas showed that there was a 5% over-allocation of quotas in 2006.

Other Norwegian emissions are covered by a CO<sub>2</sub> tax that was introduced in 1991, covering some 40% of national emissions. The energy-intensive industries most exposed to competition on the World market have entered an environmental agreement with the Ministry of Environment, where emissions are to be reduced by 7.5% compared to business as usual in 2007.

#### *Phase 2, 2008-2012*

Norway will introduce a second period of its ETS from 1<sup>st</sup> January 2008 till end of 2012, which coincides with the second EU ETS period and with the target period of the Kyoto Protocol. After long negotiations Norway will accept EU's ETS directive, although some adaptations are still being negotiated. Compared to the first period the ETS is significantly expanded, mostly due to the inclusion of oil and gas production, reaching about 40% of national emissions. Other new sectors are fertilizers, herring meal and oil, and paper and pulp. Land-based industries will receive quotas equivalent to 92% of their emissions in 1998-2001, which is the same base period as for the first phase. Relative to 2005 emissions this will be 80% free quotas. Off-shore industries, that is oil and gas production, will get no free quotas. Taken together this means that the industries included in the ETS receive only 25% of projected 2010 emissions as free quotas. In addition gas and oil and gas production will get a lower CO<sub>2</sub> tax, so that the sum of the quota price and tax will be about equal to the present CO<sub>2</sub> tax. There is a quota reserve for new gas fired power stations, which will get free quotas equivalent to the amount of CO<sub>2</sub> they are able to capture and store in geological formations. Quotas that are not given out for free will be sold or auctioned.

### **Inter-Ministerial Coordination Process and Stakeholder Consultation Mechanism**

The Ministry of the Environment has been responsible for developing the national emission trading system in Norway, and has coordinated this work with other ministries. For the second phase a lot efforts have been spent to link the system to EU's emission trading system. The Norwegian Pollution Control Authority (SFT) has been delegated the responsibility to

develop detailed rules for the system, and implement and manage the system vis-à-vis the firms included in the emission trading system. Both for proposed law on emission trading for the first phase and the revised law for the second phase, and for the more detailed rules of operation of the emission trading system, business, interest organizations, and research organizations were invited to forward comments and propose amendments.

### **Expected Output from ETS**

To a large extent the first trading phase has been considered a learning experience for the authorities and business. For the second phase ambitions are higher. The system is wider in terms of Norwegian participation and it is linked to EU's trading system. Furthermore it coincides with trading under the Kyoto Protocol (emission trading and joint implementation among industrialized countries and the clean development mechanism involving developing countries). The aim for the emission trading system is to make significant contributions for reaching the Norwegian Kyoto target and in a way that realizes a substantial cost saving potential given the cost effectiveness potential of the policy instrument, both in terms of the large European market and the global Kyoto market.

## 4.2 Sweden

### 4.2.1 Utilization of the CDM and JI

#### **Contribution of the Kyoto Mechanisms to Complying with the Kyoto Commitments**

According to the latest “with existing measures” projection, Sweden’s greenhouse gas emissions in 2008-2012 will be 1 per cent below the 1990 level. This is *below* the national commitment according to European Union’s burden sharing agreement (i.e., 104% of 1990 levels), but *above* the national emission target (i.e., 96% of 1990 levels).

Sweden has announced that it does not intend to use credits from Joint Implementation (JI) and the Clean Development Mechanism (CDM) in order to fulfill its commitments under the Kyoto Protocol. The national short-term target, too, is to be achieved without the use of flexible mechanisms.

Although Sweden intends to meet its short-term targets and obligations by means of domestic measures only, the government is providing funds for JI and CDM projects. More specifically, the Swedish government participates in two multilateral CDM/JI funds - the Prototype Carbon Fund (PCF) and the Testing Ground Facility (TGF) – and is also committed to the government-financed CDM and JI program Swedish International Climate Investment Programme (SICLIP).

The total sum invested is expected to generate credits corresponding to around 5 Mt CO<sub>2</sub> equivalents in the period 2008 to 2012, i.e. 1 Mt CO<sub>2</sub> equivalents per year (Ds 2005:55). One of the motives behind participating in the projects is to gain experience and contribute to sustainable development in host countries (IISD 2007).

#### **Operational Procedures to Procure Carbon Credits from the KM**

The Swedish Energy Agency, a government agency reporting to the Ministry of Enterprise, Energy and Communications, is responsible for administering the SICLIP program. The program has a total budget of approximately €22 million for CDM and JI projects. The Swedish Energy Agency is also responsible for the Swedish participation in the Testing Ground Facility and the Prototype Carbon Fund.

Participation in CDM, JI and emissions trading for Swedish entities is regulated by a Government Ordinance issued on 31 August 2006 (“Ordinance amending the Emissions Trading Ordinance (2004:1205)”). Parts of the ordinance have been made available in English, and may be accessed via the Energy Agency’s website; <http://www.energimyndigheten.se/>.

The European Commission’s decision on CDM/JI limits for Sweden for the period 2008 to 2012 has been set to 10% of total allocation, corresponding to approximately 2.28 million credits per year (Point Carbon 2007, May 18).

#### **The Roles and Functions of Each Ministry in Project Approval and Coordination of Relevant Ministries**

Since 1998, the Swedish Energy Agency has been responsible for the administration of international climate related investments. Project approval is regulated by the abovementioned Government Ordinance issued on 31 August 2006, available at the Swedish Energy Agency’s website: <http://www.energimyndigheten.se/>.

**Government Support Programs to Promote the KM and Best Practices, if Any**  
(To our knowledge, none exist at this stage.)

**4.2.2 Emissions Trading Scheme**

From 1999 Sweden worked on a domestic emission trading scheme, but after EU's initiative to develop an early emission trading system to be initiated 1 January 2005 the country joined the efforts to develop and implement an EU-wide system. As an EU member state from 1995 Sweden joined the first phase of EU's emission trading in January 2005, and continues with the second phase to be initiated 1 January 2008 and lasting until end of 2012.



## 5 Studies on Carbon Fund and its Utilization

### 5.1 Norway

#### 5.1.1 Background of introducing carbon fund and structure of the fund

At present, Norway does not have any national carbon fund. Moreover, to our knowledge, at this stage no private sector funds exist either. However, both the government and actors from the private sector are committed to providing financial support to several of the existing international carbon funds. In this section, we provide a brief overview of some of these funds.

##### *The Prototype Carbon Fund (PCF)*

The PCF became operational in 2000. The fund is managed by the World Bank, and has a total capital of USD 180 million. Contributions have been made by a total of seventeen companies and six governments. The PCF will invest in projects designed to produce Emission Reductions consistent with the Kyoto Protocol and the emerging framework for JI and the CDM. The Government of Norway and the companies Statoil ASA and Norsk Hydro are all participants in the fund. The government is committed to investing USD 10 million in the World Bank's PCF.

##### *The Community Development Carbon Fund (CDCF)*

The CDCF was established in 2003. The CDCF is a multi-donor trust fund administered by the World Bank. Nine governments and fifteen companies/organizations participate at present. The fund invests in small scale CDM-projects. Credits can be used as emissions rights and qualify for use in the EU and in Norway from 2005. Statoil ASA and Statkraft Carbon Invest S.A. (Norway) both participate in the CDCF.

##### *The Baltic Sea Region Testing Ground Facility (TGF)*

The Testing Ground Facility is a regional carbon fund with investors from the Nordic governments and Germany. The TGF provides carbon finance to cleaner energy investments in the Baltic Sea Region through the Joint Implementation (JI) mechanism of the Kyoto Protocol. The Facility is administered by Nordic Environmental Finance Corporation (NEFCO). In 2003 Norway invested USD 1.14 million in the Testing Ground Facility.

##### *Carbon Fund for Europe (CFE)*

The CFE was established in March 2007 by the World Bank, in cooperation with the European Investment Bank (EIB). The Participants in the CFE are Statkraft Carbon Invest S.A. (Norway), Ireland, Luxembourg, Portugal and the Flemish Region. The CFE will purchase GHG emission reductions through the CDM and JI from climate friendly Investment projects from either bank's portfolio, as well as from standalone projects. Projects are prepared, appraised and financed either by the World Bank or the EIB directly or through implementing entities.

A summary of the funds, its participants and the funds invested is provided in Table 5.

With regard to motives for committing contributions to the World Bank's funds, Statoil ASA states that "Emissions trading is seen ... as an important means of responding to climate

challenges. This and other Kyoto mechanisms represent a cost-effective way for industry to help reduce global greenhouse gas emissions.”<sup>4</sup>

**Table 5.** Funds invested in multilateral carbon funds

<b>Fund/ Program</b>	<b>Participant</b>	<b>Funds Invested</b>	<b>Comments</b>
<b>Testing Ground Facility</b>	The Norwegian government	USD 1.14 million (in 2003 only)	JI co-operation within the framework of BASREC
<b>Prototype Carbon Fund</b>	The Norwegian government, Statoil ASA, Norsk Hydro	USD 10 million	The World Bank's fund for the acquisition of emission reduction units from CDM and JI projects
<b>The Community Development Carbon Fund (CDCF)</b>	Statoil ASA, Statkraft Carbon Invest S.A.	USD 2.5 million (Statoil ASA).	Investment in small-scale CDM projects. Administered by the World Bank
<b>Carbon Fund for Europe (CFE)</b>	Statkraft Carbon Invest S.A.	Euro 10 million	EIB in cooperation with the World Bank. Acquisition of emissions reductions units from JI and CDM projects

Finally, it should be noted that although the Norwegian government currently does not have a national carbon fund, NOK 100 million has been allocated on the 2007 budget for purchase of Kyoto units.

### 5.1.2 Detailed information on operating the fund

**Operator of the fund, approval procedures to use the fund, repayment scheme, etc.**

(Remains to be decided.)

**Size of the fund, approval conditions, status of fund operation**

(Remains to be decided.)

### 5.1.3 Future plans on the fund

(Remains to be decided.)

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<sup>4</sup> Statement taken from Statoil ASA's website:  
<http://www.statoilnorge.no/STATOILCOM/SVG00990.nsf?opendatabase&lang=en&artid=F51B899B9A97B5E1C1256FD6002FBD1F>

## 5.2 Sweden

### 5.2.1 Background of introducing carbon fund and structure of the fund

The Swedish government participates in two international funds, the Prototype Carbon Fund (PCF) and Testing Ground Facility (TGF). In addition, the Swedish company Göteborg Energi AB participates in the Community Development Carbon Fund (CDCF). The three multilateral carbon funds are described in section D.N.1.

The Swedish government is moreover committed to a state financed CDM and JI program, the Swedish International Climate Investment Programme (SICLIP). According to Sweden's Fourth National Communication on Climate Change (Ds 2005:55), investments in the multilateral funds and in the SICLIP are expected to lead to the acquisition of emissions reduction units over the period 2008-2012 amounting to around 5 Mt of CO<sub>2</sub> equivalent, i.e. approximately 1 Mt of CO<sub>2</sub> equivalent per year. Table 6, taken from Sweden's Fourth National Communication on Climate Change, provides an overview of funds invested by the government thus far.

**Table 6.** Funds invested for the acquisition of emission reduction units.

Fund/ Program	Funds Invested	Comments
Testing Ground Facility	EUR 4 million	JI co-operation within the framework of BASREC
Prototype Carbon Fund	USD 10 million	The World Bank's fund for the acquisition of emission reduction units from CDM and JI projects
SICLIP	SEK 160 million	Sweden's national program for the acquisition of emission reduction units from JI and CDM projects

*Source: Swedish Ministry Memorandum Ds 2005:57.*

Swedish international climate related investments are managed within the SICLIP. The SICLIP was established in 2002. The SICLIP's primary aim is to "contribute to the development of the Kyoto mechanisms and for the Swedish authorities, as well as relevant authorities in the host countries, to enhance knowledge and gain experience of developing CDM and JI projects" (Swedish Energy Agency 2007, April 19).

#### **In case of public fund, funding source, inter-ministerial consultations and how to decide a responsible ministry or agency**

SICLIP is administered by the Swedish Energy Agency, a government agency reporting to the Ministry of Enterprise. SICLIP is funded by the Swedish government.

### 5.2.2 Detailed information on operating the fund

#### **Operator of the fund, approval procedures to use the fund, repayment scheme, etc.**

SICLIP is administered by the Swedish Energy Agency.

Participation in CDM and JI is regulated by a Government Ordinance issued on 31 August 2006 ("Ordinance amending the Emissions Trading Ordinance (2004:1205)"). Sections of the

ordinance relevant to approval procedures have been made available in English, and may be accessed via the Swedish Energy Agency's website; <http://www.energimyndigheten.se/>.

### **Size of the fund, approval conditions, status of fund operation**

The SICLIP fund mostly focuses on small and medium sized (less than 1Mt CO<sub>2</sub> equivalents) RE / EE projects in Kyoto signatory countries in Africa, Asia, Latin America and Central/Eastern Europe (Swedish Energy Agency 2007, April 19). The investments tend to be part of larger projects, and involve different modes of cooperation. The contribution to the sustainable development of the host country is carefully considered in each project. It is moreover important that the project meets the requirements for approval by the host country (ibid.). The Agency may choose to engage in a project at any time during the project cycle, and on a case to case basis provide financial support for documentation preparation and transaction costs (ibid.). In addition, the Agency takes into consideration the financial status of the project entity, and prospects for and availability of project finance (ibid.).

The Swedish Energy Agency is currently engaged in projects generating between 200,000 to 600,000 ton CO<sub>2</sub> emissions reductions over a period of 7-10 years. The program has a budget of approximately €23 million (ibid.).

The SICLIP-JI program was initiated in 2003. With regard to JI investments, four small to medium sized projects leading to approximately one million ERUs, will be developed further (ibid.). The prioritized areas are renewable energy applications and energy efficiency improvements. The projects are located in Rumania, Estonia, Russia and Ukraine. Further information about the projects can be accessed at the Swedish Energy Agency's web pages; <http://www.energimyndigheten.se/>

The SICLIP-CDM program was initiated in 2002. Priority is given to energy efficiency and renewable energy projects (Swedish Energy Agency 2007, April 19). Currently, a total of 6 projects have been selected for further development. The CDM projects are located in Brazil, India and China. The projects are described in more detail at the Swedish Energy Agency's web pages; <http://www.energimyndigheten.se/>

The Swedish Energy Agency is also responsible for the Swedish Government's participation in the multilateral carbon funds. The Swedish contribution to the TGF amounts to €4 million. The Swedish government is also investing USD 10 million in the PCF.

### **5.2.3 Future plans on the fund**

(Remains to be decided).

## **6 Cases of impact assessment of and adaptation policies to climate change**

### **6.1 Norway**

#### **6.1.1 Case study of central government**

##### **Main policies and milestones**

The Norwegian government is currently in the process of preparing a comprehensive action plan for adaptation to climate change. This work commenced in 2005 (Report T-1453/2006), but is so far at an early stage.

Although the central government currently lacks an overall strategy for adaptation to climate change, there are examples of measures being carried out independently in vulnerable sectors (Report T-1452/2006). For instance, the Norwegian Public Roads Administration and the Norwegian Water Resources and Energy Directorate are both currently involved in projects to evaluate the consequences of climate change in their respective sectors (*ibid.*). The results from the project carried out by Norwegian Public Roads Administration will be taken into account when developing new guidelines for the building, maintenance and drainage of roads (*ibid.*). Other examples of current activities can be found in the coastal administration, where the potential consequences of increased water levels and changes in the size of waves are taken into consideration in the planning activities, and in the Norwegian railroad network, where measures to improve the warning systems for extreme weather and landslides are currently undertaken (*ibid.*).

#### **6.1.2 Inter-ministerial coordination**

##### **The role and function of relevant ministry or agency**

The current process of devising a national plan for, as well as the current work on, adaptation to climate change is coordinated by the Ministry of the Environment, but involves several other ministries and agencies (Report T-1452/2006; Report T-1453/2006).

#### **6.1.3 Roles of the local governments, industry and civil society in adaptation policies and strategies**

Adaptation to climate change is currently not as integrated in local and regional planning as is necessary (Report T-1452/2006; Aall and Groven 2003). According to Aall and Groven (2003), the general lack of focus on adaptation to climate change that characterizes local and regional planning also holds in the areas of civil protection and emergency planning and insurance (i.e., other institutional systems where one might expect adaptation to be on the agenda). Moreover, to the extent that actors involved in these areas do focus on adaptation, the focus is generally on present extreme events (e.g., extreme weather) rather than on adapting to more long-term effects of climate change.

It is worth pointing out, however, that The Planning and Building Act is currently under revision. The aim of this revision is to make it a tool to ensure that climate change is taken into consideration in local and regional planning (Report T-1452/2006).

## **6.2 Sweden**

### **6.2.1 Case study of central government**

#### **Main policies and milestones**

Like Norway, Sweden currently lacks an overall strategy for adaptation to climate change. However, a commission was appointed in 2005 to draw up proposals for ways of making Swedish society more robust in the face of climate change (Ds 2005: 57). The commission released a Government official report, titled "Sweden facing climate change - threats and opportunities", in 2007 (SOU 2007:60).<sup>5</sup> Sweden has also produced an official report on challenges related to flooding of its great lakes (SOU 2006:94).

### **6.2.2 Inter-ministerial coordination**

#### **The role and function of relevant ministry or agency**

The current process of devising a national strategy for, as well as the work on, adaptation to climate change is coordinated by the Ministry of the Environment, but involves several other ministries and agencies (Ds 2005:55).

### **6.2.3 Roles of the local governments, industry and civil society in adaptation policies and strategies**

Although Sweden still lacks an overall strategy for adapting to climate change, there are examples of implemented, ongoing and planned adaptation measures in several sectors. The following examples have been taken from Sweden's Fourth National Communication on Climate Change (Ds 2005:55):

- A strategy for the breeding of pine, spruce, birch and contorta pine has been devised by Skogforsk (the Forestry Research Institute of Sweden). The purpose of the strategy has been to ensure long-term dynamic preservation of genes, to create a state of readiness for future climate change and to improve the general characteristics of the trees in terms of vitality, growth and timber quality.
- Amendments to physical planning and building regulations have been undertaken by some municipalities in order to take into account potential extreme water levels and water flows in the future.
- A review of the ability of the hydropower system to cope with high flows. Account is taken of the potential risks that climate change entails in this review.
- Sweden's two largest cities, Stockholm and Gothenburg, have done studies on adaptation challenges and how they can be addressed.<sup>6</sup>

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<sup>5</sup> The report is available in English at <http://www.sweden.gov.se/sb/d/574/a/96002>

<sup>6</sup> See <http://www.smhi.se/cmp/jsp/polopoly.jsp?d=10002&l=sv> for further information (in Swedish).

## **7 Policy suggestions to establish national roadmaps to respond to climate change**

### **7.1 *Division of roles and function among relevant ministries and other stakeholders***

- There are arguments for lifting the responsibility for climate policy to the Prime Minister's office.
- Conflicts of interest between ministries should be handled in interministerial committees and secondly at government level.
- A larger staff (than in Norway) may be needed in MoE.

#### **7.1.1 How to establish cooperation mechanisms with local government, industry, and other private sector participants for effective implementation of response policies and strategies**

- Communities and local governments should develop policies (and local targets), but based on central policy framework and strategy. Sufficient opportunities for adapting central policies to local needs/conditions should be ensured.
- Organizations and citizens at local level should be engaged.
- Central government support programs (financial support, education/information etc.) are needed.
- Local/industry/private sector engagement should be ensured when formulating national policy and measures (e.g. system of hearings/referrals, committees, etc.)

### **7.2 *Policy suggestions for effective applications of the Kyoto Mechanisms and carbon fund***

- The flexible mechanisms should have as wide coverage (in terms of sectors, sources, and gases) as possible.
- Participation in emissions trading and other flexible mechanisms should be as wide as possible.
- Emissions trading should be combined with taxing and other policy instruments since no single instrument is most suitable under all circumstances.
- Authorities should make sure that everyone has the best available and updated information on the workings, prices, etc., of flexible mechanisms.
- The authorities should participate in markets for flexible mechanisms to fill in on activities of private firms, organizations, and households, for reasons of covering

emissions from the public sector and because this can enhance the efficiency of these markets.

- The government and business should use carbon funds as a supplement to single quotas and credits to spread risk and reduce administrative and information costs.



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