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Strategic Approaches to Climate Change in Europe: EU policies and strategies, provisions in SD strategies and overview of national climate change strategies

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This ESDN Quarterly Report provides an overview of strategic approaches to climate change in Europe. It is a very topical issue because the debate about climate change has constantly increased over the last years and has led to the formulation of policies that try to reduce manmade greenhouse gases (GHG). As climate change mitigation cuts not only across many policy fields (e.g. energy, transport, industry, agriculture, waste, etc.) but also involves long-term planning, strategic policy approaches play an important role. First, the report introduces some key scientific reports on climate change that inform political action and briefly portrays the UN climate change regime (UNFCCC and Kyoto). Second, it describes the EU's climate change approach and the latest Greenhouse Gas emission trends, suggesting that significant additional efforts are needed in numerous countries if the EU-15 want to meet their Kyoto reduction target of -8%. Based on a comprehensive review of all SD strategies in the EU-27 and other European countries, the report then gives a complete picture of climate change policy objectives and indicators in the context of SD strategies. Fourth, the report provides a list of climate change strategies in Europe, complemented with a portrait of the climate strategies of Sweden and the UK – two EU-15 countries that have the best climate policy performance with respect to their Kyoto emission reduction targets.

Content

Introduction

Scientific reports on climate change that inform political action

In recent years, the debate about climate change issues and its consequences has constantly increased. On the one hand, media attention and public concern were spurred by extreme weather conditions (e.g. high temperatures, droughts, floods, hurricanes, etc.). On the other hand, scientific reports about climate change and its human origins increasingly provide the basis for informed public discussion and political action.

The most widely accepted assessment reports on human-induced climate change are published by the ***Intergovernmental Panel on Climate Change (IPCC)***. The IPCC has been established by the World Meteorological Organization (WMO) and the United Nations Environmental Programme (UNEP) in 1988. Its main role is to assess the scientific, technical and socio-economic information relevant to understand the scientific basis of risks of human-induced climate change, its potential impacts and options for adaptation (i.e. how to live with climate change) and mitigation (i.e. how to reduce GHG emissions). IPCC does not carry out its own research but bases the assessments largely on peer reviewed and published literature about climate change. It has three working groups and one task force that

work on different climate change topics. So far, four assessment reports have been published (in 1990, 1995, 2001 and 2007). The findings presented in IPCC assessment reports provide the most important scientific basis for the United Nations (UN) and the EU when formulating their climate change policies.

Published in February 2007, the report of Working Group 1 to IPCC's Fourth Assessment Report (referred to as AR4) on the physical science basis of climate change states that eleven of the last twelve years (1995-2006) rank among the twelve warmest in the records of global surface temperature[1] since 1850. And this increase in global average temperature, so the report, "is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations" (emphasis in original, IPCC, 2007, 10). Carbon dioxide (CO2) is the most important anthropogenic greenhouse gas (GHG). The primary source of the increased atmospheric concentration of CO2 mainly results from using fossil fuels (coal, oil and natural gas). For instance, fossil fuels currently account for more than 85 per cent of all the energy consumed in the USA, nearly two-thirds of electricity, and virtually all of transportation fuels (US Department of Energy website). Land-use change (in particular sprawl) can be regarded as another factor for increasing CO2 emissions. The other two major GHGs are methane (CH4) and nitrous oxide (N2O). The IPCC assessment report argues that continued GHG emissions will lead to further warming of the global climate system when no mitigation measures are taken: Using climate change models, it estimates that the surface temperate will rise by 1.8 to 4.0°C during this century (IPCC, 2007).

The second report which had a significant impact on policy-makers and the wider public was the report of the ***Stern Review***. The review was undertaken for the UK government and published in October 2006. It focused on the economics of climate change, and its major conclusion was that the costs of inaction would be much higher than the costs of action: "if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5 % of global GDP each year [...] In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1 % of global GDP each year" (Stern Review, 2006, iv). The report also mentioned that evidence would show that climate change has serious impacts on the world economy, the environment and human life in general.

The Stern Review in particular illustrates the close **link between climate change and SD policies** (and strategies):

- On the one hand, climate change has an impact on all three pillars of SD – economic (costs of non-action, energy prices, etc.), environmental (pollution, impacts on eco-systems and biodiversity, etc.) and social issues (food and energy prices, consumption patterns, etc.).
- On the other hand, climate change cuts across many SD policy fields (e.g. energy, transport, industry, agriculture, waste, etc.) and is, therefore, one of the key challenges of horizontal and vertical policy integration towards SD.

International responses to climate change

The findings of the first assessment report of the IPCC in 1990 were used to initiate negotiations on an effective framework convention on climate change before the UN Conference on Environment and Development (UNCED) in Johannesburg in 1992. The ***United Nations Framework Convention on Climate Change (UNFCCC)*** was adopted in May 1992 and opened for signature during UNCED. The Convention entered into force in March 1994 and most countries in the world joined this international treaty (UN, 1992). Currently, 195 countries have ratified the Convention (status of ratification, 22 August 2007).

UNFCCC sets out an overall framework for intergovernmental efforts to tackle the challenges posed by climate change. The main objective of the Convention is "to achieve [...] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UN, 1992, 4). The countries that have singed the Convention have accepted several commitments, among them:

- To develop, periodically update, publish and make available to the Conference of Parties (COP)[2] national inventories of anthropogenic GHG emissions;
- To formulate, implement, publish and regularly update ***national programmes*** containing measures to mitigate climate change; and
- To submit ***progress reports*** about the steps they have taken to implementation their commitments, based on common reporting guidelines.

National greenhouse gas inventories of anthropocentric emissions are submitted by developed countries on an annual basis. The reports for 2007 are available on the UNFCCC website. National programmes have been developed by some countries (for a European overview of climate change programmes and strategies, see below), and about 41 progress reports ("national communications", in particular from developed countries" listed in Annex 1 of the Convention) can be found on the UNFCCC website.

When the UNFCCC was adopted, governments were aware that their commitments in the Convention would not suffice to seriously tackle climate change. Therefore, in the first COP in Berlin in 1995 a new round of talks was launched to decide on stronger and more detailed commitments for the industrialized countries ("Berlin Mandate"). After two and a half years of intensive negotiations, the ***"Kyoto Protocol"*** was adopted at the third COP in Kyoto, Japan, on 11 December 1997. The Kyoto Protocol shares the objectives, principles and institutions of the UNFCCC. However, it also strengthens the Convention by committing the Annex 1 countries to individual, legally-binding targets and timetables to limit or reduce their GHG emissions. Currently, 178 countries have singed the Kyoto Protocol (status of ratification, 6 June 2007). However, the USA – for a long time the world's largest CO2 emitter and now only second to China in absolute terms (Guardian, June 19, 2007) – rejected to sign the Kyoto Protocol (Steurer, 2003).

Under the Kyoto Protocol, developed countries have committed themselves to reducing their collective emissions of six key GHGs by at least 5 per cent. For the three most important GHGs (CO2, methane and nitrous oxide), cuts will be measured against the base year of 1990. Each country's emission target must be achieved in the period 2008-2012 and will be calculated on average over these five years. However, the individual contribution of GHG emission cuts varies among the developed countries. For instance, the EU committed itself to reduce GHG emissions by 8 per cent from 1990 levels by 2008-2012. In a "burden sharing agreement" adopted by the European Council in June 1998, the then 15 EU Member States defined their individual contributions to reach this objective. Below are the GHG reduction targets of the EU-15 as agreed on in 1998:

EU-15 country	GHG reduction target (based on 1990 figures)
Austria	-13%
Belgium	-7.5%
Denmark	-21%

Finland	0%
France	0%
Germany	-21%
Greece	+25%
Ireland	+13%
Italy	-6.5%
Luxembourg	-28%
Netherlands	-6%
Portugal	+27%
Spain	+15%
Sweden	+4%
UK	-12.5%
EU	**-8%**

Table 1: EU-15 Kyoto Protocol GHG emission reduction targets

The EU and its then 15 Member States ratified the Protocol on 31 May 2002 and it entered into force on 16 February 2005.

A common Kyoto target and burden sharing agreement for the EU-27 does not exist. Therefore, it has to be reviewed how the EU-15, not the EU-27 fare in reaching the -8% GHG reduction target (European Environment Agency). Although the new EU Member States are not part of the EU burden sharing agreement outlined above, they nevertheless have adopted their own Kyoto targets, except for Cyprus and Malta (for an overview, see the table below).

On 24 September 2007, the UN Secretary General held a high-level meeting with officials from more than 150 countries (including about 80 heads of state or government) in order to advance the global agenda on climate change. The event was aimed at securing political commitment and building momentum for the UN Climate Change Conference in Bali (3-14 December 2007) where negotiations about "post-Kyoto" climate agreement for the time after 2012 will start.

EU climate change policies and strategies

The climate change website of DG Environment of the European Commission reads, "Climate change is one of the greatest environmental, social and economic threats facing the planet." As this section demonstrates, several EU actors, in particular the European Commission and different European Council formations (but also the European Parliament - for its temporary committee on climate change, click here) have launched several programmes and strategies addressing climate change in recent years.

European Climate Change Programme and Emissions Trading Scheme

Already in 1991, the European Commission released a Community strategy that included ways to limit CO2 emissions and improve energy efficiency (European Commission, 1991). The emission reduction targets set out in the Kyoto Protocol in 1997 fostered further climate change actions in the EU. In the late 1990s, the EU Council of Environmental Ministers asked the Commission to put forward a list of respective priority actions and policy measures. The Commission responded in June 2000 by launching the ***"European Climate Change Programme"*** (ECCP). The ECCP has the aim to identify the most environmentally and cost-effective policies and measures to cut GHG emissions. One of the immediate goals was to help ensure that the EU meets its GHG reduction targets under the Kyoto Protocol. The ECCP was set up as a multi-stakeholder consultation process, involving representatives of the Commission, the Member States, industry and NGOs. The first ECCP phase (running from 2000-2004) examined a range of different policy sectors and instruments with the potential of reducing GHG emissions. A number of working groups were established to develop options and reduction potentials in different areas, e.g. energy supply and demand, energy efficiency, transport industry, agriculture, research, etc. Documenting the results of the working groups, the Commission published an ECCP Report in June 2001. One of the main results was that "every sector should contribute to the Kyoto target of -8 % in view of minimising the compliance costs of EU climate policy for society as a whole" (European Commission, 2001a, 1). Following this ECCP Report, the Commission brought forward three broad measures to tackle climate change in October 2001:

- An action plan for the implementation of the first phase of the ECCP;
- A proposal for ratification of the Kyoto Protocol which finally led to the Council Decision that paved the way for the EU and its Member States to ratify the Protocol on 31 May 2002.
- A proposal for a GHG emissions trading system.

The second phase of the ECCP was launched with a stakeholder conference in October 2005. More than 450 participants, representing a broad spectrum of stakeholders, discussed key areas of current and future European climate change policy. Furthermore, five stakeholder working groups were set up and met between December 2005 and June 2006.

One of the major results of the first ECCP phase was the development of an ***EU Emissions Trading Scheme*** (ETS). The ETS is based on Directive 2003/87/EC, proposed by the European Commission and approved by the European Parliament and the EU Member States. The ETS is based on the idea that "creating a price for carbon through the establishment of a liquid market for emission reductions offers the most cost-effective way for EU Member States to meet their Kyoto obligations and move towards the low-carbon economy of the future" (European Commission, 2005, 6). Thus, the ETS is a central instrument in the EU to achieve the Kyoto Protocol target. It comprises several fundamental principles, including a 'cap-and-trade' system, and it is implemented through national allocation plans for emission allowances.

The first trading period runs from 2005 to 2007 and only covers CO2 emissions from large emitters in the power and heat generation industry and in selected energy-intensive industrial sectors. For this period, each Member State had to develop a national allocation plan which provides for each installation in the scheme a certain number of allowances free of charge, thus allowing it to emit the corresponding amount of CO2 without any cost. The Commission has to adopt decisions on these allocation plans which are then made public. The second phase foresees a five-year trading period (2008-2012) . Until the end of August 2007, 24 national allocation plans for

the second period were adopted by the Commission. In a recent assessment of the national allocation plans, the European Commission pointed out that the first period was intended to be a learning phase. The second phase, however, must make sure that the criteria set out in the ETS Directive are applied and emission allowances are appropriately scarce. This should ensure that "emissions reductions are delivered and that the emerging carbon market is strengthened" (European Commission, 2006b, 2).

Climate Change in EU environmental and SD policy documents

Climate change is also one of the main priorities in EU environmental and SD policy documents. The ***Sixth Community Environmental Action Programme*** (EAP), adopted in 2002 with a running time until 2012, sets out the framework for environmental policy-making in the European Union. One of the four priority areas is climate change.

The EAP considers climate change as "an outstanding challenge of the next 10 years and beyond" (Official Journal of the European Communities, 2002, L242/3) and refers to two long-term goals: First, to have a maximum global temperature increase of 2oC over pre-industrial levels; second, to reduce GHG emissions significantly compared to 1990 as identified by the IPCC. However, a concreter objective is to achieve the Kyoto reduction targets. In order to achieve this, the following priority actions are identified:

- Implementing international climate commitments, in particular demonstrating progress towards the Kyoto goals by 2005;
- Reducing GHG emissions in various sectors, mainly energy, transport, and industrial production; and
- Using appropriate policy instruments such as fiscal measures (energy taxation), environmental agreements with industry sectors and making climate change a major theme of EU and national research programmes.

The ***renewed EU SD Strategy*** (EU SDS) includes climate change as one of seven key challenges with the overall objective to "limit climate change and its costs and negative impacts to society and the environment" (European Council, 2006, 7). In the EU SDS, the following operational targets are defined for climate change:

- Achieving the Kyoto emission reduction commitment (EU-15 target: -8% GHG emission compared to 1990 level) and maximum global temperature rise of 2oC compared to pre-industrial levels;
- Adaptation and mitigation measures for climate change to be integrated in all EU policies;
- 12 % of energy consumption and 21 % of electricity consumption should be met by renewable energy sources by 2010;
- 5.75 % of transport fuel should consist of biofuels by 2010; and
- 9 % of final energy consumption should saved over 9 years until 2017.

The EU SDS then describes several actions how these objectives are to be achieved, including options for the period after Kyoto ("post-2012 options"), a review of the ETS and measures for energy efficiency. Most of the actions described apply to the EU as well as the individual Member States.

Emission trends and Kyoto targets

In order to accurately monitor progress towards achieving the Kyoto reduction targets, the European Parliament and the European Council adopted Decision No. 280/2004/EC in February 2004. The Decision lays out the reporting responsibilities for the EU and its Member States, and it provides a legal basis for the compilation of the GHG inventory to be submitted annually to the UNFCCC. It requires each Member State to report to the Commission about the progress made towards achieving their Kyoto targets. The two-year reporting cycle of the national progress reports started in March 2005. The progress reports need to include:

- Information on national policies and measures which limit or reduce GHG emissions;
- National data on GHG emissions;
- Information on measures being taken or planned for the implementation of relevant EU legislation and policies; and
- Information on institutional and financial arrangements.

In 2006, the Commission published a progress report regarding the Kyoto objectives that is based on the first Member States reports (European Commission 2006c). The data included covers the time from 1990 to 2004. The report shows that, in total, the annual GHG emissions per capita in the EU-25 decreased by 1 tonne from 1990 to 2004 (-9 %). In the EU-15, GHG emissions per capita decreased by about 6 %, largely due to the reductions in Germany and the UK (European Commission, 2006, 5). However, the emission trends are extremely different in the various sectors (for details see the box below).

Sectoral GHG trends in Europe according to the European Commission's progress report 2006:
In the energy sector (including transport), which accounts for 80 % of total EU-15 GHG emissions, an increase in emissions of 3.8 % compared to 1990 could be witnessed. When looking at the figures for energy supply and use (excluding transport), the CO2 emissions from public electricity and heat production increased by 6 %, and from households by 3 % between 1990-2004. However, the rise in energy demand was higher than the increase in emissions in the EU-15 which shows a trend of decoupling. In the transport sector, the GHG emissions from domestic transport in the EU-15 increased by 26 % as did the emissions from road transport. A decrease in GHG emissions between 1990-2004 could be discerned in the non-energy related industry sector, including e.g. the mineral, chemical and metal industries (EU-15 GHG emission reduction by 16 % compared to base year 1990) as well as in the agricultural sector and waste management (European Commisison, 2006c, 6-9).

In May 2007, the European Environment Agency (EEA), on behalf of the European Commission (DG Environment), published the annual EU GHG inventory for the UNFCCC. This inventory report 2007 includes the GHG emission trends in the EU (in total and for sectors) as well as data on GHG emissions for each EU Member State for the period 1990-2005 (EEA, 2007).

Sectoral GHG trends in Europe according to the EEA's EU GHG inventory from 2007:
In the energy sector (including transport), total GHG emissions increased by 2.9 % in 2005, compared to 1990, but decreased by 0.8 % compared to 2004 figures. The CO2 emissions from road transport had the highest increase in absolute terms of all energy-related emissions (+15 %), while CO2 emissions from manufacturing industries decreased substantially between 1990 and 2005 (-10 %). The GHG emissions from the non-energy related industry sectors decreased by 12 % from 1990-2005, however increased slightly (+0.3 %) compared to 2004. The emissions in the agricultural sector decreased by 11 % compared to 1990 and 1.4 % compared to 2004. Reductions can also be seen in the waste sector, where emissions decreased by 38 % compared to 1990 and 3.5 % compared to 2004 (EEA, 2007).

Table 2 below shows the GHG emissions in CO2 equivalents for the three most important GHGs (excluding land use, land use change and forestry - LULUCF) for the individual EU Member States as well as figures for the EU-15 and the EU-27 in 2005 compared to the

base year 1990 (EEA, 2007, 13). We also included percentages of the current state in the EU Member States in terms of meeting their Kyoto targets, that is, the emission reduction they would need in order to reach their Kyoto target. In 2005, Austria, for example, was 18.1 % above the base year 1990 and has committed itself to reduce its emission by 13 % compared to 1990, resulting in a difference to the Kyoto target of 31.1%. In other words, Austria needs to reduce its 2005 GHG emissions by 31.1 % in order to meet the Kyoto target by 2008-2012.

Member State	Base year 1990 (million tonnes)	2005 (million tonnes)	Change base year 1990 – 2005	Kyoto target (2008-2012)	Difference to Kyoto target
Austria	79.0	93.3	18.1%	-13.0%	+31.1%
Belgium	146.9	143.8	-2.1%	-7.5%	+5.4%
Bulgaria	132.1	69.8	-47.2%	-8.0%	-39.2%
Cyprus	6.0	9.9	63.7%	-	-
Czech Republic	196.3	145.6	-25.8%	-8.0%	-17.8%
Denmark	69.3	63.9	-7.8%	-21.0%	+13.2%
Estonia	43.0	20.7	-52.0%	-8.0%	-44.0%
Finland	71.1	69.3	-2.6%	0%	-2.6%
France	563.9	553.4	-1.9%	0%	-1.9%
Germany	1232.5	1001.5	-18.7%	-21.0%	+2.3%
Greece	111.1	139.2	25.4%	25.0%	+0.4%
Hungary	123.0	80.5	-34.5%	-6.0%	-28.5%
Ireland	55.8	69.9	25.4%	13.0%	+12.4%
Italy	519.5	582.2	12.1%	-6.5%	+18.6%
Latvia	25.9	10.9	-58.0%	-8.0%	-50.0%
Lithuania	48.1	22.6	-53.1%	-8.0%	-45.1%
Luxembourg	12.7	12.7	0.4%	-28.0%	+28.4%
Malta[3]	2.2	3.4	54.8%	-	-
Netherlands	214.6	212.1	-1.1%	-6.0%	+4.9%
Poland	586.9	399.0	-32.0%	-6.0%	-26.0%
Portugal	60.9	85.5	40.4%	27.0%	+13.4%
Romania	282.5	153.7	-45.6%	-8.0%	-37.6%
Slovakia	73.4	48.7	-33.6%	-8.0%	-25.6%
Slovenia	20.2	20.3	0.4%	-8.0%	+8.4%
Spain	289.4	440.6	52.3%	15.0%	+37.3%
Sweden	72.3	67.0	-7.4%	4.0%	-11.4%
UK	779.9%	657.4%	-15.7%	-12.5%	-3.2%
EU-15	**4278.8**	**4192.0**	**-2.0%**	**-8.0%**	**+6.0%**
EU-27	**5818.5**	**5177.0**	**-11.0%**	**Not applicable[4]**	**-**

Table 2: GHG emissions in CO2 equivalents (exl. LULUCF) and Kyoto targets for 2008-2012 (based on EEA, 2007)

In 2005, the EU-15 have reduced their GHG emissions in comparison with the base year 1990 by 2 %, still 6 % away from the strategic goal set in the Kyoto Protocol.

In order to provide an easy-to-read overview of the difference between 2005 emission levels and the Kyoto targets, the following two tables rank the EU-15 and the EU-12 (new Member States) accordingly.

EU-15	Difference 2005 GHG emissions and Kyoto target
Sweden	-11.4%
United Kingdom	-3.2%
Finland	-2.6%
France	-1.9%
Greece	+0.4%
Germany	+2.3%
Netherlands	+4.9%
Belgium	+5.4%
Ireland	+12.4%
Denmark	+13.2%
Portugal	+13.4%
Italy	+18.6%
Luxembourg	+28.4%
Austria	+31.1%
Spain	+37.3%

Table 3: Difference of 2005 GHG emissions and Kyoto targets in EU-15

Table 3 shows that, although several of the EU-15 could reduce their emissions in 2005 compared to 1990, only four countries (Sweden, UK, Finland and France) are currently below their Kyoto targets. About half of the EU-15 is still between 12 and 37 % above their committed targets. Therefore, the European Commission pointed out in its Kyoto progress report that Member States "need to accelerate their efforts in implementing policies and measures as planned" (European Commission, 2006c, 3).

EU-12 (new Member States)	Difference 2005 GHG emissions and Kyoto target
Latvia	-50.0%
Lithuania	-45.1%
Estonia	-44.0%
Bulgaria	-39.2%
Romania	-37.6%
Hungary	-28.5%
Poland	-26.0%
Slovakia	-25.6%
Czech Republic	-17.8%
Slovenia	+8.4%
Malta	No Kyoto target
Cyprus	No Kyoto target

Table 4: Difference of 2005 GHG emissions and Kyoto targets in EU-12 (new Member States)

Table 4 shows that, with the exception of Slovenia, all new Member States are far below their Kyoto targets. The main reason for the emission reductions in the new Member States is the transformation and restructuring of formerly socialist economies, in particular the modernisation or closure of heavily polluting and energy-intensive industries and the growth of the service sector (EEA, 2006).

When looking at the figures for the current EU-27, the decrease in GHG emissions is 11 % in 2005 compared to 1990. However, because no Kyoto target was set for the EU-27 (the 8 % reduction target refers to the EU-15), the political relevance of this achievement is limited.

Latest developments: Beyond Kyoto, integrated climate and energy policy and Green Paper on adapting to climate change

Recognising the need to develop ***policy options for the time after 2012*** when the Kyoto Protocol's emission targets expire, the European Commission issued a communication in January 2007 (European Commission, 2007c). It addressed the Spring 2007 European Council to take decisions which will enhance the conditions for reaching a new global agreement to follow up on the Kyoto commitments. It proposes a set of actions which should ensure that global average temperature increases do not exceed pre-industrial levels by more than 2°C:

- *Defining emission reduction targets*: The communication recognises "a large potential for reducing GHG emissions in the EU" (European Commission, 2007c, 5). Therefore, the Council should decide that the EU and its Member States propose a 30 % reduction in GHG emissions by developed countries by 2020 as part of an international agreement in order to achieve the 2°C objective. Until then, the EU should make an independent commitment to achieve a 20 % reduction of GHG emissions by 2020 compared to 1990 through the Emissions Trading Scheme (ETS) and other climate change and energy policies.
- *Actions resulting from the EU's energy policy:* The communication suggests improving energy efficiency in the EU by 20 % and an increase in the share of renewable energy to 20 %, both by 2020.
- *Strengthening the ETS:* A greater portion of the EU's CO2 emissions should be covered by the ETS (currently 43 % are covered).
- *Limiting transport emissions:* Link taxes on passenger cars to CO2 emissions, limit CO2 emissions from cars, include aviation in ETS, etc.
- *GHG emission reduction in other sectors:* Including measures for residential and commercial building as well as non-CO2 gases.
- *Research and technological development:* The 7th Framework Programme for Research (FP7) should provide knowledge that helps to tackle climate change.
- *Cohesion Policy:* Promotion of sustainable transport and energy, environmental technologies and eco-innovations under the Structural Funds and Cohesion Fund.
- *Other measures:* e.g. raising awareness in the general public for climate change.

In the spring 2007 meeting of the European Council, many of the suggestions made in the above mentioned Commission communication were taken up. Generally, the Council decided upon an ***integrated climate and energy policy***. Regarding climate change, the Council Conclusions outline that the EU endorses the objective of a 30 % GHG emission reduction by 2020 compared to 1990 as contribution to a global agreement beyond 2012, "provided that other developed countries commit themselves to comparable emission reductions" (European Council, 2007, 12). However, the Council decided upon "a firm independent commitment" of the EU to achieve at least a 20 % reduction of GHG emissions by 2020 compared to 1990 (European Council, 2007, 12).

The Council Conclusions also include the action plan, "Energy Policy for Europe" (EPE), covering the period 2007-2009. It regards developments in energy efficiency and increased use of renewable energies as means to enhance energy security, curb the projected rise in energy prices and reduce GHG emissions. EPE includes the objective of saving 20 % of the EU's energy consumption compared to projections for 2020 and the binding target of a 20 % share of renewable energies in overall EU energy consumption by 2020. Apart from these objectives, EPE also states that the energy mix of Member States will be fully respected, including the decision whether or not to rely on nuclear energy. EPE will be regularly reviewed in the context of the annual implementation review of the EU's energy and climate change policies. The European Commission will forward an updated Strategic Energy Review in early 2009, which will form the basis for a new action plan to be adopted by the Spring 2010 European Council.

The latest development in the EU's climate change policy is the ***Green Paper on adapting to climate change*** that was adopted by the European Commission in June 2007. The Green Paper builds on the work and findings of the ECCP and focuses on adaptation which is defined as "reducing the risk and damage from current and future harmful impacts cost-effectively or exploiting potential

benefits" (European Commission, 2007d, 3). It examines climate change impacts in Europe, cases for action and policy response. Moreover, it acknowledges the role of the EU and its Member States (including sub-national levels) in addressing climate change. Thus, it defines climate change as a multi-level governance challenge. The Green Paper advises the national level to develop adaptation strategies, including social aspects of climate change. The regional and local level are also mentioned with their specific roles (spatial planning and land use practice).

For climate change adaptation actions on the EU level, the Green Paper defines four pillars:

- *Early action in the EU*: Integrating adaptation measures when implementing or modifying legislation and policies; integrating adaptation in EU funding programmes (e.g. Cohesion Fund, Trans-European Networks Programme, Rural Development Fund); and developing new policy responses for different policy sectors, including an analysis of the impacts of EU policies on climate change by 2009.
- *Integrating adaptation into EU external actions*: Dialogue, partnership and cooperation on adaptation should be initiated with developing, neighbouring and industrialised countries.
- *Integrated climate research*: The objective is to reduce uncertainty by expanding the knowledge base. Therefore, FP7 places a strong emphasis on climate change.
- *Involving stakeholders in the preparation of adaptation strategies*: An expert group should provide advice to the European Commission.

For each of the four pillars, the Green Paper poses several questions which are open for public feedback. The web-based consultation process will be open until the end of November 2007. Moreover, the Commission will organise four workshops (in Finland, Portugal, UK and Hungary) during autumn 2007 in order to have a more direct exchange of views.

Provisions for climate change issues in national SD strategies (NSDSs) in Europe

As mentioned above, climate change is not only an issue that is addressed at the EU level. It is a multi-level governance challenge that also needs to be confronted at the national and sub-national levels. Due to the close relation between climate change and SD policies (see above), climate change issues feature prominently in many NSDS processes across Europe.

This section provides a comprehensive overview of how climate change issues are addressed in the NSDSs of EU Member States (22 of 27), Norway and Switzerland. More specifically, table 5 provides information on

- The general status of climate change in NSDSs,
- Climate change objectives stated in NSDSs, and
- Climate change related indicators in SD indicator sets (SDI) that are used to monitor NSDSs.

In order to cope with the different terms used (sometimes also due to different translations into English), we summarise the climate change objectives and indicators by using categories derived from the objectives in the renewed EU SDS.

Country	Status of Climate Change (CC) in the NSDS	Key objectives related to CC	CC related indicators
EU Member States			
Austria	CC objectives and targets are mentioned in two of the 20 key objectives of the Austrian NSDS (2002)	• Decoupling energy consumption from economic growth • Reducing energy consumption and improve energy intensity • Raising the share of renewable energies • Reducing GHG emissions	The Austrian NSDS and the subsequent indicator and monitoring reports (the latest issued in 2006) include indicators for: • GHG emissions • Energy consumption • Share of renewable energy and biofuels
Belgium	'Limiting climate change and increasing the use of clean energy' is one of the six main objectives of the Belgian Federal Plan for Sustainable Development (2004)	• Sustainable energy policy • Energy-conserving buildings • Elaborating an action plan on CC (including specific actions for renewable energies) • Promoting the use and production of biofuels	The Belgian NSDS does not include indicators. However, SD indicators (SDIs) are included in the Federal Reports on SD (the latest issued in 2005): • GHG emissions • Share of renewable energies • Energy consumption and energy intensity
Bulgaria	*Bulgaria does not yet have an NSDS*	N/A	N/A
Cyprus	*Cyprus does not yet have an NSDS*	N/A	N/A

Czech Republic	CC issues are mentioned in two out of the six chapters of the Czech Republic NSDS (2004)	• Exploiting the potential of energy savings and energy efficiency • Increasing the share of renewable energies • Reducing GHG emissions, in particular CO2	• GHG emissions • Share of renewable energies • Energy consumption and energy intensity
Denmark	The Danish NSDS (2002) provides two CC separate chapters, one dealing with 'Climate Change' and one with 'Energy'	The 'Climate Change' chapter describes the following objectives: • Reducing GHG emissions • Cutting CO2 emissions from energy consumption The 'Energy' chapter addresses the following issues: • Reducing energy consumption • Sustainable energy policy • Expansion of renewable energies supply	• GHG emissions • Energy consumption • CO2 intensity of energy consumption
Estonia	The Estonian NSDS (2005) does not explicitly refer to the term 'Climate change'	In the Estonian NSDS, no concrete objectives regarding CC are mentioned	The Estonian NSDS includes only a preliminary set of SDIs. However, indicators related to CC are published in separate indicator reports (the latest issued in 2006): • GHG emissions • Energy consumption • Renewable energy resources • Generation and disposal of radioactive waste
Finland	CC issues are included in one of the 7 main themes of the Finnish NSDS (2005)	• Limiting GHG emissions • Increasing energy efficiency and the use of renewable energy • Adapting to the adverse effects of climate change	• GHG emissions • Energy consumption • Use of renewable energies
France	'Climate Change and clean energy' is the first of nine objectives of the revised French NSDS (2006)	• Reducing GHG emissions • Developing a sustainable energy policy • Adapting to climate change • Fostering renewable energies and biofuels • Fostering energy efficiency	• GHG emissions • Share of renewable energies
Germany	'Climate protection' and 'Renewable energies' constitute two of the 21 objectives of the German NSDS (2002). Additionally, CC is dealt with in detail in the first of seven 'key focus points' of the NSDS	• Reducing GHG • Sustainable energy systems • Efficient use of energy resources • Developing renewable forms of energy Additionally, the German NSDS comprises a chapter on 'Climate protection and nuclear energy'.	The German NSDS and the subsequent progress and indicator reports (the latest issued in 2007) comprise indicators on: • GHG emissions • Share of renewable energies • Energy productivity
Greece	Greece is currently in the process of elaborating a new NSDS. In the current NSDS, CC issues are mentioned under one of the 5 objectives	• Reducing GHG emissions • Fulfilling the Kyoto targets • Reducing energy consumption	The Greek NSDS does not specify indicators
Hungary	*Hungary does not yet have an NSDS*	N/A	N/A
Ireland	Energy issues (including CC) are mentioned in one of the seven main objectives of the Irish NSDS (1997)	• Promoting energy efficiency and energy conservation • Raising the share of renewable energies • Limiting the growth of GH emissions	The Irish NSDS does not include an explicit set of indicators, however, figures are specified for the following topics: • Energy consumption and energy efficiency • CO2 Emissions

Italy	CC is one of four main 'priority areas' of the Italian NSDS (2002)	The Italian NSDS specifies the following objectives for 'Climate and atmosphere': • Reducing GHG emissions • Reducing energy consumption • Increasing use of renewable energies • Adapting to climate change	The Italian NSDS includes a number of indicators on the following issues: • GHG emissions • Share of renewable energies • Energy consumption
Latvia	Two of the 16 main 'thematic areas' of the Latvian NSDS (2002) are dedicated to CC	• Limiting GHG emissions • Increasing energy efficiency • Enhancing the use of renewable energies • Sustainable energy policy • Promoting the production of biofuels	• GHG emissions • Energy usage
Lithuania	CC related objectives are mentioned in three of the 16 main 'thematic areas' of the Lithuanian NSDS (2003)	• Limiting greenhouse gas emissions • Developing alternative energy sources (renewables) • Promoting use of boifuels • Sustainable energy policy	• GHG emissions • Energy consumption • Share of renewable energies and biofuels
Luxembourg	The Luxembourgian NSDS (1999) mentions CC related objectives in two of its four chapters	• Reducing GHG emissions • Reducing energy intensity and increasing energy efficiency • Raising the share of renewable energies	• GHG emissions • Energy intensity • Energy consumption
Malta	CC related objectives are included in the first of the four chapters of the Maltese NSDS (2006)	• Reducing GHG emissions • Sustainable energy policy • Increasing energy efficiency • Promoting the use of renewable energies	• GHG emissions
The Netherlands	One of the 12 main 'sustainability themes' of the Dutch NSDS (2003) is dedicated to 'Sustainable energy'	• Improving energy efficiency • Sustainable energy policy • Increasing renewable energy sources	The Dutch NSDS does not include indicators
Poland	*The Polish NSDS is not yet available in English*	N/A	N/A
Portugal	*The Portuguese NSDS is not yet available in English*	N/A	N/A
Romania	*Romania does not yet have an NSDS*	N/A	N/A
Slovakia	The Slovakian NSDS (2001) specifies CC issues in three of its 28 'strategic objectives'.	• Reducing energy consumption • Increasing the use of renewable energies • Reducing the development of nuclear energy	The Slovakian NSDS does not specify an explicit set of indicators, however, figures are specified for the following topics: • Energy consumption • Share of renewable energies
Slovenia	CC related objectives are mentioned in one of the five 'key development priorities' of the Slovenian NSDS (2005).	• Reducing industry's contribution to climate change • Adapting to climate change • Decreasing energy intensity • Increasing energy efficiency and the use of renewable energy resources	The Slovenian NSDS does not include indicators. However, indicators are presented in the annual 'development reports' (the latest issued in 2006): • Energy intensity • Renewable energy sources
Spain	*Spain does not yet have an NSDS*	N/A	N/A
Sweden	CC related objectives are mentioned in two of the four 'strategic challenges' of the Swedish NSDS (2005).	• Improving energy efficiency • Raising the share of biofuels and renewable energies	• GHG emissions • Energy intensity and supply • Radioactive waste

UK	'Climate change and energy' is one of the four main 'shared priorities' of the UK NSDS (2005).	• Reducing GHG emissions • Raising the share of renewable energies and biofuels • Raising energy efficiency • Adapting to climate change	• GHG emissions (including CO2 emissions from various sources) • Share of renewable energies • Energy consumption
Other European countries			
Norway	The Norwegian NSDS (2004) mentions CC related objectives in two of its seven 'priority areas'.	• Limiting greenhouse gas emissions • Increasing the use of renewable energies and biofuels	• GHG emissions • Energy usage
Switzerland	CC related issues are mentioned in one of the 10 'action areas' of the Swiss NSDS (2002).	• Reducing CO2 emissions • Increasing energy efficiency • Increasing the use of renewable energies	The Swiss NSDS does not specify indicators. However, an SDI set has been developed in the course of the 'MONET' project (2004): • GHG emissions • Energy consumption and energy intensity • Renewable energies • Radioactive waste stocks

Table 5: Inclusion of climate change provisions in NSDSs of European countries

Table 5 shows that, with the exception of Estonia, concrete objectives regarding climate change are mentioned in all NSDSs across Europe. In 8 NSDSs, climate change is defined as one of the general objectives or is covered in a separate main chapter (Belgium, Denmark, France, Germany, Italy, Latvia, Netherlands and UK). In the other 14 NSDSs, climate change is mentioned in one or more of the general objectives and/or main chapters. This clearly shows that climate change is recognised as a key topic of SD in the SD strategy processes in Europe.

A closer look at climate change related objectives mentioned in NSDSs reveals that most of them include several of the following objectives:

- reductions in GHG emissions,
- better energy efficiency,
- increasing use of renewable energy sources,
- the promotion of biofuels,
- climate adaptation measures, and
- the development of a sustainable energy policy.

Strong similarities across Europe are also obvious regarding climate change related indicators used to monitor NSDSs. Most SDI sets include indicators related to

- GHG emissions,
- energy consumption, and
- the share of renewable energy sources.

Obviously, there is a strong common understanding in SD strategies across Europe of how to tackle climate change, regarding both key objectives and indicators. Reasons for this are the common commitments made in the Kyoto Protocol, the "burden sharing agreement" among EU Member States and other EU climate change actions summarised above.

Climate change strategies in Europe: Overview and selected examples

In the previous section, we looked into climate change issues as part of NSDSs. However, in many countries, SD strategies are not the only strategic approach that tackles climate change. In this section, we explore strategic policy approaches that are solely concerned with climate change, such as climate change strategies and action plans.

Overview of climate change strategies and action plans in Europe

Table 5 gives an overview of all strategies and action plans on climate change in the EU Member States, Norway and Switzerland. It presents the result of an extensive internet search and an email request among ESDN members of the countries for which we could not find respective documents by ourselves (we thank them for their support!).

Country	Name of document and link	Year of publication	Language	Responsible ministry (climate policy website)	Comment
EU Member States					

Austria	Austrian Climate Strategy (adaptation to Kyoto goals 2008-2012), PDF	2007	German	Ministry for Agriculture, Forestry, Environment and Water Management	N/A
Belgium	National Climate Plan 2002-2012, PDF	2002	French	Federal Public Service Health, Food Chain Safety and Environment	N/A
Bulgaria	National Action Plan on Climate Change, PDF	No date	English	Ministry of Environment and Water	N/A
Cyprus	Climate Change Action Plan, Link	2004	Greek	Ministry of Agriculture, Natural Resources and Environment	N/A
Czech Republic	National Program to Abate the Climate Change Impacts, PDF	No date	English	Ministry of the Environment	N/A
Denmark	Proposal for a Climate Strategy for Denmark, PDF	2003	English	Ministry of the Environment	Proposal by Danish Government
Estonia	*No strategy/action plan available*	N/A	N/A	Ministry of the Environment	Aspects of climate change are covered in the Estonian National Environmental Strategy and the Estonian Environmental Action Plan 2007-2013, (one of the 5 strategic activity fields)[5]
Finland	National Strategy to Implement the Kyoto Protocol, PDF	2005	English	Ministry of the Environment	N/A
France	Climate Plan 2004-2012, PDF	2006 (update)	French	Ministry of Ecology, Sustainable Development and Spatial Planning	N/A
Germany	National Climate Protection Programme, PDF	2005	German	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	N/A
Greece	*No strategy/action plan available*	N/A	N/A	Ministry for the Environment, Physical Planning and Public Works	N/A
Hungary	*No strategy/action plan available*	N/A	N/A	Ministry of Environment and Water	National Climate Change Strategy for Hungary is under elaboration[6]
Ireland	National Climate Change Strategy 2007-2012, PDF	2007	English	Department of the Environment, Heritage and Local Government	N/A
Italy	*No strategy/action plan available*	N/A	N/A	Ministry of Environment	N/A
Latvia	Climate Change Mitigation Programme 2005-2010, Link (dead link in late Sept 07)	2005	Latvian	Ministry of the Environment	
Lithuania	*No strategy/action plan available*	N/A	N/A	Ministry of Environment	N/A

Luxembourg	*No strategy/action plan available*	N/A	N/A	Ministry of Environment	N/A
Malta	National Action Plan on Climate Change (included in first communication of Malta to UNFCCC), PDF	2004	English	Ministry for Rural Affairs and the Environment	This work plan is coordinated by the National Commission for SD, taking into account existing strategies and plans[7]
Netherlands	*No strategy/action plan available*	N/A	N/A	Ministry of Housing, Spatial Planning and the Environment	Climate Policy Evaluation Memorandum was published in 2005, PDF
Poland	Poland's Climate Policy: The strategies for greenhouse gas emission reductions in Poland until 2020, PDF	2003	English	Ministry of the Environment	N/A
Portugal	*No strategy/action plan available*	N/A	N/A	Ministry of Environment	N/A
Romania	National Action Plan on Climate Change 2005-2007, PDF	2005	English	Ministry of Environment	N/A
Slovakia	*No strategy/action plan available*	N/A	N/A	Ministry of the Environment	Climate change strategy is planned for 2008.[8]
Slovenia	*No strategy/action plan available*	N/A	N/A	Ministry of the Environment and Spatial Planning	N/A
Spain	Climate Change Strategy 2007-2012-2020, PDF	2007	Spanish	Ministry of Environment	N/A
Sweden	Climate Change Strategy, PDF	2002	English	Ministry of the Environment	The Ministry of Environment has published a Newsletter in May 2007 on the government's climate policy, PDF[9]
UK	Climate Change – The UK Programme 2006, PDF	2006	English	Department for Environment, Food and Rural Affairs	N/A
Other European countries					
Norway	*No strategy/action plan available*	N/A	N/A	Ministry of the Environment	A government website provides information on climate policy, Link
Switzerland	Climate Report about the Future Climate Policy of Switzerland, PDF	2007	German	Department of the Environment, Transport, Energy and Communications	N/A

Table 6: Climate change strategies/action plans in Europe

Table 5 shows that 16 of the 27 EU Member States have developed a climate change strategy, an action plan or a similar document (9 "old" and 7 "new" Member States). They have all been developed between 2002 and 2007 under the main responsibility of environment ministries. Denmark has only a proposal for a climate strategy. For 10 EU Member States, we could not find any climate change strategy/action plan and did not receive contrary information via email request (5 "old" and 5 "new" Member States). From the selected non-EU Member States, Switzerland has very recently, in August 2007, published a report about the future of national climate policy.

Climate change strategies/action plans: Two examples

In order to get a more in-depth understanding of how climate change strategies/action plans work in comparison to (ideal-type) SD strategies (see, for example, the section on "Basics of SD strategies" and the presentation on "SD strategies in Europe: Principles and

Steps" at the ESDN homepage), we conclude this report with two examples on climate strategies in Sweden and the UK. The selection was made on the basis of their success in staying below the Kyoto targets (see Table 3 above, indicating that Sweden is currently 11.4 % and the UK 3.2 % below the national Kyoto target).[10]

(1) Sweden: "The Swedish Climate Strategy"

Main objectives

The Swedish Climate Strategy was adopted by the Swedish parliament ("Riksdag") in March 2002 (Swedish Ministry of Environment, 2003). It comprises national objectives in the short- and long-term. The short-term national climate objective is to reduce GHG emissions by 4 % by 2010 compared to 1990 level. It is interesting to note that this national objective differs from the Swedish Kyoto target which permits an increase of 4 % in the period 2008-2012 compared to 1990. The long-term climate objective is to reduce the annual per capita GHG emissions in Sweden below 4.5 tonnes of CO2 equivalent by 2050.

GHG emission reductions in Sweden

As mentioned above, Sweden committed itself in the Kyoto Protocol and the "burden sharing agreement" of the EU to have an increase of 4 % of GHG emissions by 2008-2012 compared to the 1990 levels. Regarding the lasted estimated data for 2005, Sweden is 7.4 % below the 1990 level (EEA, 2007). Therefore, Sweden is about -11.4 % below the Kyoto target, which makes it one of the most successful EU Member States in reducing its GHG emissions. Additionally, the country is also -3.4 % below the goal it set itself in the national Climate Strategy (-4 % compared 1990 levels).

A recent progress report by the Swedish Ministry of Sustainable Development[11](2005) provided an overview of sectoral GHG emissions for 2003 compared to 1990. Overall, the largest emission reductions were achieved in the residential and service sector (energy), followed by the waste and agricultural sectors. Increases mainly took place in the transport sectors. Table 7 below shows the GHG emission for the different sectors (in Mio. tonnes CO2 equivalent):

Sector	1990	2003
Energy (exl. transport)	34.8	32.7
• Electricity and district heat	10.6	13.3
• Residential and service sector	11.1	6.7
• Industrial combustion	11.3	11.7
Transport	18.9	20.9
Industrial processes	5.7	5.9
Waste	2.8	2.0
Agriculture	9.6	8.7

Table 7: GHG emissions in Sweden per sector (in Mio. Tonnes CO2 equivalent)

In the energy sector, excluding transport, GHG emissions fell by about 6 %. CO2 emissions form the residential and service sector during the period 1990-2003 fell by almost 40 %. This reduction is mainly due to the major transition from oil-fired boiler to district heating, but also to the increased use of heat pumps and the small-scale use of biofuels. The development was stimulated by the energy tax system, mainly by the CO2 tax. As argued in the recent Swedish progress report about implementing the EU SDS, "the carbon tax is an important explanation why Swedish emissions in 2005 were below the 1990 level" (Swedish Government, 2007). Emissions from electricity production and district heat have varied greatly from year to year due to variations in precipitations and temperature differences. Despite the fact that district heating increased dramatically during this period, emissions from production declines because of the increasing use of biofuels, stimulated by incentives to use renewable energy sources. No clear trend can be detected in emissions from industrial combustions and industrial processes. Emissions vary depending on the economic situation but also on different energy prices (mainly electricity and oil). Emissions from the transport sector have increased steadily by approximately 10 % since 1990. This increase is mainly due to an increase in transport mileage for the transportation of heavy freight goods. Emissions from individual traffic have increased to a lower extent. Emission of methane and nitrous oxides from the agricultural sector fell by about 9 % between 1990 and 2003. Emissions of methane from landfill fell by 32 % during this period as a result of the collection of gas at landfill sites and a huge reduction in the amount of organic material deposited (Ministry of Sustainable Development, 2005).

Responsibilities, policy coordination and governance arrangements

The ministry mainly responsible for climate change policy is the Ministry of Environment. In January 2002, the Environment Quality Objectives Council was set up as proposed by the Climate Strategy. This Council consists of representatives of different stakeholder groups (i.e. central government agencies, county administrative boards, local authorities, NGOs and the business sector). The Council is supported by a secretariat that is based at the Swedish Environmental Protection Agency. It has the following functions (Swedish Ministry of Environment, 2003):

- Coordinating the work of national authorities regarding climate issues and the 16 environmental quality objectives[12];
- Collecting, processing and compiling GHG emission statistics;
- Organising the review and evaluation of climate change policy; and
- Compiling supportive documents for international reports (UN, EU).

The new Swedish government, which was appointed in October 2006, has made climate change a "top-priority issue" (Swedish Ministry

of Environment, 2007, 2) and set up the following three institutions that should broaden and deepen the cooperation with stakeholders:

- The "Commission on Sustainable Development" comprises representatives from business and industry, NGOs, the research community and policy-makers. Its main objective is to analyse obstacles for SD and to develop cross-sectoral action strategies. Climate change will be one of the main themes of the Commission in the first year.
- The "Scientific Council on Climate Issues" has the remit to contribute scientific assessments to the planned government bill on climate policy in 2008. The Council's recommendations will relate to the objectives of Swedish climate policy at the national and international level.
- The government has invited all parties represented in the parliament to participate in the "Climate Committee to review Climate Policy". The Committee's objective is to carry out a comprehensive review of Swedish climate policy.

Policy Instruments

The Swedish Climate Strategy contains a number of different policy instruments that aim to reduce GHG emissions. Some of these policy instruments cross-cut several sectors and some target individual sectors. They have either been introduced through national initiatives or as a consequence of EU directives and strategies and international climate approaches. We first look at cross-sectoral policy instruments and instruments designed for specific sectors.

The EU Emissions Trading Scheme (ETS) is one of the cross-sectoral policy instruments that were introduced in Sweden. It started to operate in January 2005 and is intended to limit total GHG emissions in the EU. Recent reports point out that detailed effects for Sweden are difficult to predict at the moment (Ministry of Sustainable Development, 2005). Several other cross-sectoral instruments were initiated at the national level. First, the Environment Code compiles overall legislation in the environmental field since 1999. Its general objective is to promote SD and it includes several provisions to achieve climate objectives. Second, local investment programmes were developed that aimed to foster local climate change mitigation measures and to raise awareness about local climate issues. The Local Investment Programme for Ecologically Sustainable Development (LIP) was launched in 1996. Half of its total budget of SEK 4.7 billion (about € 500 Mio.) were awarded to climate related projects and 1/3 to investments in the energy sector, e.g. development of district heating, waste heat and local heating systems. In 2003, LIP was succeeded by the Local Climate Investment Programme (Klimp). It is expected to reduce GHG emissions by 0.5 million tonnes of CO2 equivalent per year. Third, the government invested in 2002-03 several million SEK in a national climate information campaign. Finally, climate-related research is considered as important in order to increase scientific knowledge. In 2001, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) was set up and is especially responsible for climate research.

Several policy instruments for specific sectors were suggested in the Climate Strategy and later developed, mainly for energy and transport. The energy taxation system in Sweden is based on a combination of CO2 taxes, energy taxes on fuel, taxes on nuclear power and taxes on the consumption of electricity. In particular, the CO2 tax, which was introduced in 1991, has contributed to a decrease in emissions. The effects are mainly visible in the district heating sectors as well as in residential heating and heating of commercial premises (Swedish Environment Protection Agency & Swedish Energy Agency, 2004). Additionally, the Swedish government has developed certain incentives to stimulate the use of renewable energy. Among them is the Electricity Certificate System, introduced in 2003. This is a support system for the generation of electricity based on renewable energy. Electricity generators receive certificates for every MWh of renewable electricity generated.

In September 2007, the Swedish government decided on a climate billion (approx. €110 Mio.) in its 2008 Budget Bill (Press release, Ministry of Environment). The money will be invested until 2010 on sustainable cities, energy efficiency measures, technological development, research and international climate efforts. Moreover, the government presented a climate tax package, comprising a total of more than SEK 3 billion (about €325 Mio.) in increased energy and climate tax.

Monitoring and evaluation

Despite the various monitoring and reporting commitments under the UNFCCC, the Swedish Climate Strategy foresees an additional review process. So-called "Checkpoints" are suggested in the strategy for 2004 and 2008. The Checkpoints should evaluate climate policy and GHG emissions reductions. The Checkpoints may lead to the amendment of measures and targets of the Swedish government: "If emissions do not diminish according to the target, the Government may propose further measures or if necessary review the target." (Ministry of Environment, 2003, 2).

Conducting the first Checkpoint was assigned to the Swedish Environment Protection Agency and the Swedish Energy Agency, and their review was published in 2004. It provides an overview of climate change issues in Sweden, GHG emissions in various sectors, an evaluation of policy instruments and forecasts for the period 2008-2012.

The report argued that the measures and instruments outlined in the Climate Strategy and implemented in practice contributed to the reduction of GHG emissions in several sectors. Furthermore, it points out that Sweden will most likely achieve an emission reduction below the Kyoto target but will be above the national target. However, most recent data and estimations suggest that Sweden will be successful in achieving both goals.

(2) United Kingdom: "Climate Change – The UK Programme 2006"

Main objectives

The main goal of the UK government is to deliver the UK's legally binding GHG emission reduction targets under the Kyoto Protocol (-12.5 % reduction in 2008-2012 compared to 1990 level). However, the UK government outlined in "Climate Change – The UK Programme 2006"[13] that "greater reductions in emissions are feasible, and that there will be real advantages to the UK in aiming to achieve them" (HM Government, 2006, 30). Thus, similar to Sweden the UK government (and its devolved administrations) agreed on a national reduction goal that exceeds the Kyoto target of -12.5%: CO2 emission should be reduced to -20 % by 2010 compared to 1990. This should ensure that the UK leads by example on climate change issues and starts the transition to a lower carbon economy.

The UK Climate Change Programme is based on the following principles:

- A balanced approach with all sectors and parts of the UK having a role;
- The need to safeguard economic competitiveness, encourage technological innovation, promote social inclusion and reduce health risks;
- The use of integrated package of flexible and cost-effective policy options;
- Long-term planning, looking beyond the Kyoto commitment; and

- The review of the Climate Change Programme.

GHG emission reductions in the UK

The UK committed itself in the Kyoto Protocol to reduce its GHG emissions by 12.5 % in 2008-2012 compared to the 1990 base year. As Table 2 above shows, the UK has achieved emission reductions of 15.7% in 2005 compared to 1990. Therefore, the UK is 3.2 % below its Kyoto goal which makes it one of the most successful European countries in reaching this legally-binding commitment. The Annual Report to the UK parliament about the implementation of the Climate Change Strategy (DEFRA, 2007) provides data on GHG emission reductions for various sectors which are summarised in Table 8 below.

Sector	Base year (1990)	2005
Business	242.2	204.9
Industrial processes	58.6	18.4
Transport	148.0	166.5
Residential	168.3	155.4
Public	31.1	22.2
Agriculture	63.1	52.4
Waste management	52.8	22.1
Exports	9.4	14.0

Table 8: GHG emissions in the UK per sector (in Mio. Tonnes CO2 equivalent)

The Annual Report argues that "reduction in GHG emissions has, since 1990, mainly been driven by restructuring, especially in the energy supply industry, by energy efficiency, pollution control measures in the industrial sector and other policies (...)" (DEFRA, 2007, 12).

Strong emission reductions could be achieved in industrial processes (-68.6 %), the public (-28.6 %) and business sectors (-15.4 %). The Climate Change Levy and the Renewables Obligation can be considered as a major contribution for these achievements.

Severe reductions could also be achieved in waste management (-58.1 %) and in the agricultural sector (-17 %). Falling landfill methane emissions are mainly due to the increasing collection of landfill gas for energy recovery and environmental control. This was fostered by the EU Landfill Directive and the national landfill tax scheme. Residential or domestic emission reductions (-7.6 %) were high but not as significant as in the other sectors.

GHG emissions in 2005 increased compared to 1990 in the transport sector (+12.5 %) and in exports (+48.9 %).

Responsibilities, policy coordination and governance arrangements

Within the UK government, two cabinet committees have climate change among their responsibilities: The Cabinet Committee on Energy and the Environment (EE) has the remit to develop the government's energy and environmental policies, to monitor the impact on SD of the government's policy and to consider issues of climate change, security of supply and affordability of energy. The committee is chaired by the Prime Minister and involves most ministers. The Ministerial Sub-Committee on Sustainable Development in Government (EE(SD)) is a sub-committee of the EE. It aims to improve the government's contribution to SD, including the departmental SD action plans and to report to the EE. In autumn 2006, the Office of Climate Change (OCC) was established. It is governed by a Ministerial Board which is a working sub-group of the EE. OCC works across government to provide shared resources for the analysis and development of climate change policy and strategy. It reports to a group of ministers from all relevant government departments.

Progress on emission reductions is also monitored through the Sustainable Energy Policy Network, a network of policy units from across government departments, the devolved administrations, regulators and key delivery organisations that are jointly responsible for delivering the Energy White Paper, "Our Energy Future – creating a low carbon economy" (2003).

Stakeholders are invited to provide their experience for various climate change policy measures, for example through partnerships. One example for a partnership is the Low Carbon Vehicle Partnership that was established in 2003. It involves representatives from various organisations, e.g. automotive and fuel industry, government, academia, environmental NGOs, etc. It has the aim to lead in accelerating the shift to clean low carbon vehicles and fuels in the UK.

Policy instruments

The UK Climate Change Programme outlines policy instruments and measures for the various sectors that contribute to GHG emissions. Below we provide an overview of the most important instruments (HM Government, 2006):

In the energy sector, the Climate Change Programme refers to the EU Emissions Trading Scheme, investments in the support of microgeneration and carbon abatement technologies as well as the Renewables Obligation (RO). The RO places a mandatory requirement for UK electricity suppliers to source a growing percentage of electricity from renewable sources. The current level of obligation in England, Wales and Scotland is 5.5 % for 2005-2006, rising to 15.4 % by 2015-2016. In order to provide a stable and long-term market, the RO is intended to remain in place until 2027.

In the business sector, the Climate Change Levy (CCL) was introduced in 2001. It is a tax on the use of energy in industry, commerce and the public sector. The aim is to encourage users to improve energy efficiency and reduce GHG emissions. In order to support competitiveness, the introduction of the levy was accompanied by a 0.3 % cut in employers' national insurance contributions which has led to a net reduction in tax liability for businesses.

Regarding transport issues, fiscal instruments like the Vehicle Excise Duty and Company Car Tax will be continued in order to give incentives to purchase less polluting vehicles. In 2008-2009, a Renewable Transport Fuel Obligation will be introduced which will require transport fuel suppliers to ensure a set percentage of their sales comes from renewable sources. The obligation level will be set at 5 % for 2010-2011.

Several policy instruments are used for GHG emission reductions in the domestic sector (households, residential sector). The Energy Efficiency Commitment (EEC) is the main policy mechanism to obtain increased efficiency in existing homes. Under the EEC, electricity and gas suppliers are required to achieve targets for the promotion of energy efficiency improvements in the domestic sector. The update of the Building Regulations in 2006 aims to raise energy standards of new build and refurbished buildings. With the introduction of the Code for Sustainable Homes, voluntary standards beyond those required by the Building Regulation will be set and should contribute to lower environmental impacts of housing growth.

Methane (CH4) is the dominant GHG emission from the waste sector. Landfill contributed about 98 % of emissions. Several policy instruments are used to achieve emission reductions. The EU Landfill Directive had a significant impact as it requires landfill gas (methane) to be captured and used. Moreover, the UK government has introduced landfill allowance schemes to meet targets for biodegradable municipal waste and has increased its landfill tax.

Finally, in the agriculture, forestry and land management sector, the Climate Change Programme mentions the promotion of resource efficient farm management and the examination of the scope and feasibility of an emissions trading system for the agriculture and forest sector.

The latest development is a proposed Climate Change Bill which was published in a draft version in March 2007. The Bill intends to introduce a clear, credible, long-term framework for the UK to achieve its goals of reducing CO2 emissions and ensure steps are taken towards adapting to the impacts of climate change. The public consultation process was open until June 2007.

Monitoring and evaluation

In addition to existing monitoring and review processes by various committees (see above), the Climate Change Programme introduced the Annual Report to Parliament. The reports provide an overview of GHG emissions in the UK and review government actions to reduce them. The first Annual Report (DEFRA, 2007) was published in July 2007.

Conclusions from the two examples

Sweden and the UK are both among the most successful EU Member States in reaching their Kyoto targets. Furthermore, both countries have set themselves more ambitious emissions reduction targets in their national climate strategies. On a glance, the two examples show considerable similarities regarding governance arrangements, policies and feedback cycles related to the respective climate strategies.

Regarding governance arrangements, several councils and committees are responsible for climate change policies. Policy coordination is carried out by the Environment Quality Objectives Council in Sweden and the recently established Office of Climate Change in the UK. Both countries also include stakeholders in commissions, partnerships and networks.

Regarding policy instruments, both Sweden and the UK make use of an extensive “toolbox”. The Swedish Climate Strategy distinguishes between cross-sectoral and sectoral policy instruments, and the UK Climate Programme outlines policy instruments for various sectors. However, national reviews in both countries (DEFRA, 2007; Swedish Ministry of Sustainable Develoment, 2005) suggest that the highest GHG emission reductions were stimulated by economic/financial instruments, namely, the carbon dioxide tax in Sweden (emission cuts in the residential and service sector) and the Climate Change Levy in the UK, a tax on energy use (emission cuts through energy reduction in the industry, business and public sector).

Regarding feedback cycles, both countries have established regular review and monitoring processes on the implementation of their climate change strategies. Sweden uses so-called “Checkpoints” every four years (2004 and 2008). The UK has established a system of annual reports to the parliament.

Overall, it seems that climate strategies and SD strategies share several features of strategic management in the public sector that would be worthwhile to explore in more detail.

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Notes:

[1] Average of near-surface air temperature over land and sea surface temperature.

[2] The COP is highest decision-making authority of UNFCCC, including all the countries that have singed the Convention.

[3] Malta did not provide GHG emission estimates for 2005, therefore, the European Commission prepared estimates for the missing data.

[4] The EU-27 do not have a common Kyoto target.

[5] Information provided by a representative of the State Chancellery via email on 18 September 2007.

[6] Information provided by a representative of the Ministry of Environment and Water via email on 20 September 2007.

[7] Information provided by a representative of the Ministry for Rural Affairs and the Environment via email on 12 September 2007.

[8] Information provided by a representative of the Ministry of the Environment via email on 13 September 2007.

[9] Information provided by a representative of the Ministry of the Environment via email on 12 September 2007.

[10] We excluded the new Member States because their decline in GHG emissions is mainly due to economic restructuring in general.

[11] In Sweden, the Ministry of Environment was for several years renamed Ministry of Sustainable Development. With the new government appointed in 2006, the ministry is again called Ministry of Environment.

[12] The environmental quality objectives were adopted by the parliament in 1999 (one objective was added in 2005). They aim to create a transparent and stable framework for environmental programmes and initiatives, and serve to guide such efforts at various levels in society. Further information can be found at http://www.miljomal.nu/english/objectives.php#.

[13] The first Climate Change Programme was published in 2000

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