Sweden's First Biennial Report under the UNFCCC

REGERINGSKANSLIET
Ministry of the Environment
Sweden

1st Biennial Report for Sweden

Swedish Ministry of the Environment.

REGERINGSKANSLIET

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Contents

1 Information on GHG emissions and trends, GHG inventory including information on national inventory system

1.1 Greenhouse gas emissions from 1990 to 2011

The information in this chapter is a summary of the inventory of emissions and removals of greenhouse gases in the National Inventory Report of Sweden 2013, submitted under the UN Climate Change Convention and the Kyoto Protocol. For more detailed information, see CTF Table 1.

1.1.1 Total emissions and removals of greenhouse gases

In 2011, Sweden emitted 61.4 million tonnes of carbon dioxide equivalent (Mt CO_2 eq) of greenhouse gases. Total emissions are shown in Fig. 1.1. Compared with 2010, that represents a reduction of 6%, and compared with 1990 a reduction of 16%. Apart from high levels in 2010, the trend in Swedish greenhouse gas emissions since 1998 has been downward. Emission levels have varied between a low of 59.3 Mt CO_2 eq in 2009 and a high of 78.3 Mt CO_2 eq in 1996. Between-year variations are largely due to fluctuations in temperature and precipitation and to the economic situation.

The net sink attributable to the land use, land-use change and forestry (LULUCF) sector has varied over the period. In 2011 it amounted to 35 Mt CO_2 eq, which corresponds to 57% of total greenhouse gas emissions.

The breakdown between greenhouse gases in 2011 is shown in Fig. 1.2. In 2011, carbon dioxide made up 79% of greenhouse gases emitted, or 48.7 Mt. The majority (88%) of carbon dioxide emissions come from the energy sector. Emissions of methane in 2011 totalled 5.0 Mt CO_2 eq (8% of total emissions), the main sources being agriculture and waste. Nitrous oxide emissions amounted to 6.7 Mt CO_2 eq, or 11% of the total. Of these emissions, 73% originated from the agricultural sector. Emissions of fluorinated greenhouse gases, reported in the industrial processes sector, made up 2%, or 1.1 Mt CO_2 eq, of aggregate greenhouse gas emissions.

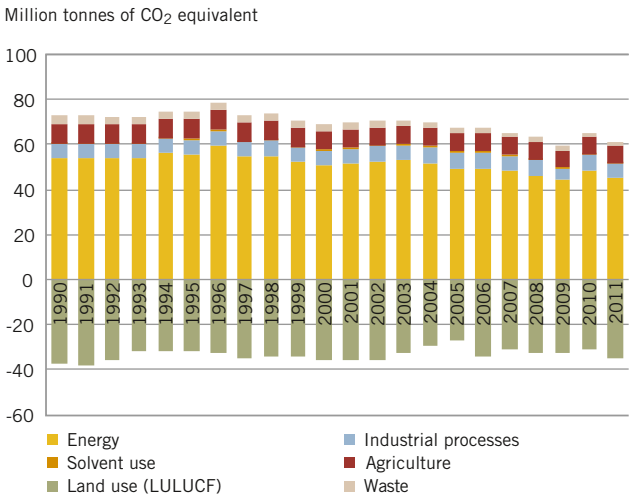


Figure 1.1 **Total greenhouse gas emissions from different sectors.**

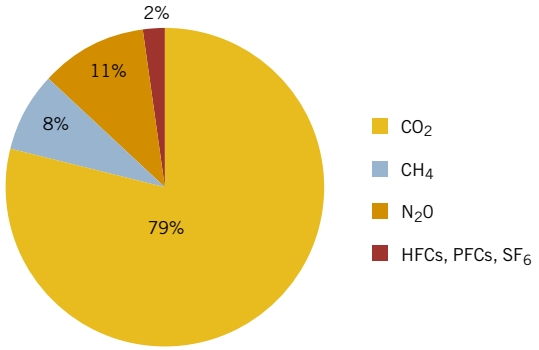


Figure 1.2 **Greenhouse gas emissions in 2011 (excl. LULUCF) by gas, in carbon dioxide equivalent terms.**

1.1.2 Emissions and removals of greenhouse gases by sector

The largest sources of emissions in 2011 were domestic transport (33%), manufacturing industries (26%, of which fuel combustion contributed 15% and industrial processes 11%), energy industries (electricity and heat production, refineries and manufacture of solid fuels) (17%) and agriculture (13%), as shown in Fig. 1.3.

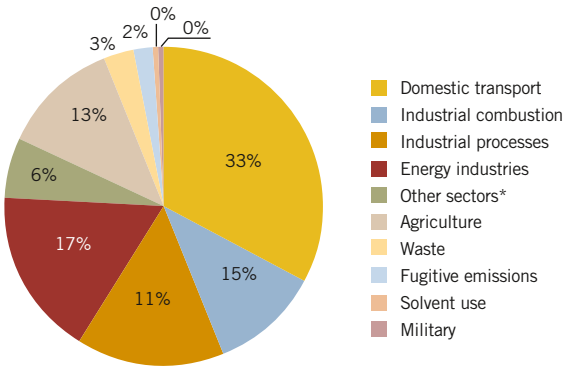


Figure 1.3 **Greenhouse gas emissions in 2011 (excl. land use), by sector.**

Apart from the sharp fluctuations of the last few years, there is a clear downward trend in emissions – see Fig. 1.4, which shows total emissions broken down by sector. The largest reductions in absolute terms are due to the replacement of oil with biofuels for the heating of homes and commercial and institutional premises. Emissions from the energy industries sector have varied from year to year and no clear trend can be discerned. Industrial use of energy has decreased since 1997, and emissions from industrial processes show a slight decline. Emissions in the transport sector had increased in 2011, compared with 1990. Agricultural emissions show a downward trend over the period.

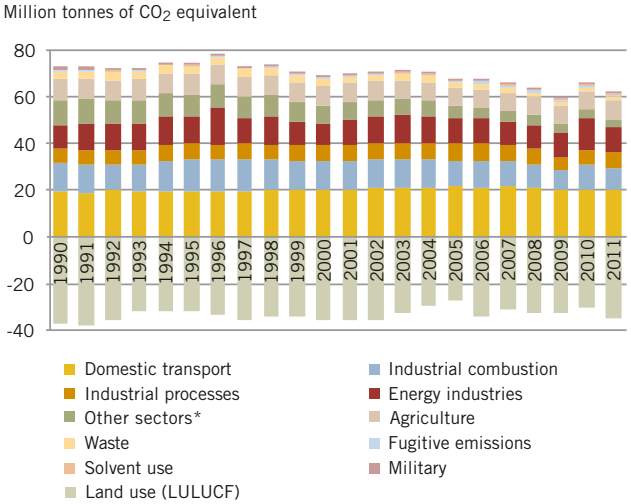


Figure 1.4 **Greenhouse gas emissions and removals (incl. land use), by sector.**

1.1.2.1 ENERGY INDUSTRIES

The energy industries sector (see Fig. 1.5) includes production of electricity and district heating, refineries and the manufacture of solid fuels. Sweden's energy industries are based largely on hydropower, nuclear power and biofuels. Fossil fuels serve as a complement, often as a marginal fuel in cold weather. Greenhouse gas emissions therefore vary widely, depending on weather conditions in different years. In 2011, the sector emitted 10.7 Mt CO_2 eq of greenhouse gases, or 17% of the national total.

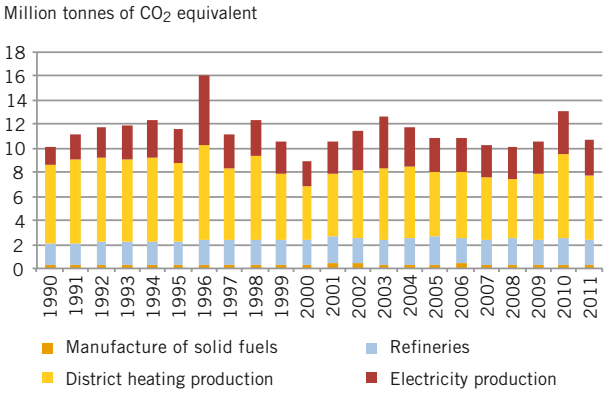


Figure 1.5 **Greenhouse gas emissions from the energy industries.**

Production of district heat is responsible for the largest greenhouse gas emissions in this sector (5.3 Mt CO_2 eq in 2011). Between 1990 and 2011, as the district heating system expanded, the amount of heat produced more than doubled. This expansion was based largely on biofuels, however, with the result that emissions of greenhouse gases remain at roughly the same level as in 1990. Fossil fuels are used as a complement to biofuels. Cold winters (like those of 1996 and 2010 in particular) increase the demand for district heating, leading to higher emission levels. Unusually mild winters (as in 2000) have the opposite effect, reducing heating demand and greenhouse gas emissions. Variations from one year to another can therefore be dramatic: in 2011, for example, emissions fell by 16% compared with 2010.

Emissions from electricity production (2.9 Mt CO_2 eq in 2011) show a similar pattern. Most of the electricity generated in Sweden comes from hydroelectric and nuclear power plants. Fossil fuels are burnt as a complement when the demand for electricity exceeds normal production. This happens, for example, on cold winter days. The high emissions of 1996 were due to a cold winter combined with a poor supply of hydropower resulting from a dry summer. Since 1996, opportunities to import and export electricity have improved considerably, and variations have therefore been less pronounced in recent years. In 2010, emissions rose owing to cold

winters and a reduced supply of nuclear power. In 2011 they fell again, thanks to a good supply of hydropower, (somewhat) increased production of nuclear power, and warmer weather.

Refinery emissions remained relatively constant over the period under review, at around 2 Mt CO_2 eq. Emissions from the manufacture of solid fuels are a minor category, amounting to some 0.3 Mt CO_2 eq annually.

1.1.2.2 INDUSTRIAL COMBUSTION

Greenhouse gas emissions from fuel combustion in manufacturing industries were 9.5 Mt CO_2 eq in 2011 (see Fig. 1.6), or 15% of national emissions. That is 21% lower than in 1990. Emissions from this sector have varied up and down over the years, chiefly owing to economic fluctuations. In recent years (2002–11) there has been a downward trend, partly due to a shift from oil to electricity and biofuels.

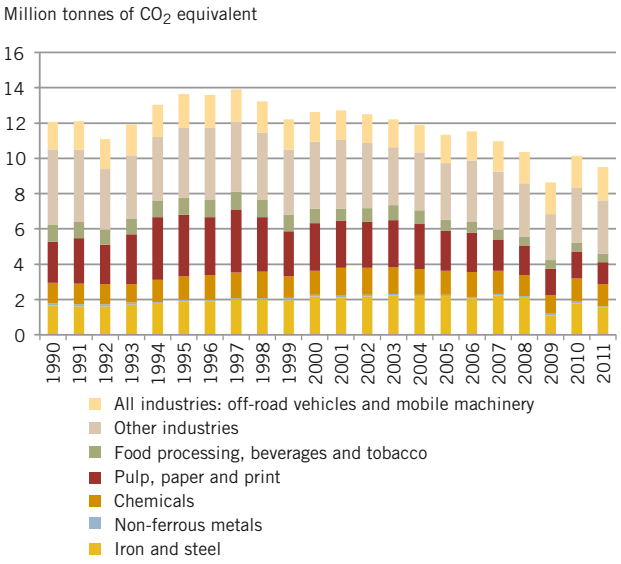


Figure 1.6 **Greenhouse gas emissions from industrial combustion.**

A small number of energy-intensive industries account for a large share of greenhouse gas emissions in this sector. Iron and steel (16% of emissions), pulp and paper (13%) and chemicals (13%) are responsible for almost equally large shares of the total. The heterogeneous subsector 'Other industries' accounted for 52% of emissions in 2011.

Over a long period, industry has reduced its use of oil and increased its consumption of electricity. Biofuels and electricity are now its most important sources of energy. Since 2002 emissions have shown a downward trend, one reason being the replacement of fossil fuels with biofuels. The biggest change has occurred in the pulp and paper industry, where the use of biofuels is most common.

The last recession saw a marked fall in emissions, especially in 2009. In 2010 they rose again, owing to higher volumes of production and demand for energy. In 2011, reduced energy demand and a modest decrease in production in some industries led to a decline in emissions compared with 2010.

1.1.2.3 TRANSPORT

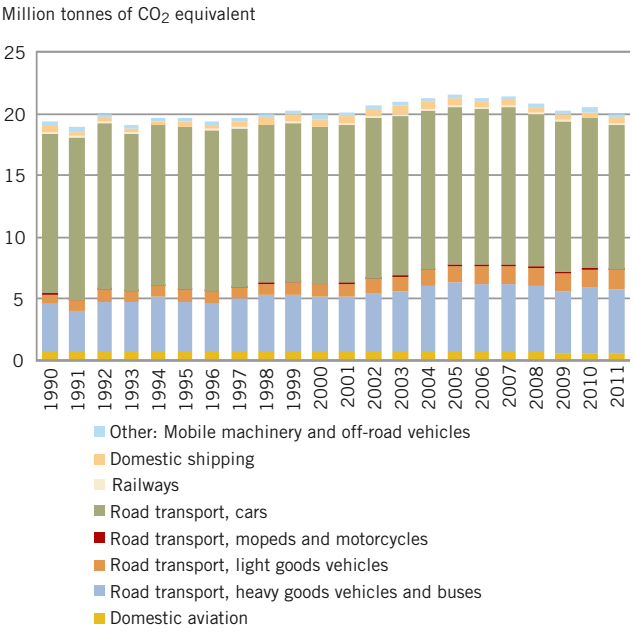


Figure 1.7 **Greenhouse gas emissions from transport.**

In 2011, emissions of greenhouse gases from domestic transport amounted to 20 Mt CO_2 eq, which is a third of the national total. Emissions were 4% higher in 2011 than in 1990. Since 2005, however, there has been a slight downward trend (see Fig. 1.7).

The majority of emissions come from cars (11.7 Mt CO_2 eq) and heavy-duty vehicles (6.7 Mt CO_2 eq). Emissions from cars have fallen by 9% compared with 1990, despite growth in traffic. This is a result of more energy-efficient vehicles and greater use of biofuels. The decrease for cars is offset by a 44% rise in emissions from heavy-duty vehicles over the same period. The increase in transport activity involving heavy vehicles is due partly to the restructuring of society towards specialisation, centralisation and globalisation, resulting in goods being transported over ever greater distances.

Greenhouse gas emissions from domestic aviation were 0.5 Mt CO_2 eq in 2011, 22% down on 1990 levels. The decline is due to more efficient aircraft and higher cabin factors, but also to stricter security require-

ments, which have made it more complicated and time-consuming to fly, reducing domestic aviation's advantages over rail and road transport.

For domestic shipping, emissions in 2011 were estimated at 0.5 Mt CO_2 eq. Over the period, emissions from this source varied in a pattern reflecting fluctuations in the economic situation. No trend can be discerned.

Sweden's railways are largely electrified, with only a few smaller lines served by diesel-hauled trains. Emissions from rail transport have been almost halved since 1990 and now stand at just 0.07 Mt CO_2 eq.

1.1.2.4 EMISSIONS FROM OTHER SECTORS

Greenhouse gas emissions from 'Other sectors', i.e. fuel combustion in the commercial and institutional, residential, and agriculture, forestry and fisheries sectors, come primarily from stationary combustion (heating in homes, non-residential premises, agriculture, forestry and fisheries), but also from mobile combustion (mobile machinery, off-road vehicles and fishing boats). In 2011, emissions were 3.7 Mt CO_2 eq, or 6% of the national total.

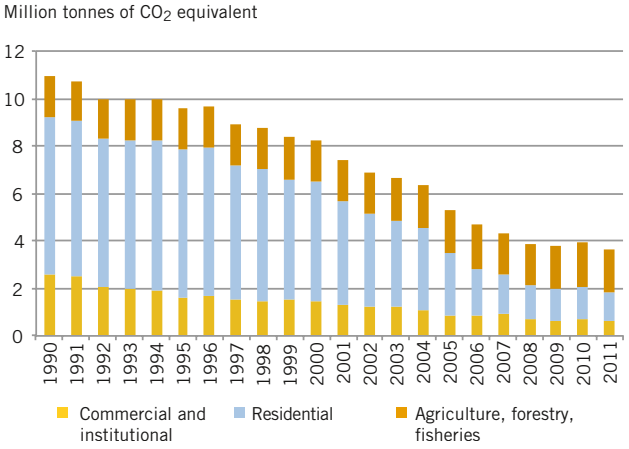


Figure 1.8 **Greenhouse gas emissions from 'Other sectors'.**

Since 1990, emissions have fallen by 67%, mainly owing to lower emissions from heating of homes and premises (see Fig. 1.8). There are several reasons for this trend: the shift from oil-based to district and electric heating, increased use of heat pumps and pellet-fired boilers, and measures to improve energy efficiency. Another contributory factor behind the positive trend is the mild weather experienced most years since 1990. Emissions from mobile combustion are very low, but rising.

1.1.2.5 MILITARY

Emissions from military transport have fallen sharply since 1990, reflecting restructuring of the Swedish Armed Forces over the period. In 2011, emissions amounted to 0.2 Mt CO_2 eq (see Fig. 1.9).

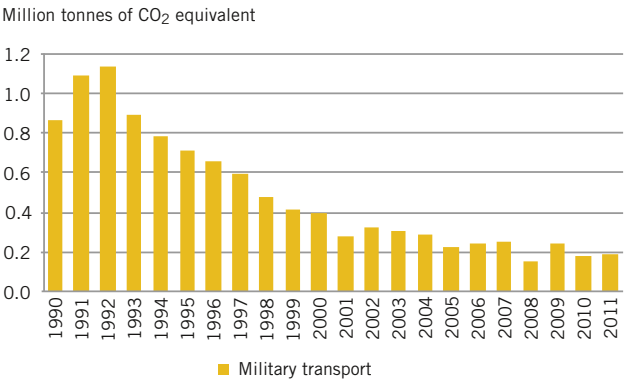


Figure 1.9 **Greenhouse gas emissions from military transport.**

1.1.2.6 FUGITIVE EMISSIONS

Fugitive emissions are a minor category, accounting for 1 Mt CO_2 eq or 1.6% of national emissions. Sources include refineries, flaring in the iron and steel industry, and handling of fuels, for example at filling stations. Emissions rose sharply in 2006 owing to the commissioning of two hydrogen production facilities, an increase that is clearly evident in Fig. 1.10.

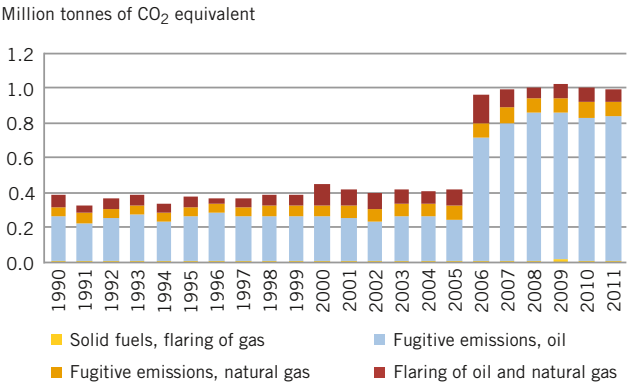


Figure 1.10 **Fugitive emissions.**

1.1.2.7 INDUSTRIAL PROCESSES

Emissions of greenhouse gases from industrial processes totalled 6.7 Mt CO_2 eq in 2011, or 11% of national emissions. This represents a rise of 5% since 1990 (see Fig. 1.11).

The largest emission sources are iron and steel production and the cement and lime industry. Others include the use of coke in blast furnaces, of limestone and dolomite in the minerals industry, and of coal in copper production. Emissions of fluorinated greenhouse gases are also reported in this sector.

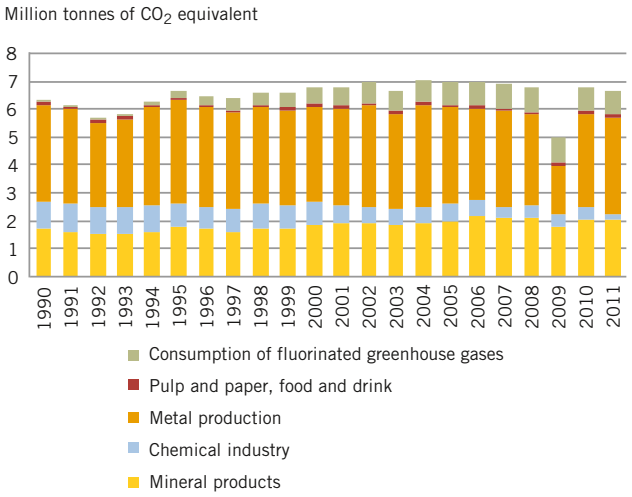


Figure 1.11 **Greenhouse gas emissions from industrial processes.**

Emissions have varied since 1990, mainly owing to changing volumes of production linked to economic fluctuations. With the exception of 2009, which saw a dramatic fall in emissions due to the recession, overall emissions show a modest decline since 2004. Trends vary from one industry to another. Emissions from the mineral products sector have risen, while those from the chemical industry fell over the period. Emissions of fluorinated greenhouse gases – halocarbons and sulphur hexafluoride (SF_6) – have increased since 1992, but began to stagnate around 2008.

1.1.2.8 SOLVENT AND OTHER PRODUCT USE

Greenhouse gas emissions from the use of solvents and other products amounted to 0.3 Mt CO_2 eq in 2011, or 0.5% of national emissions. Compared with 1990, this represents a reduction of 11%, primarily due to a shift from oil- to water-based paints (see Fig. 1.12).

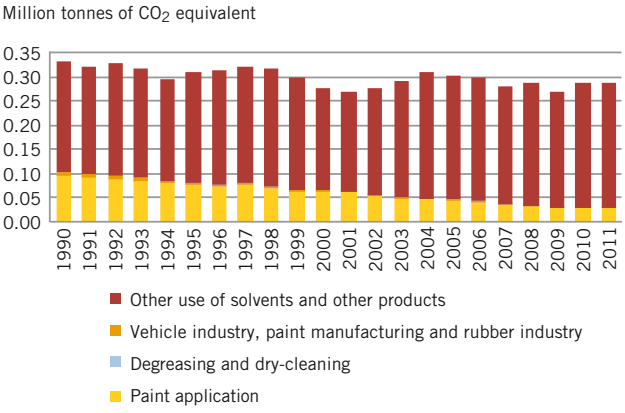


Figure 1.12 **Greenhouse gas emissions from solvent and other product use.**

1.1.2.9 AGRICULTURE

Agriculture is the largest source of emissions of methane and nitrous oxide. In 2011, the sector's emissions of these greenhouse gases came to 7.8 Mt CO_2 eq, representing 13% of national emissions. Total emissions from agriculture have fallen by 14% since 1990 (see Fig. 1.13).

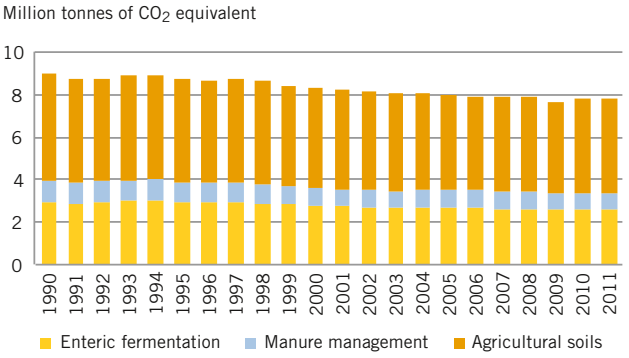


Figure 1.13 **Greenhouse gas emissions from agriculture.**

Enteric fermentation in livestock (chiefly cattle) gives rise to methane emissions. These emissions have fallen by 13% since 1990, amounting to 2.6 Mt CO_2 eq in 2011. The principal reason for the reduction is a decline in the livestock population, with a decrease of 12% in the number of cattle between 1990 and 2011.

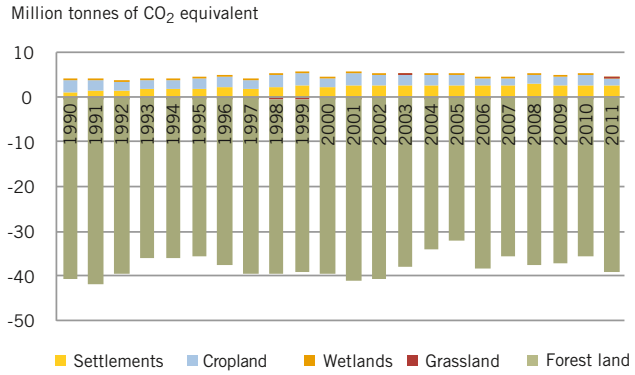
Manure management produces emissions of methane and nitrous oxide. Aggregate emissions from this source have decreased by 23%, from 1.0 Mt CO_2 eq in 1990 to 0.7 Mt CO_2 eq in 2011. The main reason for the decline is a reduction in the quantities of animal manure, due to falling numbers of dairy cattle and pigs.

Agricultural soils are another major source of nitrous oxide emissions, contributing 4.4 Mt CO_2 eq in 2011, a reduction of 12% compared with 1990. The decrease is due to declining use of both mineral fertilisers and animal manure. To some extent, action programmes to curb nitrogen losses from agriculture have reduced indirect emissions of nitrous oxide from leached nitrogen and from ammonia deposition. An expansion of slurry management in pig and dairy farming has also played a significant role in bringing down nitrous oxide emissions from the agricultural sector.

1.1.2.10 LAND USE, LAND-USE CHANGE AND FORESTRY

Over the period 1990–2011, the land use, land-use change and forestry sector represented an annual net sink, as a result of carbon dioxide from the atmosphere being taken up by vegetation and incorporated in biomass. This net removal varied between 27 and 38 Mt

CO_2 eq (see Fig. 1.14). In 2011, it amounted to 35 Mt CO_2 eq, corresponding to 57% of national greenhouse gas emissions. Sweden has a rolling sampling system based on permanent plots. Data for 2008–11 involve greater uncertainty than the rest of the time series, as not all plots were surveyed for those years.



Figur 1.14 **Greenhouse gas emissions and removals from land use.**

Forest land is the land-use category accounting for the majority of removals in this sector (39.3 Mt CO_2 eq in 2011). The long-term trend points to a slight decline in removals from land use. This is due primarily to increased felling, but also to two severe storms: Gudrun at the beginning of 2005 and Per early in 2007. Winter storm Gudrun brought down a large quantity of timber, 75 million m^3 standing volume (Swedish Forest Agency 2006).

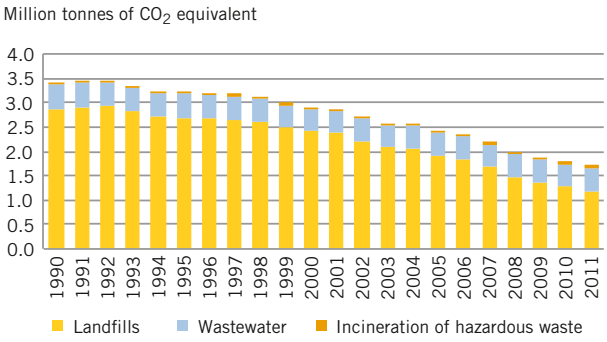
According to the Forest Agency, gross fellings varied between 64 and 96 million m^3 standing volume over the period 1990–2011, with the exception of 2005, when felling, including windthrow, was estimated at 122 million m^3 (Swedish Forest Agency 2013).

Cropland is a net source of greenhouse gases, as the cultivation of organic soils gives rise to emissions. These varied between 1.3 and 2.7 Mt CO_2 eq in the period 1990–2011.

At a national level, grassland, wetlands and settlements represent very small areas (and associated changes in carbon stocks) compared with forest land, resulting in greater uncertainty in the data. The change in the stock of carbon in grasslands and wetlands is small (0.06 Mt CO_2 eq in all in 2011). Emissions from settled land ranged from 1.3 to 2.9 Mt CO_2 eq between 1990 and 2011.

1.1.2.11 WASTE

Emissions of greenhouse gases from the waste sector have been halved since 1990 and show a downward trend (see Fig. 1.15). In 2011, they stood at 1.7 Mt CO_2 eq, or around 3% of total greenhouse gas emissions.



Figur 1.15 **Greenhouse gas emissions from waste sector.**

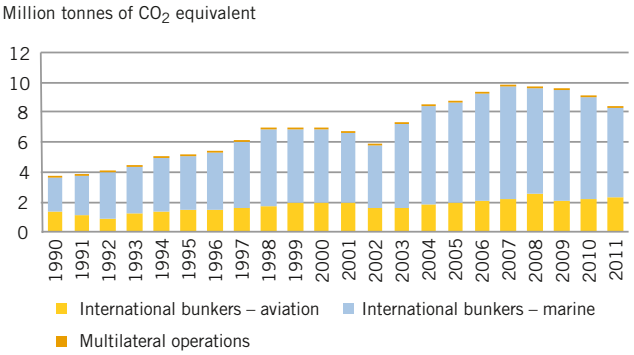
Of total emissions from the waste sector in 2011, methane from landfill sites accounted for just over two-thirds. After livestock farming, landfills are the largest source of methane emissions, as the gas forms when organic wastes decompose. Emissions of methane have steadily declined since the early 1990s, owing partly to less waste being landfilled and partly to increased recovery of methane from landfill sites. The main reason for the decrease in the quantities of waste sent to landfill is the bans on landfill disposal of combustible and organic material, introduced in 2002 and 2005 respectively. Producer responsibility, municipal waste plans and the waste tax have also reduced the amount of waste.

Emissions from wastewater have fallen by 10% since 1990, owing to improvements in sludge management.

Emissions from the incineration of hazardous waste have risen somewhat in recent years compared with 1990–2002, due to an increase in the quantities of waste incinerated.

1.1.2.12 INTERNATIONAL BUNKERS

Greenhouse gas emissions from international shipping and aviation, known as international bunkers, are considerably larger than those from domestic shipping and aviation. In 1990, they amounted to 3.6 Mt CO_2 eq. Since then, they have risen sharply, peaking in 2007. In 2011, emissions were 8.3 Mt CO_2 eq, a full 129% higher than in 1990. See Fig. 1.16.



Figur 1.16 **Greenhouse gas emissions from international bunkers.**

The majority of these emissions come from shipping, which contributed just over 6.0 Mt CO_2 eq in 2011, a rise of 164% since 1990. International freight transport activity has increased, as the volume of goods transported has grown and globalisation of trade and production systems has led to goods being transported over greater distances. Another factor is that Swedish refineries produce low-sulphur marine fuels (fuel oil nos. 2–5), meeting strict environmental standards. This has led to more shipping companies choosing to refuel in Sweden. Fluctuations in bunker volumes between years are also dependent on fuel prices in Sweden compared with ports in other countries.

Greenhouse gas emissions from international aviation bunkers amounted to 2.3 Mt CO_2 eq in 2011, which was 70% higher than in 1990. The trend points to a rise in these emissions, owing to growth in foreign travel.

The Swedish Armed Forces bunker extremely small quantities of fuel in Sweden for operations abroad.

International bunker fuel emissions are not covered by any existing international commitments on emission reductions. As from 2012, however, aviation is included in the EU Emissions Trading System, although 2012 emissions from aircraft have in effect been exempted from the scheme.

1.2 The national system

In accordance with the Kyoto Protocol and the associated Decision 20/CP7[1], as well as EU Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions, Sweden has established a national system for the inventory and reporting of emissions and removals of greenhouse gases. The system came into effect on 1 January 2006 and is described in detail in Sweden's annual National Inventory Report, submitted to the UNFCCC Secretariat.

KP reporting of LULUCF uses the same institutional arrangements, national system and corresponding QA/QC procedures as are used for UNFCCC reporting.

This account of the national system is a summary of the information in sections 1.2–1.3 of the National Inventory Report.

1.2.1 Legal arrangements

The legal basis for Sweden's national system is provided by the Ordinance on Climate Reporting (SFS 2005:626), which describes the roles and responsibilities of the relevant government agencies in this area. The Ordinance ensures that sufficient capacity is available for reporting.

Sweden also has legislation which indirectly supports the work of climate reporting by providing a basis for estimating greenhouse gas emissions and removals. Environmental reports are submitted under the Environmental Code (SFS 1998:808), and the Official Statistics Act (SFS 2001:99) imposes an obligation to submit annual data. In addition, government agencies have to comply with the Secrecy Act (SFS 1980:100) and to archive documents in accordance with the Archives Act (SFS 1990:782).

1.2.2 Institutional arrangements

To prepare the annual inventory and other reports, cooperation takes place between the Ministry of the Environment, the Swedish Environmental Protection Agency, other government agencies and consultants (see Fig. 1.17).

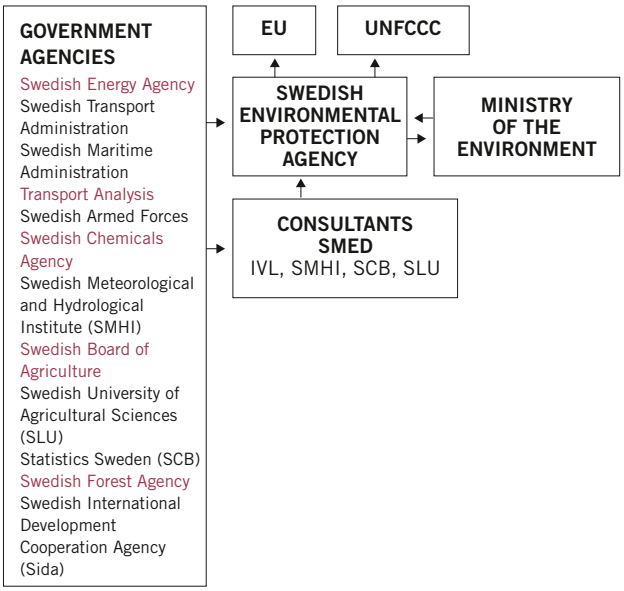


Figure 1.17 **The Swedish national system.**

The *Ministry of the Environment* is responsible for the national system and for ensuring that Sweden meets international reporting requirements in the area of climate change. The *Swedish Environmental Protection Agency* is responsible, on behalf of the Ministry, for producing data and drafts for the required reporting. The Agency is thus responsible for coordinating Sweden's national system for climate reporting and for maintaining the necessary reporting system. Under contract to the Swedish Environmental Protection Agency, *consultants (SMED[2])* process data and documentation received from the various government agencies, as well as data they have produced themselves, and calculate Swedish greenhouse gas emissions and removals. A range of other *government agencies* participate in the national system (see Fig. 1.17), with responsibility for different parts of the inventory process (see Table 1.1).

[1] UNFCCC 2002. FCCC/CP/2001/13/Add. 3.

[2] SMED = Svenska MiljöEmissionsData (Swedish Environmental Emissions Data), a consortium comprising Statistics Sweden (SCB), the Swedish Meteorological and Hydrological Institute (SMHI), IVL Swedish Environmental Research Institute and the Swedish University of Agricultural Sciences (SLU).

Table 1.1 **Responsibilities of government agencies under the Ordinance on Climate Reporting (SFS 2005:626)**

Sector	Data and documentation	National peer review	Other responsibilities
Energy	Swedish Energy Agency	Swedish Energy Agency	Swedish Energy Agency responsible for documentation of flexible mechanisms, projections and documentation of national registry
	Swedish Transport Administration		
	Swedish Transport Agency	Transport Analysis	
	Swedish Maritime Administration		
	Swedish Armed Forces		
Industrial processes	Swedish Chemicals Agency (fluorinated greenhouse gases)	Swedish Environmental Protection Agency Swedish Chemicals Agency	
Solvent and other product use	Swedish Chemicals Agency	Swedish Chemicals Agency	
Agriculture	Swedish Board of Agriculture Statistics Sweden	Swedish Board of Agriculture	
Land use, land-use change and forestry	Swedish University of Agricultural Sciences	Swedish Forest Agency Swedish Board of Agriculture	
	Statistics Sweden Swedish Forest Agency	Swedish Board of Agriculture	
	Swedish Meteorological and Hydrological Institute (SMHI)		
Waste		Swedish Environmental Protection Agency	
Reporting of initiatives involving co-operation with developing countries			Swedish International Development Cooperation Agency (Sida) responsible for submitting documentation to Swedish Environmental Protection Agency

1.2.3 Contact details of organisation responsible

Ministry of the Environment
Address: SE-103 33 Stockholm, Sweden
Telephone: +46 8 405 10 00
Contact: Ms Nilla Thomson
nilla.thomson@regeringskansliet.se

1.2.4 Inventory planning, preparation and management

The Swedish inventory is compiled in accordance with the various reporting guidelines drawn up by the Intergovernmental Panel on Climate Change (IPCC) and the UNFCCC. The national system is designed to ensure the quality of the inventory, i.e. to ensure its transparency, consistency, comparability, completeness and accuracy. The Swedish quality system is based on the structure described in UNFCCC Decision 20/CP7 and applies a PDCA (plan–do–check–act) approach.

1.2.4.1 PLANNING AND DEVELOPMENT

In any given year, priorities are set on the basis of recommendations received from international and national reviews, the results of key category analysis, uncertainty analysis, ideas for improvements from the Swedish Environmental Protection Agency and SMED, and new requirements, arising for example from international decisions.

Based on these criteria, the Swedish Environmental Protection Agency decides on development projects, which are undertaken by SMED. On completion of these projects, the results are implemented in the inventory.

1.2.4.2 PREPARATION

Government agencies supply activity data to SMED, which also gathers activity data from companies and sectoral organisations, and from environmental reports. Emission factors may be plant-specific, developed at a national level, or IPCC default factors. Methods used to estimate emissions comply with current requirements and guidelines.

1.2.4.3 QUALITY CONTROL AND QUALITY ASSURANCE

All data are subjected to general inventory quality control (Tier 1), as described in the IPCC Good Practice Guidance (2000), Table 8.1. Certain sources also undergo additional checks (Tier 2). All quality control is documented by SMED in checklists. Data are also validated using the checks built into the CRF Reporter tool.

Quality assurance is carried out in the form of a

national peer review by government agencies, as provided in Ordinance 2005:626 (see above). This national review covers choice of methods, emission factors and activity data. The reviewers also identify potential areas for improvement in future reporting. Their findings are documented in review reports.

In addition, reporting is reviewed annually by the EU and UNFCCC.

1.2.4.4 FINALISATION, PUBLICATION AND SUBMISSION

The Swedish Environmental Protection Agency supplies a draft report to the Ministry of the Environment in mid-December. At the same time, the results are published nationally. The Environmental Protection Agency submits the inventory to the EU on 15 January and to the UNFCCC on 15 April.

1.2.4.5 FOLLOW-UP AND IMPROVEMENT

Each year, suggestions for improvements from the national and international reviews, and from SMED and the Swedish Environmental Protection Agency, are compiled into a list. Based on this list, priorities are set and development work is carried out in preparation for next year's reporting. Any suggestions not implemented one year remain on the list for consideration in subsequent years.

The Environmental Protection Agency also undertakes an annual follow-up with government agencies that have supplied input data, to maintain the accuracy of data in subsequent reporting.

1.2.5 Information on changes to the national system

There have been no material changes to the national system since the previous National Communication or Biennial Report. Owing to a national reorganisation of government agencies, certain agencies forming part of the system have been reorganised and changed their names. Their functions in the national system remain the same, however.

1.3 References

National Inventory Report Sweden 2013.

Swedish Forest Agency (2006). *Skogsstatistisk årsbok 2006 (Swedish Statistical Yearbook of Forestry 2006)*, p. 23.

Swedish Forest Agency (2013). Officiell statistik, Tabell 7.9 Beräknad bruttoavverkning i hela landet (Table 7.9 Gross fellings by assortments: The entire country), http://www.skogsstyrelsen.se/Myndigheten/Statistik/Amnesomraden/Avverkning-och-virkesmatning/Tabeller--figurer/

2 Quantified economy-wide emission reduction target

The European Union and its member states have communicated an independent quantified economy-wide emission reduction target of a 20% emission reduction by 2020 compared with 1990 levels. This is documented in UNFCCC document FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011. In the EU submission to the UNFCCC from 20 March 2012 (FCCC/AWGLCA/2012/MISC.1), the EU target is explained further.

Sweden will, as part of the European Union, take on a quantified economy-wide emission reduction target jointly with all the member states. The EU's commitment to meeting the 20% target is underlined by the fact that it is already enshrined in EU legislation, and is being implemented by the EU and its member states. At the heart of this legislation is the EU 'Climate and Energy Package'. This includes the EU Greenhouse Gas Emissions Trading System (ETS) and the Effort Sharing Decision (ESD). Under the Effort Sharing Decision, Decision No 406/2009/EC, Sweden will take on a target of reducing emissions not included in the EU ETS by 17% between 2005 and 2020.

The use of carbon credits from international market-based mechanisms is explained in the EU submission from 2012.

With regard to the role of land use, land-use change and forestry, the EU pledge under the Convention does not include emissions/removals from LULUCF, while the national commitment under the second commitment period of the Kyoto Protocol does include the LULUCF sector in accordance with 2/CMP.7, 1/CMP.8 and 2/CMP.8. No decision has yet been made as to whether Sweden will account for any of the voluntary activities under Article 3.4 of the Kyoto Protocol.

3 Progress in achievement of quantified economy-wide emission reduction targets and relevant information

This chapter describes policies and measures in Sweden's climate strategy and their effects. A summary table is found in CTF Table 3.

3.1 Background

Sweden has introduced a range of policies and measures directly or indirectly affecting greenhouse gas emissions. The emphasis in the country's climate strategy is on the use of general economic instruments, but in many cases these are supplemented with targeted measures, for example to support the development and market introduction of technology and eliminate barriers to energy efficiency. Many instruments which interact with carbon dioxide tax and emissions trading have also been adopted to achieve other policy goals than the climate objective, such as energy policy objectives.

Since the early 1990s, two key instruments in reducing Swedish emissions have been the energy and carbon dioxide taxes. These taxes have been supplemented with other instruments, however, such as technology procurement, information, a differentiated annual vehicle tax and investment grants. Legislation, for example involving prohibitions and relating to planning, also plays a part in curbing emissions, primarily in the waste sector. In recent years, EU-wide policy instruments, in particular the Emissions Trading System (EU ETS), have assumed growing importance in Sweden.

At the same time, the design of spatial planning and other instruments long established in Sweden has also very much defined the framework for the developments of recent decades. Of particular importance are earlier decades' investments in an expansion of district heating networks, public transport systems and carbon-free production of electricity.

Given the large number of policies and measures, many of them introduced to achieve other goals as well as those relating to climate, it can be difficult, after the event, to evaluate the exact progress made towards the objectives. And because several instruments interact, it is also hard to distinguish the effect of any one of them from those of the others. Furthermore, picking out the effects of policy instruments from the impacts of other, external changes is often complicated. This is particularly clear as regards developments over the past decade. During this period, several instruments of significance for the climate strategy have been introduced or tightened up in Sweden, in parallel with a sharp rise in energy prices. A solid conclusion, though, is that energy and carbon dioxide taxes have been key instruments in achieving policy objectives in the area of energy and climate.

Yet another difficulty in evaluating policies and measures in Sweden is that instruments which reduce electricity consumption or increase the production of carbon-free electricity have only a limited impact on carbon dioxide emissions inside Sweden's borders, owing to the fact that the electricity market is Nordic/north European and, moreover, has been covered by the EU ETS since 2005.

It should also be noted that, even before 1990, there were instruments in the Swedish energy sector with a similar steering effect to those used after 1990, in that incentives were created early on for the introduction of bioenergy and an expansion of district heating. For the energy supply sector and the residential and

To give a clear structure to environmental efforts in Sweden, the Riksdag (the Swedish Parliament) has adopted a number of environmental quality objectives. One of these, *Reduced Climate Impact*, forms the basis for action on climate change in the country. Current climate policy is in addition set out in two Government Bills, entitled *An Integrated Climate and Energy Policy*, passed by the Riksdag in June 2009 (Govt. Bills 2008/09:162 and 163). The first of these Bills sets a national milestone target for climate, calling for a 40% reduction in emissions by 2020, compared with 1990. This target applies to activities not included in the EU Emissions Trading System. In addition, the Bill makes it a priority for Sweden to have a vehicle fleet independent of fossil fuels by 2030, and sets out a vision of Sweden as a country with no net emissions of greenhouse gases to the atmosphere by 2050.

For more information about the Bills and the national milestone target see Sweden's Sixth National Communication on Climate Change.

Table 3.1 **Existing policies and measures of significance for Sweden's climate strategy. EU instruments are marked in bold.**

Cross-sectoral	Energy supply	Industry	Transport	Residential	Agriculture	Waste
• **Emissions trading** • Energy and carbon dioxide taxes • Environmental Code • Planning and Building Act • Research and development	• **Emissions trading** • Energy and carbon dioxide taxes • Electricity certificates • Special initiatives in support of wind and solar power	• **Emissions trading** • Energy and carbon dioxide taxes • **F-gas Regulation**	• **CO_2 standards for new vehicles** • Energy and carbon dioxide taxes • Tax relief on transport biofuels/ quota obligation • CO_2-based annual vehicle tax • Incentives for green vehicles • Definition of green vehicles • Car benefit taxation • Infrastructure planning	• **Energy performance certificates** • Energy and carbon dioxide taxes • **Ecodesign Directive and energy labelling** • Building regulations • Energy advice • Technology procurement	• **Rural Development Programme** • Energy and carbon dioxide taxes • Support for biogas • Advice	• **Bans on landfill disposal** • Methane recovery • Recycling • Producer responsibility • Municipal waste plans

Source: Government Offices of Sweden 2013

commercial/institutional sector, therefore, it may be difficult to distinguish the additional effects of policy instruments introduced in Sweden after 1990 from the effects that might otherwise have arisen if instruments had not been tightened up.

3.2 Cross-sectoral instruments

Energy and carbon dioxide taxes

The Swedish system of energy taxation is based on a combination of a carbon dioxide tax, an energy tax on fuel, a tax on thermal capacity on nuclear power and a consumption tax on electricity. Taxes on energy have existed for a long time. A tax on petrol and diesel was introduced as early as the 1920s, while heating fuels and electricity have been taxed since the 1950s. An energy tax is levied on fossil fuels, based in the case of heating fuels on their energy content. In 2013 the energy tax on natural gas, coal and fuel oil was the equivalent of SEK 0.082/kWh. The energy tax on petrol (environmental class 1) corresponds to SEK 0.346/kWh and that on diesel (environmental class 1) to SEK 0.177/kWh (Swedish Tax Agency 2013a). The carbon dioxide tax was introduced in 1991 as part of a broader tax reform and has been raised in stages over the years, from SEK 0.25/kg CO_2 to SEK 1.08/kg CO_2 in 2012 (Swedish Environmental Protection Agency 2012a). It is charged at a rate that is expressed per unit of weight or volume of fuel, calculated on the basis of the fuel's fossil carbon content. This means that biofuels are not taxed. The carbon dioxide tax base can be summed up as comprising the fossil fuels covered by the EU's Energy Taxation Directive, which means that the tax does not apply to peat. Up to 2015, some relief from carbon dioxide tax will be granted for natural gas and liquefied petroleum gas (LPG) used in motor vehicles, ships and aircraft (Swedish Tax Agency 2013a). As from 2015, though, the same general level of carbon dioxide tax will apply in calculating the rates of this tax for all fossil fuels.

As from 1 January 2013, combined heat and power (CHP) production covered by the EU ETS is completely exempt from carbon dioxide tax, but is liable to an energy tax set at 30% of the standard rate (Swedish Tax Agency 2013b). The same rules have applied since 1 January 2011 to industries included in the trading system and to the generation of heat used in industrial manufacturing within the system (Swedish Tax Agency 2013c). The changes are designed to avoid overlap in the steering provided by the trading system and the carbon dioxide tax, thereby helping to make both instruments more cost-effective.

Manufacturing industries outside the EU ETS, as well as agriculture, forestry and pisciculture, pay 30% of the standard rates of energy and carbon dioxide tax (Swedish Tax Agency 2013c). Generation of heat in an installation included in the EU ETS, not used in industrial manufacturing, is subject to carbon dioxide tax at 94% of the standard rate (Swedish Tax Agency 2013d). In addition, there are special rules on further reductions of carbon dioxide tax for some energy-intensive industries and for diesel used in agriculture, forestry and pisciculture.

Table 3.2 **Energy and carbon dioxide taxes as per 1 January 2013, excl. VAT**

Heating fuels[3]	Energy tax	CO_2 tax	Total tax	Tax SEK/kWh
Fuel oil, env. class 1, SEK/m³	817	3 093	3 910	**0.393**
Coal, SEK/tonne	621	2 691	3 312	**0.438**
LPG, SEK/tonne	1 050	3 254	4 304	**0.337**
Natural gas, SEK/1000 m³	903	2 316	3 219	**0.293**
Crude tall oil, SEK/m³	3 910	–	3 910	**0.399**
Transport fuels				
Petrol, unleaded, env. class 1, SEK/l	3.13	2.50	5.63	**0.623**
Diesel, env. class 1, SEK/l	1.76	3.09	4.86	**0.487**
Natural gas/methane, SEK/m³	–	1.853	1.85	**0.168**
LPG, SEK/kg	–	2.603	2.60	**0.204**
Electricity consumption				
Electricity, N Sweden, SEK/kWh	0.194	–	0.194	**0.194**
Electricity, rest of Sweden, SEK/kWh	0.293	–	0.293	**0.293**
Industry				
Electricity consumption, industrial processes and agriculture, forestry and pisciculture, SEK/kWh	0.005		0.005	**0.005**

Source: 2013e collated by Swedish Energy Agency

With effect from 1 February 2013, sustainable biofuels in petrol and diesel, in blends of up to 5% by volume, are exempt from the whole of the carbon dioxide tax and most of the energy tax (89% for biofuels in petrol and 84% for biofuels in diesel). E85 and other sustainable high-blend biofuels and biofuels with no fossil content are entirely exempt from carbon dioxide and energy tax on their biomass-based component.

Tax is payable on consumption of electricity, at a rate that depends on where in the country and how the power is used. For electricity used in manufacturing processes or in agriculture, forestry or pisciculture, anywhere in the country, the rate applied in 2013 is SEK 0.005/kWh. The tax on electricity consumed by households and service-sector enterprises is SEK 0.194/kWh in northern Sweden and SEK 0.293/kWh in the rest of the country (Swedish Tax Agency 2013a).

Effects of taxes introduced

Instruments to promote lower emissions from district heating production and residential heating began to be introduced before 1990, with biofuels, for example, already exempt from energy tax at that time. Analyses using the MARKAL-NORDIC modelling tool (see Box 3.1) show that the energy and carbon dioxide taxes have primarily helped to reduce emissions from district heating and from the residential and commercial/institutional sector. For homes and premises, both tax changes and oil price increases since the 1990s have meant that it has paid to switch from oil and electricity as sources of heating (Profu 2013). An analysis for each sector, based on MARKAL-NORDIC, can be found in the relevant sections of this chapter.

[3] Some tax relief is available on the use of fuels in manufacturing industries, agriculture, forestry and pisciculture, and CHP and district heating production.

Box 3.1

To assess the effects of economic instruments on Sweden's stationary energy system, we have used the results of estimates made with the MARKAL-NORDIC energy system model (Profu 2013). The 'stationary energy system' comprises production of electricity, district heating and process steam, together with final energy consumption in the residential sector, services and industry. The estimates covered two cases:

1. Actual development of policy instruments from 1990 to 2013. Current instruments are subsequently assumed to remain in use up to and including 2030.
2. A '1990 scenario', using the policy instruments in place in 1990 throughout the period studied (1990–2030). In other respects, this case is identical to (1).

Some methodological development has taken place in the modelling of policy instruments in the residential and services sector compared with the last National Communication, in that the cost of capital has been raised from 7% to 12%, to better reflect the 'inertia' built into the energy transition. Estimates have also been made of how large an improvement in energy efficiency in the sector can be linked to the instruments introduced (Profu 2011).

Modelling attempts to capture the most important variables that could conceivably influence the outcome we are interested in studying; all modelling therefore necessarily involves a simplification of reality and hence some uncertainty.

EU Emissions Trading System

The EU Emissions Trading System (EU ETS) was launched on 1 January 2005. The system puts a limit, or cap, on emissions across the EU from the sectors covered. The first trading period was from 2005 to 2007 and the second coincided with the first commitment period of the Kyoto Protocol, 2008–12. The EU ETS is an important part of the EU's strategy to reduce emissions within the Union, with a fixed emissions cap that will

decrease every year up to 2020. The annual reduction in the cap will continue beyond 2020, but may be revised no later than 2025. The trading system is key to Swedish efforts to help achieve the EU's climate targets for 2020.

Emissions from Swedish installations included in the EU ETS made up around 33% of total greenhouse gas emissions in Sweden over the period 2008–12. Some 80% of these emissions came from industrial plants and 20% from power and district heating installations. The breakdown for Sweden differs appreciably from the average for the EU ETS as a whole, where emissions from energy supply plants are greater (about 60% of the total) than those from industrial installations (roughly 40%). During the first and second trading periods, emission allowances were allocated largely free of charge, under different rules drawn up nationally on the basis of EU-wide criteria. In Sweden, however, no free allocations were made to existing plants in the electricity and district heating sector between 2008 and 2012. Overall, the emissions cap for the period 2008–12 was some 10% lower than the cap for 2005–07.

For the third trading period, from 2013 to 2020, several changes have been made to the scheme. From 2013, the emissions cap is to decrease in a linear fashion by 1.74% per year, starting from the average annual level of the cap during the second trading period. This will result in a reduction of 21% within the EU ETS by 2020, compared with 2005. More sectors have been included, and some 50% of emission allowances are to be auctioned, with a gradual phase-out of free allocations over the period. The rules on the proportion allocated for free have been harmonised across the EU and are based on specific emissions per unit of production as an allocation methodology.

How large a share of allowances will be allocated free of charge in any given member state will depend on a number of factors, including production levels and the number of industries exposed to carbon leakage. In Sweden, the district heating and pulp and paper sectors, in particular, will receive a larger free allocation than in earlier trading periods, owing to the harmonised allocation rules and low specific emissions, while other sectors will receive a smaller allocation.

Impact on carbon dioxide emissions

The effect of the EU ETS on global emissions is equal to the difference between the level set for the cap and the baseline trajectory, i.e. the emissions trend which it is assumed would otherwise have occurred. The effect on emissions in an individual country will depend on a number of factors: alongside the price of emission allowances, these include national circumstances such as the existence of additional policy instruments, the costs of measures and the reduction potential. Since the trading system limits member states' aggregate emissions at EU level, national emission levels and the breakdown between countries are of secondary interest. The economic situation, variations in weather between years and trends in energy prices also have a major impact on emission trends, both short- and long-term. Allowing for the inclusion of more combustion installations in the EU ETS in 2008, average emissions from Swedish plants in the system in 2008–12 fell by about 10% compared with the average for 2005–07 (Swedish Environmental Protection Agency estimates, 2013). In interview surveys, over 50% of Swedish operators replied that the scheme had influenced their companies in such a way that they had reduced their carbon dioxide emissions (Swedish Energy Agency 2010a).

Measures have primarily been introduced at installations in the energy supply and pulp and paper industries. Action taken includes increasing the capacity of biofuel plants, investments in waste-fired boilers (burning industrial waste), measures to improve combustion efficiency, increased use of district heating, and conversion from oil- to biofuel-fired boilers. At the same time, companies have implemented action programmes to reduce overall energy use. It should be noted that other policy instruments, too, may be behind this trend. Energy efficiency action programmes are also being implemented as part of the Programme for Energy Efficiency in Energy-Intensive Industry (PFE, see section 3.5). And the electricity certificates system (section 3.3) has provided an incentive to increase biofuel-based CHP production.

Modelling of the aggregate effects of economic instruments in the Swedish energy sector (see Box 3.1) shows that the electricity certificates system, the EU ETS and the energy and carbon dioxide taxes are expected to be the key instruments for limiting emissions from the energy supply sector in the years to come. For industry, the trading system is judged to be the most important climate instrument. The price of emission allowances and assumptions regarding future prices will be of significance for the impact of this instrument. (Profu 2013.)

The Environmental Code and planning legislation

The Swedish Environmental Code (SFS 1998:808), whose overall objective is to promote sustainable development, brings together the principal legislative provisions in the area of the environment. In applying it, Sweden's environmental quality objectives are to serve as a guide. The Code includes general rules of consideration that are to be observed in connection with all activities and meas-

ures. Large-scale environmentally hazardous activities are subject to a permit requirement. Anyone seeking a permit to establish, operate or alter an environmentally hazardous activity has to prepare an environmental impact statement (EIS), as provided in Chapter 6 of the Code. The purpose of an EIS is to identify and describe the direct and indirect impacts which the planned activity or measure could have, for example on climate.

Greenhouse gas emissions are one of the factors considered as part of the permitting procedure under the Environmental Code. As from 2005, however, the authorities may no longer impose limits on carbon dioxide emissions or the use of fossil fuels by installations covered by the EU ETS.

Measures in the area of spatial planning chiefly affect emission trends in the longer term, and can be of great significance in that perspective. Physical planning measures are primarily governed by the Planning and Building Act (PBA). Many such measures, as well as major infrastructure projects regulated by the Roads Act and the Railway Construction Act, are also subject to some of the provisions of the Environmental Code. Growing attention has been paid to the impact of development of the built environment on energy and transport demand, and to the need for greater coordination of infrastructure, transport and settlement planning (cf. SOU 2008:110, p. 29; Govt. Bill 2008/09:162, pp. 130 f.; Govt. Bill 2011/12:118, pp. 89 ff.; Swedish National Board of Housing, Building and Planning 2009).

The Government Bill proposing a new Planning and Building Act (Ministry of the Environment 2009) also emphasised the important role municipal spatial planning has to play in addressing climate change, and the need for physical planning to be better coordinated with infrastructure planning. The earlier PBA did not include an express requirement to take climate into account, other than its provision that planning and siting decisions were to be taken with due consideration for the risks of accidents, flooding and erosion. The new Act (SFS 2010:900), which came into force on 2 May 2011, introduced a new requirement to take account of environmental and climate aspects in planning. The purpose of this addition, according to the Bill, is to promote good environmental conditions both by means of adaptation to climate change and by reducing human impact on climate and thereby helping to achieve the environmental quality objective *Reduced Climate Impact*. The new PBA also made it mandatory to consider inter-municipal and regional circumstances in planning. Here, too, a link can be found between transport issues and physical planning.

In the Infrastructure Bill (Ministry of Enterprise, Energy and Communications 2012a), the assessment was made that the development of an economically efficient, sustainable transport system needed to be coordinated to a greater extent with land use, housing supply and other public planning, as well as with initiatives in other areas of society, such as growth in the business sector, the labour market etc. This has also been a basic premise in an exercise, commissioned by the Government (Ministry of Enterprise, Energy and Communications 2012b), to prepare national and regional cross-modal plans for development of the transport system over the period 2014–25. The transport system and associated infrastructure are to be adapted to the requirements, economic, environmental and social, of long-term sustainable development. Proposals for a new national plan for Sweden's transport system for 2014–25, drawn up for the Government by the Swedish Transport Administration, state among other things that the Administration will participate in spatial planning in order to integrate planning of the transport system and the siting of housing, industry and services, and that this work is fundamental to sustainable accessibility in attractive urban areas and regions. It is also noted that early collaboration with other stakeholders paves the way for long-term efficiency in the use of resources; this may range from influencing the strategic direction of spatial planning in regional development plans and regional public transport provision programmes, for example, to involvement in municipal comprehensive plans and transport strategies (Swedish Transport Administration 2012a).

In their appropriation directions and conditions for 2013, county administrative boards, certain county councils and bodies for inter-municipal cooperation, which are responsible for regional development issues in their counties, have been tasked with reporting on and assessing the coordination of and mutual links between infrastructure and transport planning, growth programmes at the county level, and local authorities' comprehensive planning.

The Government has also appointed a cross-party committee of inquiry whose terms of reference include an evaluation of the regional planning system under Chapter 7 of the PBA. The committee will examine how that system relates, on the one hand, to the systems of regional development strategies and county transport infrastructure plans, provided for in the County Coordinating Bodies Act (2002:34) and the Act on Regional Development Responsibility in Certain Counties (2010:630), and on the other, to regional transport provision programmes under the Public Transport Act (2010:1065).

Cross-sectoral investment grants

For the period 2009–12, the Government set up a Delegation for Sustainable Cities. Its purpose was to promote the development of attractive, socially and economically sustainable urban environments with a reduced impact on climate and the environment. The Delegation brought together central government, the business community and local authorities in a national platform for sustainable urban development. It also allocated financial support to enterprises and municipalities. The projects supported are intended to serve as models of sustainable urban planning and applied environmental technology.

Grants were available to all types of stakeholders, and from 2009 to 2012 a total of SEK 357m of state funding was awarded for almost a hundred investment and planning projects. All the investment projects are to be completed by 2014, and the last planning projects by 2016. The lessons learnt from the projects supported have been actively disseminated, nationally and internationally.

Under the Ordinance governing the scheme, support was primarily to be given for measures which, overall and in the long term, were judged to have the best prospects of delivering the largest reduction of greenhouse gas emissions in relation to the funding provided. The Delegation therefore paid particular attention to climate effects when assessing applications.

The National Board of Housing, Building and Planning is conducting an independent review of the support provided through the Delegation for Sustainable Cities.

Climate change information

Up to 2010, the Swedish Environmental Protection Agency received specific funding from the Government to provide information on climate change. Its efforts in this area focused on disseminating and making accessible facts about the climate issue, and especially about the associated problems and solutions, and on sharing Swedish experience internationally.

Both the Environmental Protection Agency and the Swedish Meteorological and Hydrological Institute (SMHI) have an ongoing responsibility for information, entrusted to them by the Government. SMHI has a specific remit to collate and disseminate information on climate change.

Between 2002 and 2009, the Environmental Protection Agency carried out surveys of public awareness of and attitudes to climate change. To sum up the results of the 2009 survey, 100% of Swedes are spontaneously aware or have heard of climate change. They demonstrate a very high level of readiness to reduce their own greenhouse gas emissions, and a growing number have done something in their everyday lives to reduce their climate impact (Swedish Environmental Protection Agency 2009).

Information on possible measures in different sectors is disseminated through a number of channels. Several energy efficiency campaigns have been run at a national level, but more continuous information is provided locally and regionally, through the country's climate and energy advisers and regional energy offices. They deal free of charge with enquiries concerning heating, energy costs, energy efficiency, transport, climate, and government grants in the area of energy.

The Swedish Energy Agency conducts an annual review of energy and climate advice services, assessing public awareness of these services and their impact in terms of kilowatt-hours saved. The assessment of their effect is regarded as uncertain, however, partly because the energy savings achieved cannot be assumed to be entirely the result of contact with the advice services, but may also be attributable to other policy instruments and factors. (Swedish Energy Agency 2013a.)

In agriculture and forestry, advice to landowners and managers plays a major role. Over the period 2009–11, the Swedish Forest Agency received special funding to inform forest owners and forest officers about the climate issue. Climate change information and advice have been provided at dedicated seminars or information days in various parts of the country. The Agency's website (Swedish Forest Agency 2013d) and the magazine *Skogseko* ('Forest Echo') have also been important channels.

Farming has a wide range of impacts on the environment. The Swedish Board of Agriculture maintains an informative website covering both the global aspects of climate change and issues relating to biodiversity and the individual farmer.

Research and development

Public investments in climate-related research and development are aimed at creating better conditions for achieving the substantial emission reductions that are required in the longer term.

Swedish climate-related research covers a broad spectrum, from natural sciences to humanities, but with an emphasis on technical and scientific R&D.

The Riksdag decided in 2012 to extend and progressively strengthen funding for energy research (Govt. Bill 2012/13:21), which focuses to a great extent on reducing carbon dioxide emissions. It set a level of some SEK 1.3 billion for the years 2013–15 and around SEK 1.4bn from 2016 onwards. The overarching aim is that the

work undertaken should contribute to realising existing energy and climate objectives, long-term energy and climate policy, and energy-related environmental policy goals. Energy research is a central and integral part of energy policy, offering synergies with other policy instruments in that area.

A link exists between innovation initiatives and economic instruments, in that the latter can facilitate market introduction of the new technology, as with the green vehicle rebate, for example.

An audit of climate research in Sweden by the Swedish National Audit Office (2012) estimated that funding had risen to almost SEK 2bn in 2010, or around 7% of all central government support for research. The majority of these funds went to energy research. The study shows that Swedish climate research generates an internationally high proportion of academic articles, which are also frequently cited. In terms of patent applications, Sweden tops the statistics for the Nordic region. However, it is difficult to assess whether it is the increase in funding that is behind this growth in results.

3.3 Production of electricity and district heating

In 2011, greenhouse gas emissions from the production of electricity and district heating (including residual gases from industry) totalled 8.3 Mt CO_2 eq, a slight increase on 1990 (Swedish Environmental Protection Agency 2013a). Emissions from this sector, however, vary with temperature and precipitation. In a wet year they are generally lower, while in dry years they increase. Temperature affects heating requirements, with greater demand for both electricity and district heating during cold years. Emissions from the sector have therefore fluctuated from year to year, with higher levels in years with cold winters, such as 2011.

Production of district heating rose from 41 TWh in 1990 to 60.5 TWh in 2011 (Swedish Energy Agency 2012b). At the same time, emissions from this source remained relatively stable, as the expansion was largely achieved by increased use of biofuels. The use of oil and coal, meanwhile, declined. The carbon dioxide tax is judged to be one of the main factors behind this trend. The low emissions from electricity generation are explained by the fact that nuclear and hydropower account for a dominant share of production, at the same time as additional production of electricity in recent years has chiefly come from biomass-fired combined heat and power (CHP) plants and wind power.

Policies and measures in the electricity and district heating sector

In the 1990s, the energy and carbon dioxide taxes were a major factor in the sector's development. The carbon dioxide tax on CHP production within the EU ETS was abolished on 1 January 2013, while heat production in heat-only boilers has continued to be taxed. Since 2000, policy instruments in this sector have increasingly been influenced by the EU's common energy and climate policy, at the same time as new national instruments have been introduced. The system of electricity certificates, established in 2003, is of significance for the development of new renewable electricity-generating capacity. Since 2005, most combustion installations for power and heat production have been included in the EU ETS, which represents a key policy instrument for this sector. In addition, the sector is affected by the provisions of the Environmental Code and by support for the technological development and market introduction of wind power.

Electricity certificates system

The system of electricity certificates is a market-based scheme to support the expansion of electricity production from renewable energy sources and peat, introduced in Sweden in 2003. Under the system, electricity generators approved for an allocation of electricity certificates are allocated one certificate for every megawatt-hour (MWh) of renewable electricity produced. These certificates are then sold to electricity users, who are required by law to purchase electricity certificates corresponding to a certain share, or quota, of their consumption. This quota is gradually being increased year by year up to 2020. (Swedish Energy Agency 2012c.) The electricity certificates system is a key instrument in Sweden's action plan to achieve its 2020 target under the EU Renewables Directive.

As from 1 January 2012, Sweden and Norway have a common electricity certificates market. The two countries have now set a joint target of an increase in renewable electricity production of 26.4 TWh between 2012 and 2020. In 2011 and 2012, electricity users were required to buy certificates corresponding to 17.9% of their consumption. Production of renewable electricity under the certificates scheme in 2012 amounted to 21.5 TWh. At the end of that year, 1,411 generating plants were phased out of the certificates system (Swedish Energy Agency 2013b). The background to this is that plants in operation in 2003, when the scheme started, were only allocated certificates up to the end of 2012.

Effects of economic instruments in the electricity and district heating sector

Estimates using the MARKAL-NORDIC modelling tool (see Box 3.1) show that emissions from the electricity and district heating sector (including industrial back-pressure power) could have been almost 14 Mt CO_2 eq higher in 2010 if policy instruments had remained at their 1990 levels (see Table 3.3). The difference in modelled emissions is due above all to significantly greater use of coal in the scenario based on 1990 instruments than in the one based on current levels of instruments.

Since 1990, the production of electricity and district heating has been marked by a very substantial expansion of renewable fuels, and over the same period the influence of policy instruments has increased sharply for the portion of district heat production based on heat-only boilers. For combined heat and power, the pressure from instruments increased up to the beginning of the 21st century and subsequently decreased. The rationale behind the reduced pressure of taxation was to improve market conditions for CHP as a mode of production (Swedish Energy Agency 2003). The carbon dioxide tax on CHP production within the EU ETS was abolished on 1 January 2013, contributing to more cost-effective climate policy management in a European perspective.

According to the modelling results, moreover, the electricity certificates system is an important reason for the clear phase-out of fossil fuels seen in the scenario based on current instruments, in that it provides an incentive for biofuel-based CHP. Electricity production in Sweden qualifying for certificates grew by just over 13 TWh between 2002 and 2011. In the early years, the increase consisted mostly of electricity from biofuels burnt at existing CHP plants and an expansion of capacity at existing biofuel plants. However, the system also resulted in 1,613 new installations being commissioned between 2003 and 2011, of which 1,344 were wind turbines. Between them, these new installations generated some 8.2 TWh of electricity in 2011 (Swedish Energy Agency 2012c).

Sensitivity analyses of the model's scenarios have shown that the certificates system would correspondingly 'resist' a shift towards fossil-based production if the EU ETS emission allowance price were to be €10 per tonne in 2030, rather than the €40 per tonne used as a base case. In such a situation, emissions from the sector would rise, but only to a limited extent. A sensitivity analysis involving lower fossil fuel prices points to an expansion of fossil-based generation of power and heat both in a scenario with policy instruments at their current level and in one retaining instruments at their 1990 level. Current policy instrument levels, however, are of great significance in slowing the rise in emissions, and the difference in emission levels between the two scenarios is therefore even larger than in the base case, where fossil fuel prices are higher and themselves help to reduce emissions. In this sensitivity case, too, the electricity certificates system is a major factor, as it helps to make bio-CHP competitive. (Profu 2013.)

Table 3.3 **Estimated aggregate effects of policy instruments introduced since 1990 on emissions from electricity and district heating production in Sweden, compared with a scenario based on 1990 instruments (Mt CO_2 eq per year) (Profu 2013)**

2005	2010	2015	2020	2025	2030
11	14	16	16	16	15

Further initiatives for the electricity sector

As well as from the electricity certificates system, wind power has benefited from a special 'Pilot Projects' scheme in support of technology development and market introduction in offshore and mountain areas. Projects granted support over the period 2003–12 are expected to generate some 1.44 TWh of renewable electricity per year (Swedish Energy Agency 2013c). This initiative ends in 2013.

The *Vindval* ('Wind Choices') programme is a network-oriented initiative aiming to strengthen the planning and permitting processes associated with wind power schemes, including research into effects on the environment, animals and humans. In 2012, the Swedish Energy Agency approved a new concerted commitment of SEK 4.6m for further processing and communication of the programme's results.

Designated areas of national interest for wind utilisation – which have been deemed particularly suitable for the generation of electricity from wind power – cover 2.2% of the area of Sweden and also include areas in the country's economic zone. New designations were decided in December 2013 (Swedish Energy Agency 2013d).

A Riksdag decision of 2009 requires there to be a 'planning frame' for wind power corresponding to 30 TWh by 2020, of which 10 TWh is to be offshore. This frame means that, in the context of spatial planning, conditions are to be created for an expansion of wind power to 30 TWh, but it does not represent a production target (Swedish Energy Agency 2013e). The planning frame replaces the earlier target for wind power development of 10 TWh by 2015. In 2012, just over 7 TWh of wind power was generated in Sweden, ten times as much as in 2003 when the electricity certificates system was introduced (Swedish Energy Agency 2013f).

The Guarantees of Origin of Electricity Act (SFS 2010:601) came into force on 1 December 2010. Its aim is to ensure that final customers are provided with clear information on the origins of the electricity they purchase (Swedish Energy Agency 2013h).

The earlier support scheme for solar heating was discontinued on 31 December 2011. The scheme resulted in additional solar heating corresponding to an annual output of about 20.3 GWh, primarily replacing biofuels and, to a lesser extent, direct-acting electric and district heating (Swedish National Board of Housing, Building and Planning 2012). Following withdrawal of the scheme, it is possible to apply instead for tax relief in the form of a property renovation (ROT) deduction, covering the labour costs of installing solar heating.

Since 2009 there has been a central government scheme to support the installation of solar cells. The installations granted support and built to date are estimated to be capable of producing around 8.4 GWh of renewable electricity a year (Informant 1, Swedish Energy Agency, 2013). The Government has allocated a further SEK 210m for this scheme for 2013–16 (Swedish Energy Agency 2013g).

3.4 Residential and commercial/ institutional sector

Greenhouse gas emissions from individual heating of homes and commercial and institutional premises (i.e. heating other than district heating) fell dramatically from just under 9 Mt CO_2 eq to around 1.4 Mt CO_2 eq per year between 1990 and 2011 (Swedish Environmental Protection Agency 2013b). Direct emissions from this sector now make up only around 3% of Sweden's total emissions of greenhouse gases (Swedish Energy Agency 2012f).

Energy use in the sector in 2011 accounted for some 40% of final energy use in Sweden (Swedish Energy Agency 2012e). The use of energy for heating showed a downward trend in the first decade of the 21st century. Use of electricity for domestic equipment and lighting and for common building services, on the other hand, increased (Swedish Energy Agency 2012f).

Policies and measures in the residential and commercial/institutional sector

The energy and carbon dioxide taxes can be regarded as instruments that have significantly contributed to reducing the use of fossil fuels in this sector in recent decades. The aggregate level of taxes on fossil fuel use for heating in the residential and commercial/institutional sector has risen steadily since 1990, making it considerably more expensive to burn these fuels than it would have been if energy taxation had been kept at its 1990 level (Profu 2013). This is shown in Fig. 3.1.

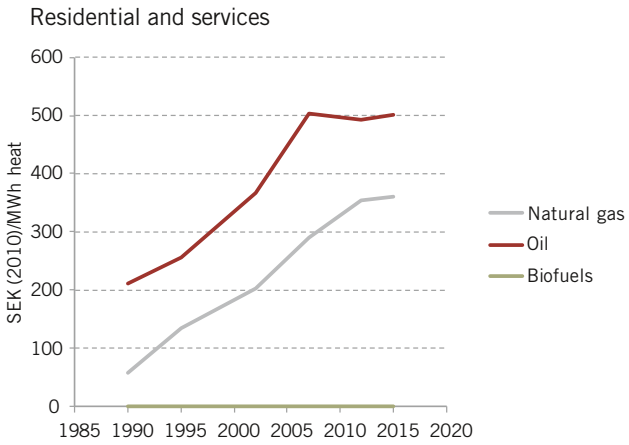


Figure 3.1 **Policy instruments affecting light fuel oil, biofuels and natural gas in the residential and services sector: development between 1990 and 2012, and model assumption for 2015 (constant 2010 prices) (Profu 2013).**

Alongside the carbon dioxide and energy taxes, there are a number of instruments targeted at energy use in homes and commercial and institutional premises. Some of the more important ones are building regulations, energy performance certificates, and the Ecodesign, Energy Labelling and Energy Efficiency Directives. In addition, there are instruments such as technology procurement, network initiatives and information campaigns at the local, regional and national levels.

Estimate of aggregate effects of economic instruments in the residential and commercial/institutional sector

Between the early 1990s and the present day, carbon dioxide and energy taxes have helped to phase out oil-based and electric heating. Analysis of model estimates based on MARKAL-NORDIC shows that drivers for a switch to other heating options exist in both the scenario retaining 1990 policy instruments and the one based on current levels of instruments, but that the incentive to replace existing oil-fired heating is greater in the scenario in which taxes have been developed and raised to today's levels (see Fig. 3.2). It is reasonable to assume, moreover, that the reduction in emissions from this sector would have been slower if instruments had not been changed and tightened up since 1990. The proportion of heat pumps is also appreciably higher in the current instruments scenario, owing to higher electricity prices and higher taxes on electricity, which discourage the use of other forms of electric heating.

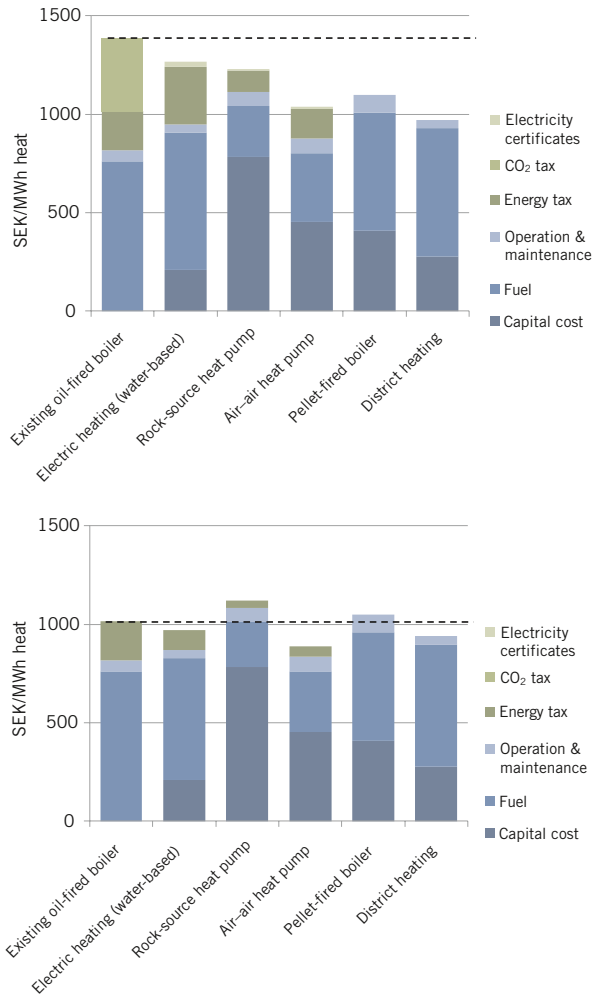


Figure 3.2 **Heat production costs in single-family houses with different heating alternatives, in the scenarios based on current (top diagram) and 1990 policy instrument levels (lower diagram) (Profu 2013).**

By 2030, according to the model's scenarios, fossil-based heating will be phased out altogether in the residential sector with current instruments, whereas there would still have been a certain proportion of fossil fuels left if instruments had remained at 1990 levels (Profu 2013).

Building regulations

The earlier Act on Technical Requirements for Construction Works etc. (SFS 1994:847) was repealed in May 2011 with the introduction of the new Planning and Building Act (PBA). The Building Regulations of the Swedish National Board of Housing, Building and Planning (BBR) contain mandatory provisions and general recommendations to ensure compliance with the PBA, the new Planning and Building Ordinance and other statutes (Swedish National Board of Housing, Building and Planning 2011a). Buildings are to be designed in such a way that energy use is limited by low heat losses, low cooling requirements, and efficient use of heat, cooling and electricity (Swedish National Board of Housing, Building and Planning 2011b). The most recent tightening of the building regulations' energy requirements took effect on 1 January 2012. Since autumn 2013, a review of these requirements has been under way. In addition, the Board of Housing, Building and Planning's general recommendations on energy performance were incorporated in the regulations on 1 January 2012. With this change, alterations and extensions are also covered by the building regulations, although the requirements normally only apply to the altered part of a building (Swedish Energy Agency 2012f).

Energy performance certificates

Directive 2010/31/EU on the energy performance of buildings has been incorporated into Swedish legislation by, among other enactments, the PBA and the Energy Performance Certificates Act (SFS 2006:985), which first took effect in 2006. Owners of multi-dwelling buildings and commercial and institutional premises are now required by law to obtain an energy performance certificate, setting out the energy use of their building and certain parameters regarding the indoor environment. The aim is to promote efficient use of energy and a healthy indoor environment, by ensuring that property owners have a better understanding of what measures would cost-effectively improve the energy performance of their buildings. Since energy performance certificates were introduced, over 430,000 buildings have been registered with the Board of Housing, Building and Planning as holding such certificates (Swedish National Board of Housing, Building and Planning 2013). As from 1 July 2012, the provisions have been amended, one change being that a certificate has to be shown and handed over when a property is sold or rented out.

Ecodesign and energy labelling

The Ecodesign Directive (2009/125/EC) has been transposed into Swedish legislation by the Ecodesign Act (SFS 2008:112). Legally binding ecodesign requirements are drawn up in the form of product-specific EU regulations, which have direct application in the member states. This directive results in energy savings by prohibiting the least energy-efficient products. The range of products covered by it is constantly growing, with requirements introduced, for example, for air–air heat pumps and lighting. Requirements for electric, gas- and oil-fired boilers and for other heat pumps have recently been adopted, but not yet taken effect.

Mandatory energy labelling of certain domestic appliances has existed in the EU since 1995, but in 2011 it assumed a new appearance, with the introduc-

tion of energy labelling for televisions and an update of labelling of refrigerators, freezers, dishwashers and washing machines. Sweden has an active programme of market surveillance, involving both supervision of dealers and laboratory tests of products. New products to be energy-labelled in 2013 include air–air heat pumps and LED lamps. The Commission estimates that the ecodesign and energy labelling requirements adopted to date could, by 2020, save 484 TWh of electricity per year across the EU. In addition, there will be savings from boilers and water heaters of 653 TWh of primary energy, comprising electricity, oil and gas (Swedish Energy Agency 2013i). For Sweden, the ecodesign and energy labelling requirements could bring savings of over 30 TWh by 2020 (Informant 2, Swedish Energy Agency, 2013).

Technology procurement and network initiatives

Technology procurement is an instrument designed to initiate a market transition and disseminate new, efficient technology – new products, systems or processes. Network-based procurement of technology is an approach that encompasses the entire decision-making process, from pre-study and purchaser group to specification of requirements and the spread and further development of new, energy-efficient technology. It is being used, for example, in the areas of heating and control, ventilation and lighting (Swedish Energy Agency 2013j). Purchaser groups exist for housing (BeBo), commercial and institutional premises (BeLok) and food distribution (BeLivs). There is also a network for public sector bodies that rent premises, HyLok (Swedish Energy Agency 2013f). The existing network projects for housing and premises are estimated to have yielded accumulated energy efficiency improvements of 2 and 117 GWh, respectively. The large difference in the measured impacts is mainly due to the types of projects involved and degree of follow-up of network activities (Swedish Energy Agency 2013k).

3.5 Industrial emissions from fuel combustion and processes (including emissions of fluorinated greenhouse gases)

Emissions from industrial combustion in 2011 were around 9.5 Mt CO_2 eq, some 21% lower than in 1990 (12.1 Mt CO_2 eq). The principal reductions have occurred in the paper and pulp industry.

Industrial process emissions in 2011 amounted to approx. 6.7 Mt CO_2 eq, an increase of about 5% on 1990. Process emissions vary widely from one year to another, partly depending on the economic situation.

Policies and measures in the industrial sector

The instruments primarily affecting combustion emissions from industry are the EU Emissions Trading System, energy and carbon dioxide taxes, the electricity certificates system, the Programme for Energy Efficiency in Energy-Intensive Industry (PFE) and the Environmental Code.

Industrial process emissions have come almost entirely within the scope of the EU ETS since its expansion for the third trading period (2013–20). They are regulated above all by the Environmental Code's requirement to use the 'best possible technology'.

Emissions of fluorinated greenhouse gases are also partly governed by an EU regulation and directive covering certain emissions of fluorinated gases.

Estimate of aggregate effects of economic instruments in the industrial sector

According to estimates made using the MARKAL-NORDIC modelling tool, the effect of economic instruments on combustion-related emissions in this sector would have been somewhat greater, or at least as great, if 1990 policy instruments had been retained. The difference in emissions between the 1990 and current instruments scenarios is consistently small.

The estimates suggest that, looking beyond 2020, the effect of current instruments will be greater than if 1990 instruments had been retained, provided that EU ETS allowance prices are considerably higher than at present (€40 in 2030). The differences, though, are very small. If the allowance price were only to rise to €10 by 2030, the effect would be comparable to that of 1990 instruments. Emission reductions could be achieved compared with the 1990 case if the price increases to €40 by 2030, whereas there will be no reduction with a lower price of €10.

The Energy Efficiency Programme (PFE) and the F-gas Regulation are not included in the MARKAL-NORDIC model.

Increased carbon dioxide tax for non-EU ETS industry, and energy tax on fossil fuels for heating in industry

Taxation of fossil fuels used in sections of industry outside the EU ETS was raised on 1 January 2011 from 21% to 30% of the standard rate of carbon dioxide tax. There will be a further increase in 2015, to 60% of the standard rate. No carbon dioxide tax is payable on fossil fuels used in industrial plants included in the trading system.

Since 1 January 2011, energy tax on fossil heating fuels has been levied according to their energy content, significantly increasing the tax on LPG, natural gas, coal and coke. On fuels used in industrial manufacturing processes, inside and outside the trading system, 30% of the standard energy tax is paid.

When these tax increases were decided, it was estimated that they would result in overall emission reductions of 0.4 Mt CO_2 eq in 2015 and 2020, beyond those projected. This assessment covered the use of fuels for heating both in non-EU ETS industry and in agriculture, forestry and pisciculture.

Programme for Energy Efficiency in Energy-Intensive Industry

An instrument designed to improve industrial energy efficiency is the Programme for Energy Efficiency in Energy-Intensive Industry (PFE). This five-year programme offered companies an exemption from the energy tax on the electricity used in manufacturing processes, in exchange for a commitment, in the first two years, to introduce an energy management system and carry out an energy survey to analyse the company's potential to take energy efficiency measures. Firms also undertook to implement, during the programme period, measures to improve electricity efficiency with a payback time of less than three years.

The first period of the programme ran from 2004 to 2009, and the end result was that the hundred energy-intensive industrial companies participating achieved electricity savings of 1.45 TWh per year (Swedish Energy Agency 2013l). It is difficult to distinguish the exact effect of PFE, as the economic benefits of the measures taken were enhanced by the sharp rise in industrial electricity prices since the beginning of the 2000s.

The PFE Act, which established the programme, ceased to have effect at the end of 2012, as the 2008 EU guidelines on state aid for environmental protection mean that there is no basis for commencing new programme periods after that date. However, the repealed Act continues to apply to companies approved as participants before the end of 2012. At present, 94 companies, together accounting for 72% of industrial energy use, are still taking part. Participating firms are allowed to complete the programme period running from 2013 to 2017. In practice, however, some 90% of them, and an even higher proportion of their total energy use, will exit the programme in June 2014, when the companies involved from the outset complete their programme periods (Informant 4, Swedish Energy Agency, 2013o). Work is in progress to find policy instruments that will continue to encourage energy-intensive industry to improve its electricity efficiency (Ministry of Enterprise, Energy and Communications 2013).

Energy survey grants for SMEs and an expansion of energy advice

Support for energy surveys of small and medium-sized enterprises and farms was introduced in 2010 and will continue at least until the end of 2014. Grants cover 50% of the cost of a survey, up to a maximum of SEK 30,000, and are available to businesses using more than 500 MWh of energy a year. Farms with at least 100 livestock units are eligible even if they use less energy.

The last few years have seen an expansion of active networking initiatives relating to energy use, targeted at businesses both large and small, partly with the aim of maximising the impact of instruments such as PFE and energy survey grants.

EU F-gas Regulation and the Environmental Code

Emissions of fluorinated greenhouse gases (F-gases) have risen sharply since 1990. The biggest increase is due to the replacement of ozone-depleting refrigerants with hydrofluorocarbons (HFCs), which do not harm the ozone layer but are very powerful greenhouse gases.

Emissions of F-gases in Sweden in 2011 totalled around 1.1 Mt CO_2 eq, an increase of 0.6 Mt CO_2 eq compared with 1990 and a decrease of 0.2 Mt CO_2 eq from 2007 levels.

In industry, F-gases are emitted both from processes (mainly in the aluminium industry) and from use of refrigerants. Emissions of process-related F-gases fell from 0.5 to 0.2 Mt CO_2 eq between 1990 and 2011, partly as a result of the Environmental Code's requirement to use the best technology. At the end of 2013, the EU is expected to adopt a BREF (Best Available Techniques reference document) for the non-ferrous metals industry. The performance requirements set out there are to be met within four years and could halve emissions from aluminium production.

Since 2006, the use of certain F-gases has been controlled by EU Regulation No 842/2006, which primarily applies to the use of F-gases in refrigeration, air conditioning and heat pump equipment, as well as in fire protection systems.

When the EU's F-gas legislation was introduced in Sweden, it was expected to reduce emissions by about 0.7 Mt CO_2 eq/year by 2020, compared with if it had not been introduced. To date, total F-gas emissions have admittedly fallen, but most of the reduction has occurred in industry and not in the applications covered by the F-gas Regulation.

In autumn 2012, the European Commission proposed a tightening of the regulation, aimed at cutting emissions by two-thirds from present levels by 2030. The proposal also includes a ban on the use of F-gases in certain types of equipment for which climate-friendly alternatives are available. A decision is expected in 2013.

3.6 Transport

Emissions of greenhouse gases from the Swedish transport sector in 2011 made up 33% of the country's aggregate reported greenhouse gas emissions, with road transport as the dominant source, accounting for over 90% of the total for the sector. Emissions from domestic transport have increased since 1990, reaching a peak in 2006–07, when they were 12–13% higher than in 1990. Since then, emissions have declined, especially from cars, and in 2012 they were just 2% up on 1990 levels. Between 2009 and 2012, road transport emissions fell by 5.6% (Swedish Environmental Protection Agency official statistics). Over the same period, the share of renewable energy rose from 5.4% (Swedish Energy Agency 2010b) to 8.1% (Swedish Energy Agency 2013m).

The decrease in emissions since 2006 can be attributed to a number of policy instruments introduced both nationally and at EU level, which have resulted in more energy-efficient vehicles and an increased share of renewable energy. Without the growth in traffic that has occurred, emissions would have been 15% lower than in 1990. According to the latest projection, transport sector emissions will continue to decline up to 2020 and 2030, but not enough to achieve the Government's priority of a vehicle fleet independent of fossil fuels by 2030, thereby risking the fulfilment of the vision for 2050 (Swedish Transport Administration 2012b). Partly for this reason, the Government has set up an inquiry to define its priority of a fossil-independent vehicle fleet by 2030 and to identify ways of realising it. The inquiry will present its final report at the end of 2013.

General policy instruments: Vehicle fuel taxes

Petrol and diesel are subject to both an energy tax and a carbon dioxide tax. In addition, value added tax (VAT) is charged on the sales value. The carbon dioxide tax on vehicle fuels was introduced in 1991 and has since been raised in several stages. The introduction of and increase in this tax, however, have been partly offset by a simultaneous reduction of energy tax on vehicle fuels. Overall, the tax on these fuels has gone up, but in 2007 and 2008 increases in the total tax were overshadowed by rising pre-tax prices for petrol and diesel, due to higher crude oil prices. The increase in the pre-tax prices of petrol and diesel has slowed growth in transport, encouraged more energy-efficient vehicles and facilitated the introduction of transport biofuels. In accordance with the climate policy decision of 2009, the energy tax on diesel has been raised in two stages, in 2011 and 2013, by a total of SEK 0.40/litre. In addition, there is the annual indexlinking of rates of energy and carbon dioxide tax on fuels and electricity.

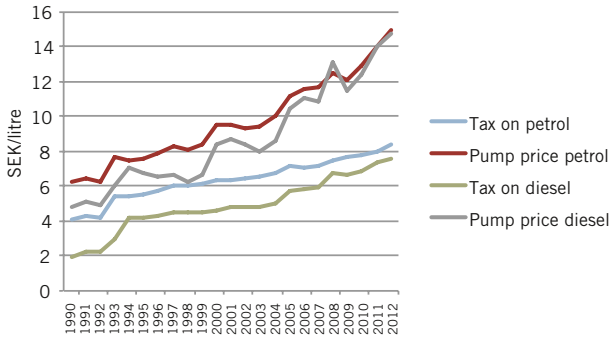


Figure 3.3 **Retail prices and total taxes (energy tax, carbon dioxide tax and VAT) for diesel and 95 octane petrol (annual averages). Current prices.**

Source: Collation of data from Swedish Petroleum and Biofuels Institute (SPBI 2013).

Support for research and demonstration

Support for research, development and demonstration is an important complement to pricing instruments. In recent years, some SEK 240m annually has been made available for research, demonstration and piloting of transport biofuels. In 2012, SEK 1,240m was allocated for the period 2013–16, a priority area being initiatives to promote a fossil-independent vehicle fleet, including increased funding for technology verification and demonstration. In the next few years, targeted research support for automotive technology, with a focus on developing electric- and hybrid-vehicle technology within the Swedish vehicle cluster and on transport biofuels etc., will amount to some SEK 400m a year. (Informant 3, Swedish Energy Agency, 2013n.)

Targeted instruments: Renewable transport fuels

Low blends of ethanol in petrol and FAME[4] in diesel have long been used in Sweden. Under the EU's Fuel Quality Directive, fuel specifications now permit 10% ethanol in petrol and 7% FAME in diesel. With effect from 1 February 2013, to promote renewable energy in the road transport sector, sustainable biofuels in petrol and diesel, in blends of up to 5% by volume, are exempt from the whole of the carbon dioxide tax and most of the energy tax (89% for biofuels in petrol and 84% for biofuels in diesel). E85 and other sustainable high-blend biofuels and biofuels with no fossil content are entirely exempt from carbon dioxide and energy tax on their biomass-based component. In the case of sustainable hydrotreated vegetable and animal oils and fats (HVO), exemption from these taxes applies to up to 15% by vol-

[4] Fatty acid methyl ester, a form of biodiesel.

ume of HVO in diesel fuel, with effect from 1 January 2012. The system will shortly be changing, as the Government intends to introduce a quota obligation on 1 May 2014, which will increase the quantities of ethanol and FAME blended with petrol and diesel. Biofuels will be required to make up a total of at least 9.5% by volume of the volume of diesel fuel subject to the obligation, with at least 3.5% by volume to consist of 'specially designated' biofuels. The proportion of biofuels in petrol is to be at least 4.8% by volume of the volume covered by the quota obligation, rising to at least 7% by volume no later than 1 May 2015. When the quota obligation is introduced, moreover, energy tax on sustainable transport biofuels included in petrol or diesel is intended to be levied at rates corresponding to the energy tax on comparable fossil fuels, calculated on an energy content basis.

The quota obligation system is a market-based support scheme, aimed at ensuring that a certain quantity of transport biofuels is available on the market. High-blend biofuels such as E85, and biogas, will remain exempt from the energy as well as the carbon dioxide tax.

Under the Renewable Fuels Act introduced in 2006, all filling stations with sales above a certain level have to supply at least one renewable fuel. Just under two-thirds of all stations are subject to this requirement.

These targeted instruments to promote renewable transport fuels will help to realise the Government's long-term priority of a vehicle fleet independent of fossil fuels, thereby reducing the climate impact of the transport sector.

Targeted instruments: Composition of the vehicle fleet

Sweden uses vehicle taxation as an instrument for reducing carbon dioxide emissions from light-duty vehicles.

In 2006, a carbon dioxide-based annual vehicle tax was introduced for passenger cars from the year 2006 and later. This tax also applies to electric and hybrid cars and to other passenger cars meeting certain emission requirements (Euro 4). As from 1 January 2011, the carbon dioxide-based vehicle tax applies, in addition, to motorhomes, light goods vehicles and light buses.

The annual vehicle tax on diesel-powered light-duty vehicles is in general higher, owing to the lower tax on diesel fuel compared with petrol. The higher tax on these vehicles is calculated using a fuel factor. On top of this, an environmental surcharge is added, to reflect the higher nitrogen oxide and particulate emissions from diesel vehicles.

As from 1 July 2009, new vehicles with lower emissions of carbon dioxide (green vehicles according to the old green vehicle definition) are exempt from annual vehicle tax for the first five years. On 1 January 2013, more stringent criteria for the five-year exemption, involving weight-based carbon dioxide emission requirements, were introduced. The tax exemption was also extended to include motorhomes, light goods vehicles and light buses. This means that passenger cars, motorhomes, light goods vehicles and light buses brought into use in Sweden for the first time on or after 1 January 2013 are exempt from annual vehicle tax for the first five years, provided that their carbon dioxide emissions (according to data in the Road Traffic Registry) do not exceed a maximum level calculated in relation to the vehicle's weight (green vehicles according to the new definition). Heavier vehicles that are energy-efficient may therefore also qualify for the exemption. On 1 August 2007 a financial incentive was introduced in the form of a grant towards the purchase cost of passenger cars causing less damage to the environment. This green vehicle rebate was discontinued on 1 July 2009. At the beginning of 2012, a super-green vehicle rebate of up to SEK 40,000 was introduced for new vehicles emitting a maximum of 50 g CO_2/km (super-green vehicles).

Roughly two-thirds of all cars sold in Sweden are bought by legal entities (Swedish Transport Administration 2013a). Many of them are company cars that are used privately, a benefit on which tax is payable. The 'benefit in kind' value on which private individuals are taxed for this has been reduced for company vehicles that are equipped with a gas engine or a hybrid or fully electric motor, to increase the incentive to choose such vehicles. There may also be a number of local advantages to buying a green car, such as free parking in certain municipalities. In addition to Swedish policy instruments, manufacturers selling vehicles in the EU are subject to EU Regulations Nos 443/2009 and 510/2011 setting emission performance standards for new passenger cars and new vans as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles. Under these regulations, new passenger cars should not emit an average of more than 130 g and new vans not more than 175 g CO_2/km by 2015 and 2017, respectively.

Effects of policy instruments in the transport sector

Since 2007, the upward trend in transport sector emissions in Sweden has been reversed. Fig. 3.4 shows actual emissions from 1990 to 2011 and a projection up to 2020, as well as an estimate of what the emissions trend would have been and could be up to 2020 with-

out the fuel tax increases implemented since 1990. The effects of these tax increases have been estimated on the basis of the nominal tax level, as a decision was taken in 1994 to adjust the taxes for inflation. The overall effect of the tax increases on diesel and petrol since 1990 is estimated to be around 2 Mt CO_2/year lower emissions in 2010 and 2 Mt CO_2/year lower emissions in both 2015 and 2020, compared with if the 1990 nominal level of taxation had been retained. The actual reduction from 2007 to the present can mainly be attributed to other factors than fuel taxes, such as a recession, rising crude oil prices and the introduction of other policy instruments.

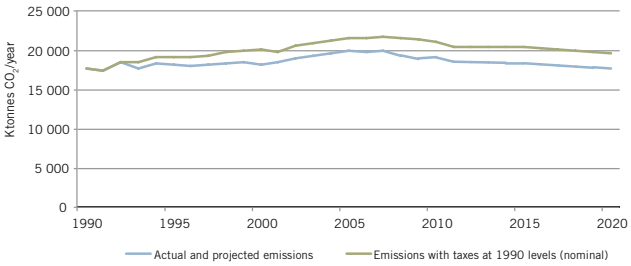


Figure 3.4 **Greenhouse gas emissions from road transport 1990–2011 and projection to 2020 with fuel taxes decided (nominal prices), compared with estimated emissions if fuel taxes had been kept at 1990 levels.[5] (SPBI 2013 and Swedish Tax Agency 2013e)**

Transport is a complex sector, with a range of different stakeholders influencing transport demand, modes of transport used, vehicle and fuel characteristics and, ultimately, emission levels. As indicated, Sweden uses a significant number of policy instruments that are intended to address the various market imperfections, barriers and obstacles to a transition to low emissions in the sector. In many cases, it is not possible to determine the exact effect of each of these instruments.

The energy efficiency of the Swedish car fleet has improved substantially in recent years. As a result, average emissions from new cars in Sweden were 138 g CO_2/km in 2012, with an average for the entire vehicle fleet of 178 g CO_2/km (see Fig. 3.5). This is partly due to a sharp rise in the proportion of diesel cars, which are more energy-efficient than petrol-engine vehicles.

The main instrument behind this trend is the EU's carbon dioxide standards for passenger cars, but Swedish instruments such as the carbon-differentiated vehicle tax and tax exemption for green vehicles (including fuel-efficient diesels) are also of significance. Other vehicle-specific instruments, such as reduced 'benefit in kind' values for electric and flexible-fuel company cars, and local instruments like parking subsidies, have mainly encouraged flexible-fuel vehicles, rather than energy efficiency.

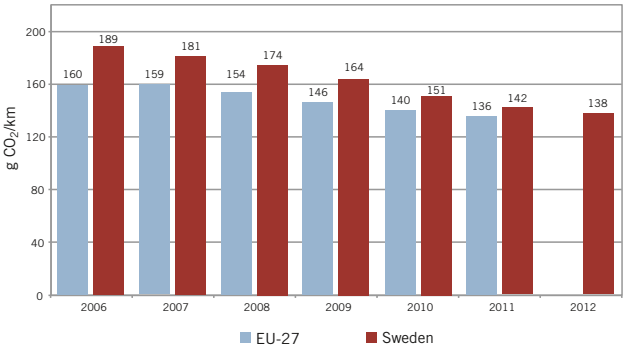


Figure 3.5 **Trends in carbon dioxide emissions (g/km) from newly registered cars in the EU-27 (for 2006, EU-24) and in Sweden, 2006–12.**

Source: Swedish Transport Administration 2013b.

Green vehicles previously consisted mainly of those run on E85, but sales have increasingly shifted towards fuel-efficient vehicles (see Fig. 3.6). This is an effect not only of policy instruments, but also to a large extent of factors such as prevailing norms in society. Demand for E85 (and E85 vehicles), for instance, has fluctuated sharply, influenced partly by how the media have chosen to describe the fuel.

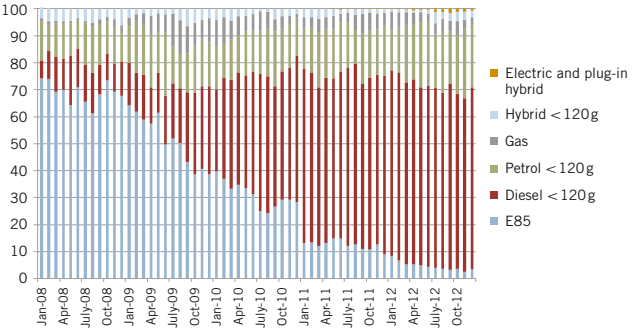


Figure 3.6 **Distribution of new green cars by type.**

Source: Johansson 2013.

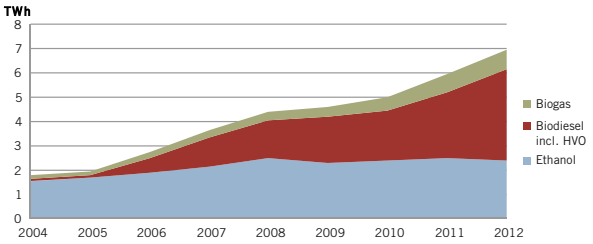


Figure 3.7 **Use of transport biofuels in Sweden from 2004 to 2012.** Source: Swedish Energy Agency 2013.

[5] Estimate with sliding elasticities from 0.3 to 0.7 for private transport and from 0.1 to 0.2 for commercial transport. A simplified method has been used, which probably slightly overestimates the tax effect.

The existence of instruments to promote transport biofuels is crucial to their use, since they still cost more to produce than fossil fuels. In all, the use of transport biofuels verified as sustainable achieved emission reductions in 2011 of about 0.94 Mt CO_2 (Swedish Energy Agency 2012g).

The share of renewable energy in the transport sector (calculated using the method prescribed in the Renewables Directive, and including, for example, electricity for railways) was 11.8% in 2012, an increase of 3.9 percentage points compared with 2010. The share of transport biofuels (on an energy content basis) was 8.1%, 2.4 percentage points up on 2010. Use of ethanol increased somewhat, from 400,000 m^3 to 407,000 m^3, between 2010 and 2012. Biodiesel use rose very sharply, from 225,000 m^3 to 404,000 m^3, over the same period, while biogas increased from 59 to 83 million m^3. (Swedish Energy Agency 2013m.)

The relevant stakeholders in Sweden have endeavoured to build up the production of transport biofuels with major climate benefits, since such benefits have been the primary driver of investments in these fuels in the country. Half of all transport biofuel use in Sweden now meets the emission reduction requirement that will apply from 2017 (Swedish Energy Agency 2012g).

Consideration of climate in long-term infrastructure planning

Long-term planning of infrastructure includes operation and maintenance measures, investments in new infrastructure, research, targeted environmental measures affecting existing infrastructure, and minor alterations such as public transport lanes. Problems and shortcomings are identified and remedied according to the 'four-step principle'. This is a step-by-step process for addressing problems and deficiencies in the transport system, while using resources in a sustainable way.

Box 3.2
The four-step principle

- **Rethink**
  The first step is to consider measures that could influence transport and travel needs and choices of transport mode.
- **Optimise**
  The second step is to implement measures that will enable more efficient use to be made of existing infrastructure.
- **Rebuild**
  The third step involves limited reconstruction.
- **Build new**
  The fourth step involves new investment and/or major reconstruction work.

The Swedish Transport Administration is responsible for long-term planning of all modes of transport. This creates a basis for intermodal measures and coordination benefits. An intermodal approach is central to long-term planning and, among other things, offers greater scope to consider the environment when choosing solutions. Planning is undertaken in dialogue with local and regional planning bodies. Under the Planning and Building Act (SFS 2010:900), too, there is a clear requirement to take environmental and climate issues into account in planning.

3.7 Waste

Methane emissions from landfill sites were around 1.3 Mt CO_2 eq in 2011, an estimated reduction of some 57% since 1990. Landfill emissions are expected to continue falling sharply over the next ten years. The factors behind this decline are an expansion of methane recovery from landfills and reduced landfill disposal of organic material, combined with increases in recovery of materials and waste incineration with energy recovery. These measures are a consequence of a series of policy instruments at both national and EU level.

Policies and measures in the waste sector

Landfill tax, bans on landfill disposal, and municipal waste planning

In 2000 a tax was imposed on waste disposed of to landfill (SFS 1999:673), and since then landfilling of separated combustible material (2002) and of organic material (2005) has been banned (SFS 2001:512). Certain exemptions from these prohibitions have been granted, but they are very limited in scale compared with the overall quantities of waste. In 2011, less than 1% of all household waste produced was sent to landfill. The remainder went either to incineration with energy recovery (51%) or to materials recovery, including biological treatment (48%). Most organic industrial waste was incinerated for energy recovery. The municipal waste planning requirement (NFS 2006:6), introduced in 1991, has also contributed to the emission reductions achieved.

Aggregate effect of policies and measures in the waste sector

Sweden's Third National Communication (2001) presented the results of an analysis of the combined effect of policy instruments influencing methane emissions from landfills. The assessment covered instruments introduced in the 1990s and those planned at the time for the early 2000s (and subsequently introduced). It showed that, in a scenario based on policy instruments

decided on at that time, emissions would end up around 1.4 Mt CO_2 eq lower in 2010 than in a scenario based on 1990 instruments. By 2020, the difference was projected to be 1.9 Mt CO_2 eq. This is still deemed a reasonable estimate.

Overall, the landfill bans are judged to have had the greatest impact in terms of reducing landfill of organic material, which will result in lower emissions of methane in the future. Demand for district heating has also strongly encouraged diversion from landfill to incineration.

While landfill emissions have decreased, waste incineration in centralised plants for district heating and power generation has increased. Incinerated household waste generates some emissions of greenhouse gases, since it consists partly of material of fossil origin, mainly plastics. However, incineration of waste for the production of heat and electricity results in additional greenhouse gas emission reductions, beyond the decrease in methane from landfills, if it is assumed that it replaces electricity and district heating that would otherwise have been produced using fuels with a higher fossil carbon content, such as coal and oil. In 2011, 13.5 TWh of heat and 2 TWh of electricity were generated from the incineration of household and similar waste in efficient plants with stringent air pollution controls. The effect of the growth in waste incineration in Sweden since 1990 is included in the estimate of aggregate effects of economic instruments in the energy supply sector, presented in section 3.3.

3.8 Agriculture and forestry

Agricultural production gives rise to greenhouse gas emissions from land use, livestock (in particular ruminants such as cattle and sheep), and management of fertilisers and manure, as well as from the use of fossil fuels.

Emissions of methane and nitrous oxide from farming make up over 10% of total greenhouse gas emissions in Sweden. Nitrous oxide emissions, especially, have fallen since 1990, but those of methane are also declining. Overall, emissions of greenhouse gases from Swedish agriculture decreased by about 14% over the period 1990–2011.

Nitrous oxide emissions are linked to the use of mineral fertilisers and animal manure. They result from conversion in the soil of nitrogen from those sources, and the fall in emissions can be attributed to reduced use of both fertilisers and manure. Use of manure is chiefly influenced by the number of dairy cattle, which has declined. Action programmes introduced to curb nitrogen losses to water and air in agriculture have also contributed to the trend, as has a shift to slurry systems for manure management. Yet another explanation for the decrease in total use of fertilisers and manure is a contraction of the arable area.

Emissions of methane have fallen as a result of the declining dairy herd, despite a rise in emissions per head of cattle over the period. While numbers of cattle (chiefly dairy) in Swedish agriculture have decreased, however, consumption and imports of beef have increased.

The land use, land-use change and forestry (LULUCF) sector represented a large net sink for carbon dioxide over the period 1990–2011. In 2011, the sector as a whole was responsible for a net removal of some 35 Mt CO_2. By far the dominant category in this sector is forest land, accounting for a net uptake of 39 Mt CO_2. Cropland generated emissions of about 1.3 Mt CO_2, while the change in the carbon stock in grassland was small, 0.001 Mt CO_2. Throughout the period since 1990, forest growth has exceeded forest felling. The total standing volume of timber has increased by about 20%. Net removals of carbon dioxide resulting from LULUCF are determined largely by changes in carbon stocks in living biomass. These changes are a result of annual forest growth (uptake of carbon dioxide) and losses due to felling and mortality (emissions of carbon dioxide). Removals vary quite widely from year to year, largely because felling varies according to the demand for timber products. Analogously with these fluctuations in living biomass, carbon stock changes in dead organic matter also vary, as increased felling produces more stumps. Gross forest growth and felling both show an upward trend. At present, annual growth and harvesting stand at around 120 and 90 million m3 standing volume, respectively. The trend in net uptake by living biomass is declining, primarily because felling increased more than growth throughout the reported period 1990–2011.

Energy use in agriculture, forestry and fisheries consists primarily of the use of diesel for farm and forest machinery. This use has shown a slight rise since 1990, while the increase in volumes of production in both agriculture and forestry has been larger. Consumption of fuel oil for greenhouses and to heat other buildings in these sectors is decreasing, partly owing to its replacement with biofuels.

Policies and measures in the agricultural sector

As yet, there are relatively few policy instruments directly targeted at limiting greenhouse gas emissions from Swedish agriculture. Interest in mitigating the sector's climate impact has grown, however, and the Government has taken a number of initiatives recent-

ly to reduce fossil fuel use in farming, and to increase awareness and encourage the use of measures that will curb emissions of greenhouse gases from manure and fertiliser management and from land use.

At the Government's request, the Swedish Board of Agriculture drew up and, in spring 2010, presented proposals for an action programme to reduce nutrient losses and greenhouse gas emissions from agriculture. No decision was taken by the Government to implement the programme in its entirety, but it did result in further assignments to the Board from the Government, as well as an increased commitment, for example, to climate and energy advice to farm enterprises. Over the period 2011–16 the Board of Agriculture judges that production and use of renewable energy are the measures that will have the greatest effect. Measures to reduce the climate impact of agricultural production more substantially in the longer term could include more efficient use of input materials, an expansion of anaerobic digestion of animal manure, reconversion of farmland with a high organic content to wetlands, reduced use of fossil energy, and increased sequestration of carbon in agricultural soils.

EU Common Agricultural Policy

The EU's Common Agricultural Policy (CAP) significantly affects the extent, direction and profitability of agriculture in Sweden. In 2003, an agreement was reached to reform the policy, referred to as the Mid-Term Review (MTR). The biggest change was that most direct support, which is one element of the CAP, was decoupled from production. Sweden did, however, retain some production-related aid until as recently as 2012, when the last coupled support scheme, the special beef premium, was withdrawn.

The Swedish Rural Development Programme (RDP) for the period 2007–13 is funded in equal shares by the EU and the Swedish state. It comprises support for rural development, environmental improvements, and greater competitiveness in agriculture, forestry, horticulture, reindeer herding and food processing. Each county administrative board has developed an implementation strategy for the RDP at county level and sets regional priorities, for instance, for the investment and project support components of the programme.

Agri-environment payments have been designed to achieve environmental objectives concerned with preserving an open agricultural landscape, conserving biodiversity, and reducing nutrient losses to water, partly through the re-creation of wetlands. Measures introduced to curb nutrient losses may in certain cases also cut emissions of nitrous oxide, particularly those that reduce the amount of available nitrogen in soil and water. Nitrous oxide emissions may in addition be mitigated by certain manure and fertiliser management options, but there are also measures that can limit nitrogen losses and benefit biodiversity, yet increase releases of nitrous oxide. Regeneration of wetlands on drained peatland can reduce greenhouse gas emissions.

In 2008 the Government decided to introduce, as part of the RDP, investment support for biogas production, with total funding of SEK 200m for 2009–13. In all, SEK 159m of this sum has been disbursed for biogas investments. As a result, 30 new biogas production plants are in operation and another 20 are at the planning and design stage. In its Budget Bill for 2014, the Government proposes that SEK 240m be made available for a 'dual environmental benefit' support scheme to promote the production of renewable energy over the period 2014–23. This is a pilot project that will encourage anaerobic digestion of animal manure by means of a payment of around SEK 0.20 per kWh of raw methane produced. Increased digestion of manure offers a dual environmental benefit, reducing both emissions of greenhouse gases and eutrophication of fresh and marine waters. In addition, the biogas can be used to generate electricity or heat, or as a vehicle fuel.

Investment support is also provided for the growing of perennial energy crops, which help to reduce greenhouse gas emissions in other sectors, as well as increasing the stock of carbon in the soil. There are currently some 13,000 ha of short-rotation coppice willow, the perennial energy crop grown on the largest scale.

Grants may in addition be available from the RDP to promote a shift to renewable energy and more efficient energy use in greenhouses and agricultural buildings.

In 2007, the European Commission carried out a review of implementation of the MTR, known as the 'Health Check'. As a result of the review, additional rural development measures were introduced to meet challenges in the areas of climate, water management and preservation of biodiversity, and in the dairy sector. Funds from Pillar 1 (direct support) were transferred to the rural development budget to address these priority areas. In the Swedish RDP, a further SEK 500m was made available for climate and energy initiatives over the period 2010–13. The Swedish Board of Agriculture has estimated that the effect of this funding will be to reduce Sweden's annual greenhouse gas emissions by 0.5 Mt CO_2 eq, primarily through switching from fossil energy to renewable energy from agriculture and through greater energy efficiency.

Changes to the energy and carbon dioxide taxes on fuels used in agriculture, forestry and pisciculture

The carbon dioxide tax on fuels used for heating in industry outside the EU ETS and in agriculture, forestry and pisciculture was raised on 1 January 2011 from 21% to 30% of the standard rate. There will be a further increase in 2015, to 60% of the standard rate.

In addition to the general relief on the carbon dioxide tax, enterprises can currently claim a further reduction under what is known as the 1.2% rule. This tax relief primarily takes effect for enterprises in the greenhouse horticulture sector. The Riksdag has decided that it is to end in 2015.

Previously, SEK 2.38 of the carbon dioxide tax on diesel used in agricultural machinery was refunded, but this refund is being scaled back. It was lowered to SEK 2.10 in 2011, and to SEK 1.70 in 2013. In 2015 it will be cut to SEK 0.90.

The energy tax on diesel has been raised in two stages in recent years, by SEK 0.20 in 2011 and a further SEK 0.20 in 2013.

Policies and measures in forestry

Measures in forestry that can contribute to a reduced impact on climate include:

- Increasing biomass growth through forestry methods such as improved propagating material, intensified reforestation practices and continued afforestation, as well as enhancing the carbon stock in forest soils by methods such as changes in silvicultural systems and setting aside of land in reserves and the like.
- Avoiding forestry methods which increase greenhouse gas emissions from forest soils, and in other respects adapting forestry to reduce the risk of future emissions as the climate changes.
- Increasing the amount of carbon stored in harvested wood products.
- Replacing fossil fuels with bioenergy, including from harvesting residues.
- Replacing energy-intensive materials with forest raw materials.

The first two types of measures are the ones that will primarily affect carbon sequestration in the LULUCF sector, while the last three could help to reduce emissions in other sectors. The effects of forestry measures on sequestration of carbon are presented as part of the background analysis commissioned by the Government for its 'roadmap towards a Sweden with no net climate emissions by 2050' (Swedish Environmental Protection Agency 2012a).

Policy, legislation and forest certification schemes

Forest policy

Swedish forest policy has two overarching, coequal objectives, relating to production and the environment. The environmental objective is as follows: The natural productive capacity of forest land should be preserved. Biodiversity and genetic variation in forests should be secured. Forests should be managed in a manner that enables plant and animal species occurring there naturally to survive in natural conditions and in viable populations. Threatened species and habitats should be protected. The cultural heritage assets of forests and their aesthetic and social values should be safeguarded. The production objective is: Forests and forest lands should be used effectively and responsibly so that they produce high, sustainable yields. The direction of forestry production should be towards giving a free hand with regard to what forests produce. Emphasis is placed in forest policy on the significance of forests for climate including the need for increased forest growth.

Government initiatives

As part of the 'Forest Kingdom' initiative, central government advice to the forestry sector has been stepped up, with a view to promoting effective and functional consideration for the environment and improved forest management. To implement this initiative, funding is being increased by SEK 10m per year over the period 2012–15 (Ministry of Finance 2011). The Swedish Forest Agency has mounted information campaigns on forestry and climate change with support from the Rural Development Programme: 'Forestry in a changed climate' and 'Forest owners and climate' (Swedish Forest Agency 2013a and 2013b). In addition, it is running a forest bioenergy project, also funded by the RDP (Swedish Forest Agency 2013c). This project aims to provide forest owners and professionals with knowledge that will enable greater use to be made of forests for bioenergy purposes.

Another strand to the Forest Kingdom initiative is a three-year programme to help achieve its goal of creating conditions for more jobs in the Swedish countryside. The programme seeks to support the development of sustainable forestry methods that will increase production, based on a systematic, iterative approach of active learning. These methods are to be developed in combination with effective and functional consideration for the environment. Examples of measures that may be analysed are tree species selection, use of improved planting material and genetic variation, thinning regimes, shortened rotation times, silvicultural systems other

than even-aged management, and fertilisation based on actual needs. In developing methods, the social values of forests are to be taken into account. To implement the programme, funding will be increased by a total of SEK 60m over the period 2013–15.

Legislation

The methods used in forestry are chiefly regulated by provisions in the Forestry Act and the Environmental Code. At present, there are no rules specifically designed to promote increased uptake of carbon dioxide. On the other hand, existing provisions do affect trends in carbon dioxide removals in various ways, in particular:

- Provisions on forest management etc. in the Forestry Act. Under this Act, new forest is required to be established after felling, for example, and abandoned farmland is to be afforested no later than the third year after it is taken out of production. These requirements are designed to ensure that full use is made of the timber-producing capacity of land, which is beneficial from a climate point of view as it promotes uptake of carbon dioxide by forest biomass and production of biomass as a substitute for fossil fuels and energy-intensive materials.
- Provisions on land drainage in the Environmental Code. In central parts of the southern Swedish highlands and north of the *limes norrlandicus* (the biogeographical boundary of northern Sweden), land drainage – defined as drainage with the aim of permanently increasing the suitability of a property for a certain purpose – may only be undertaken with a permit. In the rest of the country and on sites specially protected under the Ramsar Convention, such schemes are prohibited. Permit applications are considered by county administrative boards. Land drainage has declined since the early 1990s and now occurs on a very small scale.
- Conservation work (site protection, nature conservation agreements and voluntary set-aside of land). Such measures not only preserve biodiversity, but also mean that carbon stocks in forest biomass and soil carbon are maintained or continue to increase. Swedish forests used primarily for timber – timber production forests – have a relatively low average age and hence a large capacity to store carbon, even long after a conservation measure (such as nature reserve or habitat protection area designation, or a nature conservation agreement) has been implemented. Section 2.12 of the Sixth National Communication of Sweden includes information on forest land that has been set aside for biodiversity conservation. In addition, there are proposals to set aside further areas of forest, as mentioned above. There are also targets for the conservation and protection of areas containing both wetlands and forest land. Since such areas are usually excluded from felling, their stocks of carbon in biomass and soil will in most cases be larger than those of production forests. On the other hand, the possibility of producing timber and biomass as a substitute for other materials and as a source of biofuels – the substitution potential – will be lost.

The Government has previously emphasised that it is important now to analyse the scope for regulatory and other policy instruments that could be considered with a view to further enhancing the contribution of forestry to the cost-effective achievement of Swedish climate policy objectives. It was proposed that this analysis should include studies of possible incentives to increase sequestration of carbon in sinks, where appropriate, and to minimise greenhouse gas emissions from land. The measures contemplated were not to conflict with the production and environmental objectives of Swedish forestry. The Government is currently considering how this analysis should be undertaken. There are other instruments, too, which indirectly – by influencing demand for forest raw materials for energy supply and material substitution purposes – affect forestry practice and hence fluxes of greenhouse gases. Exempting biofuels from carbon dioxide and energy taxes has increased the profitability of biomass fuels from forests and been a major factor behind the emission reductions achieved, for example in the district heating sector. The electricity certificates system has rapidly increased the amount of renewable energy available, including forest biofuels for electricity generation.

Sectoral responsibility

Since the early 1990s, forest policy has built on landowners having considerable freedom to make their own decisions about the aims of their forestry and the operations they wish to undertake, at the same time as they have an important part to play in achieving forest policy objectives in the framework of their sectoral responsibility.

One component of this sectoral responsibility is the voluntary third-party certification schemes which most of Sweden's forest owners have joined. There are two such schemes, that of the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). Both are based on landowners undertaking to follow guidelines on sustainable forestry in managing their land. Swedish

legislation sets a common standard for all productive forest land in terms of consideration for the environment. Certification is designed to raise the bar even higher as regards the ecological, economic and social aspects of forestry, and includes provisions for the voluntary set-aside of forest land. Since many forest managers have signed up to certification schemes, the areas being set aside have also increased. As a rule, this land is set aside from any management activities, or managed with the primary purpose of promoting biodiversity.

As another result of sectoral responsibility, more than 1 million ha of land set aside voluntarily by the forestry sector – without compensation from the state. These set-aside areas may also represent a contribution to increasing uptake of carbon dioxide.

Swedish environmental objectives

In 2011, the Government decided to give the All Party Committee on Environmental Objectives an additional remit to propose a strategy for long-term sustainable land use, aimed at achieving the generational goal for the environment and the environmental quality objectives (Terms of reference 2011:91). An interim report was submitted in June 2013, concerning protection and management of sites and an enhanced level of environmental consideration in forestry. A final report is to be presented in June 2014. The interim report includes proposals on setting aside additional areas with biodiversity conservation as their primary purpose, and on ways of developing consideration for the environment in forestry. These proposals have been the subject of consultation and are currently being considered in the Government Offices.

Implementation of Articles 3.3 and 3.4 of the Kyoto Protocol

For the first commitment period of the Kyoto Protocol (2008–12), Sweden has decided that, in addition to mandatory accounting for greenhouse gas emissions and removals under Article 3.3, it will make use of forest management under Article 3.4 in calculating emissions and removals from LULUCF. Sweden follows the criteria for forest land deriving from the FAO definition and the IPCC's good practice guidance. The methodology and database used to calculate changes in carbon stocks are developed on an ongoing basis. Efforts in this area were for example reported by Sweden in its Fourth National Communication (Swedish Environmental Protection Agency 2006).

Under the Kyoto Protocol, the National Communication is to include information on national legislative or administrative procedures to ensure that implementation of Articles 3.3 and 3.4 also contributes to the conservation of biodiversity and sustainable use of natural resources. Sweden's current forest policy puts great emphasis on using forests sustainably as a natural resource and on conserving biodiversity. Under the Forestry Act, forests are to be managed and harvested in such a way as to contribute to sustainable forestry. The provisions of environmental legislation on nature reserves and habitat protection areas provide long-term formal protection for forest areas of high biological value, and the Forestry Act stipulates that forests must be managed using measures that meet good environmental standards. There has therefore been no need for supplementary legislation to conserve biodiversity and ensure sustainable use of natural resources as a consequence of implementation of Articles 3.3 and 3.4. Every year since 1990, Sweden has reported a net sink from land use (LULUCF) markedly in excess of the maximum net removal of 2.13 Mt that Sweden is allowed to claim credit for in the first commitment period of the Kyoto Protocol.

For the second commitment period of the Kyoto Protocol (2013–20), the rules on accounting for LULUCF removals and emissions have changed. During this period, accounting for forest management and changes in carbon stocks in harvested wood products will be mandatory, while certain other activities will be voluntary. The new rules on forest management also mean that changes in net emissions are to be accounted for against a reference level based on a business-as-usual projection, with Sweden allowed to claim a maximum credit of 2.5 Mt CO_2 per year in the second commitment period of the Protocol. Sweden has not decided whether additional voluntary activities under Article 3.4 will be included in its accounting for the second period.

3.9 Shipping and aviation, including international bunkers in Sweden

Emissions from domestic shipping and aviation are declining in Sweden, and together made up only 5% (around 1 Mt CO_2 eq) of total emissions from domestic transport in 2011. International shipping and aviation refuelling in Sweden are responsible for larger emissions than their domestic counterparts, with a total of about 8.3 Mt CO_2 eq in 2011 (6 Mt from shipping and 2.3 Mt from aviation). These emissions show a slight downward trend since Sweden's last National Communication. However, over a longer period, from 1990 – when emissions from international marine and aviation bunkers stood at 3.61 Mt CO_2 eq – there has been a substantial

rise. Marine bunkers show the steepest increase. Under the Kyoto Protocol, each party is to report on how it is working within the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO) to help achieve and/or implement decisions in those organisations to limit greenhouse gas emissions.

As from 1 January 2012, aviation is included in the EU ETS. The trading system covers flights and flight operators landing at or taking off from airports in the EU, regardless of the country of departure or final destination. In November 2012 the EU Commission decided to temporarily exempt flights to and from Europe, pending proposals from the ICAO for a global market-based measure to limit the climate impact of aviation. The suspension will only apply until the end of 2013 at the latest, however.

Within the ICAO, Sweden and the EU have been pressing for action to limit greenhouse gas emissions from aviation. At its session in September 2013, the ICAO Assembly decided to develop a global market-based measure, which is to be adopted in 2016 and take effect in 2020. Drafting of proposals on the design and operation of this measure will continue up to 2016 when the decision is taken.

Early in 2013, the ICAO's Committee on Aviation Environmental Protection (CAEP) agreed a metric system and measurement methodology to compare carbon dioxide emissions from different aircraft and to set emission limits. The CAEP has also adopted a new document setting out a carbon dioxide certification requirement for aircraft, drawn up under the joint leadership of the Swedish Transport Agency and the US Federal Aviation Administration. A new standard in Annex 16 of the Chicago Convention, which will also include limits on carbon dioxide emissions from new aircraft, is expected to be adopted by the CAEP at the beginning of 2016, with entry into force proposed for 31 December 2017.

In the IMO, Sweden has been one of the countries driving forward efforts to develop a number of technical and operational measures aimed at reducing greenhouse gas emissions. In 2011, several important decisions were taken in this area. An Energy Efficiency Design Index (EEDI) – a standardised way of describing the energy efficiency of ships – was made mandatory from 2013 for most (some 85% of) newly built vessels. The EEDI attained by a ship can be compared with a reference level based on an average for existing vessels, and ships for which contracts are placed after 2013 have to be at least as energy-efficient as this level. A mandatory Ship Energy Efficiency Management Plan (SEEMP) has also been introduced. This is to be used in ships' management systems, to improve the energy efficiency of both existing and new ships. In addition, a voluntary Energy Efficiency Operational Indicator (EEOI) has been introduced as a tool and benchmark. This can be used by existing ships. Sweden is also taking a lead in discussions within the IMO on the introduction of other mechanisms, market-based or operational, to reduce greenhouse gas emissions from international shipping. The country gives priority, moreover, to IMO efforts to limit nitrogen oxide and sulphur emissions. Such measures also have benefits from a climate point of view.

3.10 Estimates of emission reductions and removals from LULUCF

This section incorporates the information asked for in paragraph 9 in Annex 1 of 2/CP.17.

3.10.1 The LULUCF sector under the Climate Change Convention

Sweden will not account for LULUCF under the Climate Change Convention, but will do so under the Kyoto Protocol. In Sweden, land use, land-use change and forestry is an important sector, and the dominant land category is forest land. In 2011, total greenhouse gas emissions amounted to 61.4 Mt CO_2 eq, while overall net removals from the LULUCF sector came to 35.2 Mt CO_2 eq and net removals from forest land were 39.3 Mt CO_2 eq.

Table 3.4 **Sector 5 LULUCF contributions to total national emissions**

Year	Total GHG emissions, excluding LULUCF sector, Mt CO_2 eq	Total GHG emissions, including LULUCF sector, Mt CO_2 eq	Total net removals in LULUCF sector, Mt CO_2 eq	Total net removals in LULUCF sector, as % of total GHG emissions	Total net removals from forest land, Mt CO_2 eq	Total net removals from forest land, as % of total GHG emissions
1990	72.8	35.6	–37.2	51.1	40.6	55.8
2010	65.5	34.8	–30.7	46.9	35.7	54.5
2011	61.4	26.2	–35.2	57.3	39.3	64.0

The figures in the table above are obtained from the annual inventory with CRF tables, submitted by Sweden in April 2013.

3.10.2 LULUCF under the Kyoto Protocol

For the first commitment period of the Kyoto Protocol, Sweden will account for Article 3.3 afforestation, reforestation and deforestation, as these are mandatory activities. Under Article 3.4, Sweden has elected to account for forest management. Sweden has chosen 'commitment period accounting'. Details of our commitment can be found in the Swedish Initial Report for the first commitment period.

Since Sweden has chosen to account for the entire commitment period, the complete figures will only be ready when reviewed inventory data are available for the period as a whole, in the 'true-up' period in 2015. In CTF Table 4aII, our figures so far are presented.

3.10.3 Use of units from the market-based mechanisms and land use, land-use change and forestry activities

The use of units from market-based mechanisms and land use, land-use change and forestry (LULUCF) activities from 2008 to 2012 count towards achievement of the Kyoto Protocol targets for the first commitment period (CP1).

Final data on surrendered units are only available for the EU ETS for these years, and are included in CTF Table 4b.

Final CP1 compliance actions for sectors not covered by the EU ETS will take place when reviewed inventory data are available for the entire period, in the 'true-up' period in 2015. As a result, data on the final use of flexible mechanisms and LULUCF are not available for the 1st Biennial Report.

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4 Projections

4.1 Introduction

This chapter presents projections of greenhouse gas emissions for different scenarios. The information provided here conforms to that submitted under Council Decision No 280/2004/EC the EU Monitoring Mechanism Decision and in the Sixth National Communication of Sweden.

Key parameters and assumptions and the scenarios are reported in CTF Tables 5 and 6. The suggested sector breakdown in the CTF table with corresponding CRF codes is as follows:

- Energy: CRF 1A1, 1A2, 1A4, 1A5 and 1B
- Transport: CRF 1A3b–e
- Industry/Industrial processes: CRF 2–3
- Agriculture: CRF 4
- Waste: CRF 6
- LULUCF: CRF 5
- Aviation: CRF 1A3a

4.1.1 Scenarios

Projections of greenhouse gas emissions in Sweden have been developed for the years 2015, 2020, 2025 and 2030. They are based on the policies and measures approved by the Riksdag (the Swedish Parliament) up to 2012, which means that they are projections 'with existing measures'. One scenario including planned instruments, i.e. 'with additional measures', is also reported. In producing the projections, model-based estimates and to some extent expert assessments are used. The projections build on a number of assumptions, all of which are subject to uncertainty. The method used to calculate the projections is primarily designed with a medium- or long-term projection in mind, which means that no account is taken of short-term variations.

4.1.2 Key parameters and assumptions

The key parameters and assumptions used in the scenarios are shown in Table 4.1.

Table 4.1 **Key parameters and assumptions used in scenarios.**

	NC6	
	2010–2020	2020–2030
GDP (annual change, %)	2.4	1.9
	2020	**2030**
Price of crude oil (US$/barrel)	112	128
Price of coal (US$/tonne)	104	110
Price of natural gas (US$/Mbtu)	10	12
Emissions trading (€/tonne CO2)	16.5	36
Electricity certificates (new renewable electricity)	25 TWh by 2020	
Nuclear power (economic life)	60 years	

4.2 Projections

4.2.1 Total GHG emission projections

Total greenhouse gas emissions in Sweden in 2011 came to 61.4 million tonnes of carbon dioxide equivalent (Mt CO_2 eq), excluding LULUCF. Total emissions decreased by 11.3 Mt CO_2 eq, or 16%, between 1990 and 2011. According to the projections, total emissions of greenhouse gases (excluding LULUCF) are expected to be 59.2 Mt CO_2 eq in 2020 and 57.3 Mt CO_2 eq in 2030 (see Fig. 4.1 and Table 4.2). By 2020, emissions are projected to be almost 19% lower than in 1990. After 2020, emissions will continue to slowly decrease, and by 2030 total emissions of greenhouse gases are expected to be about 21% below 1990 levels.

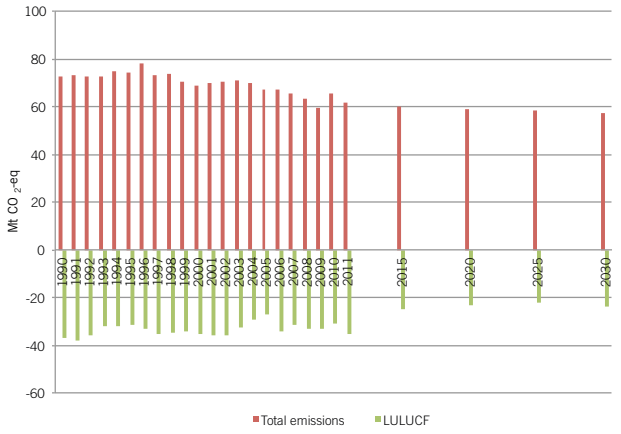

Figure 4.1 **Historic emissions of greenhouse gases 1990–2011, projected emissions up to 2030 and removals of greenhouse gases in the LULUCF sector, presented separately (million tonnes of CO_2 equivalent).**

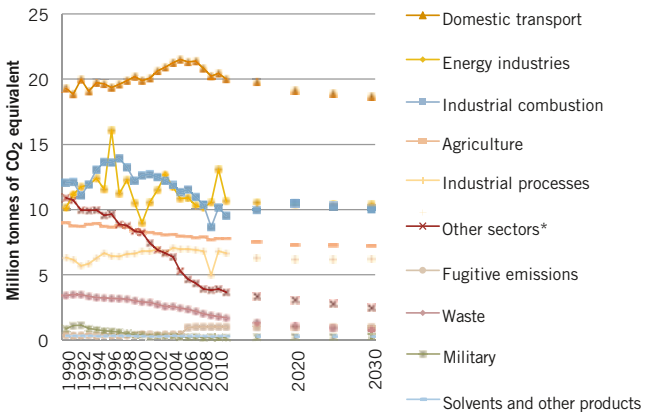

Figure 4.2 **Historic emissions of greenhouse gases 1990–2011 and projected emissions up to 2030, by sector.**

4.2.1.1 AGGREGATE GHG EMISSION PROJECTIONS BY SECTOR

The emissions projection is based on many different assumptions, and trends in greenhouse gas emissions differ between sectors. Drivers of emission trends in some sectors include economic growth, prices, population growth and policy instruments. Over the period 2011–30, emissions from domestic transport, for example, are expected to decrease, while those from the energy industries remain unchanged. Emissions from industrial combustion are projected to rise somewhat up to 2020, before showing a modest fall. Emissions in the remaining sectors decrease slightly over the period of the projection (see Fig. 4.2).

4.2.1.2 AGGREGATE GHG EMISSION PROJECTIONS BY GAS

For the year 2011, 79% of greenhouse gas emissions represent carbon dioxide emissions, while methane emissions account for 8%, nitrous oxide for almost 11% and fluorinated greenhouse gases for almost 2%.

Over the projection period, emissions of all gases decrease, but the share of carbon dioxide emissions is projected to increase somewhat, to about 82% in 2020. The contributions of other greenhouse gases to total emissions are expected to decrease. See Table 4.3 for trends in emissions of the different greenhouse gases.

Table 4.2 **Historic emissions of greenhouse gases 1990–2011 and projected emissions 2011–2030, by sector (million tonnes of CO_2 equivalent)**

	CRF code	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Energy excl. transport	1A1, 1A2, 1A4, 1B	34.4	25.0	25.0	25.2	24.7	24.2	–27%	–30%
Transport	1A3	19.3	20.0	19.8	19.1	18.9	18.7	–1%	–3%
Industrial processes	2	6.3	6.7	6.3	6.2	6.2	6.2	–2%	–2%
Solvents	3	0.3	0.3	0.3	0.3	0.3	0.3	–6%	–11%
Agriculture	4	9.0	7.8	7.5	7.3	7.3	7.2	–19%	–20%
Waste	6	3.4	1.7	1.3	1.1	0.9	0.8	–69%	–77%
Total emissions		**72.8**	**61.4**	**603**	**59.2**	**58.2**	**57.3**	**–19%**	**–21%**
LULUCF	5	–37.2	–35.2	–24.9	–23.0	–21.9	–23.9	–38%	–36%

Table 4.3 **Historic and projected total greenhouse gas emissions, excl. LULUCF, by gas (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	57.0	48.7	48.6	48.3	47.6	47.0	–15%	–18%
Methane	6.9	5.0	4.4	4.0	3.8	3.7	–42%	–47%
Nitrous oxide	8.4	6.7	6.5	6.4	6.3	6.3	–24%	–24%
Fluorinated greenhouse gases	0.5	1.1	0.7	0.5	0.4	0.3	–2%	–35%
Total emissions (excl. LULUCF)	**72.8**	**61.4**	**60.3**	**59.2**	**58.2**	**57.3**	**–19%**	**–21%**

4.2.2 GHG emission projections by sector

4.2.2.1 ENERGY INDUSTRIES

Emissions from the energy industries, i.e. production of electricity and district heating, refineries and the manufacture of solid fuels, are projected to show differing trends in each of the subsectors, but to remain at the same overall level throughout the projection period. This is due to a slight decrease in emissions from electricity generation and district heating, combined with a significant rise in refinery emissions. Emissions from the manufacture of solid fuels remain at roughly the same level over the projection horizon. The biggest increase is expected in emissions of methane (see Table 4.4).

Table 4.4 **Historic and projected greenhouse gas emissions from the energy industries (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	9.8	10.1	10.0	9.9	9.9	9.9	1%	1%
Methane	0.02	0.09	0.10	0.08	0.08	0.09	271%	286%
Nitrous oxide	0.3	0.4	0.4	0.4	0.4	0.4	24%	27%
Total emissions	**10.1**	**10.7**	**10.5**	**10.4**	**10.4**	**10.4**	**2%**	**3%**

Production of electricity and district heating

Greenhouse gas emissions from the generation of electricity and district heating are projected to fall slightly from 2011 to 2030 (see Table 4.5). This is despite an increase early in the projection period in the production of electricity in particular, but also of district heat. The reduction in emissions, despite higher production, is due to a partial change in the fuel mix. Increased use of natural gas, fuels from the iron and steel industry and, to some extent, waste will add to emissions, but this will be offset by greater use of biofuels and wind power and a decline in the use of oil, coal and peat. Biofuel use is expected to rise above all at combined heat and power plants, a trend favoured by both the electricity certificates scheme and the EU Emissions Trading System. Between 2012 and 2020, production of electricity is assumed to grow more than consumption, resulting in a projected net export of around 23 TWh by 2020.

Table 4.5 **Historic and projected greenhouse gas emissions from the production of electricity and district heating (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	7.7	7.8	7.5	7.2	7.1	7.0	–5%	–17%
Methane	0.02	0.09	0.08	0.07	0.07	0.07	–7%	–19%
Nitrous oxide	0.3	0.4	0.4	0.4	0.4	0.4	232%	195%
Total emissions	**8.0**	**8.3**	**8.0**	**7.6**	**7.5**	**7.4**	**–5%**	**–17%**
Electricity production (TWh)	142	147	160	174	175	175	23%	23%
District heating production (TWh)	41	56	57	59	58	57	42%	38%

Table 4.6 **Historic and projected greenhouse gas emissions from refineries (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	1.8	2.0	2.2	2.4	2.5	2.6	34%	45%
Methane	0.001	0.001	0.001	0.001	0.001	0.001	29%	39%
Nitrous oxide	0.02	0.02	0.02	0.03	0.03	0.03	25%	35%
Total emissions	**1.8**	**2.0**	**2.2**	**2.4**	**2.5**	**2.6**	**34%**	**45%**

Refineries

Refinery emissions are expected to rise appreciably throughout the projection period (see Table 4.6). This is due partly to assumed growth in production, and partly to increased emissions from refining of products meeting higher quality standards. Emissions from refineries are also reported in the fugitive emissions sector.

Manufacture of solid fuels

Greenhouse gas emissions from the manufacture of solid fuels are projected to remain at the same level as in the last few years, around 0.3 Mt CO_2 eq, up to 2030.

4.2.2.2 INDUSTRIAL EMISSIONS

To cover industrial emissions, account needs to be taken of both process emissions and emissions from fuel combustion in industry, which according to UNFCCC guidelines are to be reported under separate CRF (Common Reporting Format) categories. Greenhouse gas emissions from industrial processes originate from the materials used in the processes, and make up 30–40% of total emissions from industry. Emissions from industrial combustion of fossil fuels account for the remainder.

Combustion emissions from industry vary from year to year, chiefly depending on production volumes and fluctuations in the economy. A small number of energy-intensive industries are responsible for a large share of emissions in this sector. Iron and steel, pulp and paper and chemicals together account for almost half the sector's emissions.

Total energy use in industry is expected to rise between 2011 and 2030, mainly as a result of assumed growth in production. Industrial combustion emissions, on the other hand, are projected to fall (see Table 4.7). This assessment is based above all on an expected reduction in emissions from the pulp and paper industry, driven by a shift from fossil fuels to greater use of biofuels. Emissions from the chemicals, non-ferrous metals, engineering, mineral products and food industries are also expected to show a slight decline. Mining and iron and steel industry emissions, by contrast, are projected to increase somewhat.

Table 4.7 **Historic and projected greenhouse gas emissions from industrial combustion (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	11.5	9.0	9.4	10.0	9.7	9.5	–13%	–17%
Methane	0.05	0.05	0.05	0.04	0.04	0.05	–5%	–1%
Nitrous oxide	0.5	0.5	0.5	0.5	0.5	0.5	–4%	–6%
Total emissions	**12.1**	**9.5**	**10.0**	**10.5**	**10.3**	**10.0**	**–13%**	**–17%**
Energy use (TWh)	140	144	158	171	175	178	22 %	27%

Table 4.8 **Historic and projected emissions from industrial processes (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	4.9	5.5	5.4	5.6	5.6	5.7	13%	16%
Methane	0.01	0.01	0.02	0.02	0.02	0.02	19%	25%
Nitrous oxide	0.9	0.1	0.1	0.1	0.1	0.2	–84%	–83%
Fluorinated greenhouse gases	0.5	1.1	0.7	0.5	0.4	0.3	–2%	–35%
Total emissions	**6.3**	**6.7**	**6.3**	**6.2**	**6.2**	**6.2**	**–2%**	**–2%**

Process-related emissions of carbon dioxide, methane and nitrous oxide are expected to increase somewhat, in total, over the projection horizon. Emissions of fluorinated greenhouse gases showed a rising trend over the period 1990–2008, but have since fallen, a decline that is expected to continue from 2011 to 2020 and 2030. This decrease is due above all to the bans that will progressively come into effect in the EU for several areas of use of fluorinated greenhouse gases. The net effect on process emissions from industry is a slight decline up to 2030 (see Table 4.8).

4.2.2.3 OTHER SECTORS

Emissions from 'Other sectors', i.e. fuel combustion in the commercial and institutional, residential, and agriculture, forestry and fisheries sectors, fell sharply from 1990 to 2011 and are expected to continue to decrease somewhat up to 2020 and 2030 (see Table 4.9). The decline is primarily due to heat pumps, biofuels and district heating replacing the use of oil for space and water heating in homes and premises.

Emissions from energy use in agriculture are projected to fall between 2011 and 2020, owing to reduced consumption of diesel for mobile machinery and of oil for greenhouses and other agricultural buildings. Emissions from forestry machinery are expected to remain level over the projection period.

4.2.2.4 MILITARY

Emissions from military transport decreased between 1990 and 2011. Over the projection period, they are expected to remain at roughly the same level as in the last few years, between 0.2 and 0.3 Mt CO_2 eq (see Table 4.10).

4.2.2.5 FUGITIVE EMISSIONS

The majority of emissions in this sector originate from refineries. Fugitive emissions are expected to remain at roughly the same level over the projection horizon, i.e. around 1.0 Mt CO_2 eq (see Table 4.11).

Table 4.9 **Historic and projected emissions from 'Other sectors' (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	10.4	3.1	2.9	2.6	2.3	2.1	–75%	–80%
Methane	0.24	0.31	0.25	0.25	0.22	0.21	2%	–15%
Nitrous oxide	0.29	0.27	0.24	0.23	0.22	0.21	–20%	–27%
Totalemissions	**10.9**	**3.7**	**3.3**	**3.1**	**2.8**	**2.5**	**–72%**	**–77%**

Table 4.10 **Historic and projected greenhouse gas emissions from military transport (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	0.8	0.2	0.2	0.2	0.2	0.2	–71%	–71%
Methane	0.001	0.00004	0.0002	0.0002	0.0002	0.0002	–81%	–81%
Nitrous oxide	0.02	0.002	0.005	0.005	0.005	0.005	–68%	–68%
Total emissions	**0.9**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**–71%**	**–71%**

Table 4.11 **Historic and projected fugitive emissions of greenhouse gases (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	0.3	0.9	0.9	0.9	0.9	0.9	189%	189%
Methane	0.08	0.1	0.1	0.1	0.1	0.1	25%	25%
Nitrous oxide	0.001	0.004	0.004	0.004	0.004	0.004	192%	192%
Total emissions	**0.4**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**157%**	**157%**

Table 4.12 **Historic and projected emissions from domestic transport (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	18.9	19.8	19.6	18.9	18.7	18.4	0.1%	–3%
Methane	0.2	0.05	0.03	0.02	0.02	0.01	–90%	–90%
Nitrous oxide	0.2	0.2	0.2	0.2	0.2	0.2	–7%	9%
Total emissions	**19.3**	**20.0**	**19.8**	**19.13**	**18.90**	**18.66**	**–1%**	**–3%**
Petrol (TWh)	49.8	34.5	30.3	23.2	20.2	17.2	–53%	–65%
Diesel (TWh)	16.5	36.2	39.6	43.7	45.8	47.9	165%	191%

4.2.2.6 TRANSPORT

Emissions in the transport sector had increased in 2011 compared with 1990. Since 2005, however, there has been a slight downward trend. This decline is expected to slow down, but according to the projection will continue up to 2030 (see Table 4.12).

The majority of emissions come from cars and heavy-duty vehicles. The projected decline in emissions between 2011 and 2020 is due chiefly to reduced use of petrol and switching to diesel and to more energy-efficient vehicles. A modest shift to biofuels will also contribute to the downward trend.

Emissions from domestic aviation have fallen in recent years, with a growing proportion of passengers switching from shorter-haul flights to rail. This trend is expected to continue, resulting in lower emissions in 2020 and 2030. Emissions from domestic shipping are likewise projected to decline up to 2020 and 2030. Rail traffic is expected to increase up to 2020 and 2030, but emissions are not projected to rise as most rail services are electrified. See Table 4.13.

4.2.2.7 SOLVENT AND OTHER PRODUCT USE

Greenhouse gas emissions from the use of solvents and other products fell somewhat between 1990 and 2011. In 2020 and 2030, emissions are projected to remain at roughly the same level as in the last few years, just under 0.3 Mt CO_2 eq (see Table 4.14).

4.2.2.8 WASTE

Emissions of methane from landfill sites have fallen since 1990 owing to a decrease in the quantities of waste going to landfill, driven in part by the bans on landfill disposal, municipal waste plans and the waste tax. A further reduction in emissions has been achieved by methane recovery. The downward trend is projected to continue up to 2020 and 2030 (see Table 4.15), thanks to recovery of methane and a further decline in the amount of waste sent to landfill.

Emissions of carbon dioxide from incineration of hazardous waste and of nitrous oxide from wastewater treatment are low and are expected to remain at the same level as in 2011 over the projection horizon.

Table 4.13 **Historic and projected greenhouse gas emissions from different modes of transport (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Road	17.6	18.6	18.4	17.7	17.4	17.2	0%	–2%
Aviation	0.7	0.5	0.6	0.6	0.6	0.6	–8%	–13%
Shipping	0.6	0.5	0.5	0.5	0.5	0.5	–18%	–18%
Rail	0.1	0.07	0.07	0.07	0.07	0.07	–35%	–35%
Other*	0.3	0.3	0.3	0.3	0.3	0.3	8%	8%

* includes mobile machinery not used in industry, agriculture, forestry or households

Table 4.14 **Historic and projected greenhouse gas emissions from solvent and other product use (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Carbon dioxide	0.24	0.16	0.16	0.16	0.15	0.15	–35%	–38%
Nitrous oxide	0.090	0.13	0.13	0.13	0.13	0.13	39%	39%
Total emissions	**0.33**	**0.29**	**0.29**	**0.28**	**0.28**	**0.28**	**–15%**	**–17%**

Table 4.15 **Historic and projected greenhouse gas emissions from the waste sector (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2025	1990–2020	1990–2030
Carbon dioxide	0.04	0.06	0.05	0.05	0.05	0.05	25%	25%
Methane	3.2	1.5	1.1	0.8	0.7	0.6	–74%	–82%
Nitrous oxide	0.2	0.2	0.2	0.2	0.2	0.2	–22%	–22%
Total emissions	**3.4**	**1.7**	**1.3**	**1.1**	**0.9**	**0.8**	**–69%**	**–77%**

4.2.2.9 AGRICULTURE

Emissions from the agricultural sector have fallen since 1990, and the decline is projected to continue up to 2020 (see Table 4.16). Nitrous oxide accounts for a somewhat larger percentage reduction than methane, but also for a greater share of emissions.

The decrease is largely due to reduced numbers of cattle, leading to lower emissions of methane from enteric fermentation and of methane and nitrous oxide from animal manure. Nitrous oxide emissions are also expected to fall as a consequence of a smaller area under cereals, declining use of mineral fertilisers, reduced leaching of nitrogen, and a shift to slurry systems for manure management (see Table 4.17).

A smaller dairy herd and continued decline in the cereal area up to 2020 and 2030 will be a result of increased productivity, with production maintained at the same level in 2030 as today. The scenario also takes account of trends in agricultural prices and further adjustment to the latest reform of EU farm policy from 2005, with its decoupling of support from production.

4.2.2.10 LAND USE, LAND-USE CHANGE AND FORESTRY

From 1990 to 2011, the land use, land-use change and forestry (LULUCF) sector represented an annual net sink for Sweden. The size of this sink varied over the period, but the trend indicates a slight decline in removals attributable to the sector.

Net removals from LULUCF are primarily dependent on the uptake of carbon dioxide in living forest biomass, which is in turn affected by felling and forest growth. The projection is based on a long-term sustainable scenario with maximum annual felling in relation to annual growth, i.e. with no overfelling. In addition, harvesting of forest residues is assumed to increase in response to growing demand for bioenergy. Growth is assumed to rise by 2% annually from 2010 to 2020 and by 4 % annually from 2020 to 2030, as a result of assumed changes in climate. With these scenario assumptions, the projection shows a decrease in the net sink up to 2025, followed by an increase up to 2030 (see Table 4.18).

Table 4.16 **Historic and projected emissions from the agricultural sector (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Methane	3.2	2.9	2.8	2.7	2.7	2.7	–15%	–15%
Nitrous oxide	5.8	4.9	4.7	4.6	4.6	4.5	–21%	–22%
Total emissions	**9.0**	**7.8**	**7.5**	**7.3**	**7.3**	**7.2**	**–19%**	**–20%**

Table 4.17 **Historic and projected emissions from the agricultural sector, broken down into enteric fermentation, manure management and agricultural soils (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020
Enteric fermentation	3.0	2.6	2.5	2.4	2.4	2.4	–18%
Manure management	1.0	0.7	0.7	0.7	0.7	0.7	–27%
Agricultural soils	5.1	4.4	4.3	4.2	4.1	4.1	–18%
Total emissions	**9.0**	**7.8**	**7.5**	**7.3**	**7.3**	**7.2**	**–19%**

Table 4.18 **Historic and projected emissions and removals from LULUCF (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Forest land	–40.5	–39.3	–29.5	–27.4	–26.3	–28.3	–32%	–30%
Cropland	2.4	1.3	2.0	1.8	1.8	1.8	–28%	–28%
Grassland	–0.3	0.001	–0.07	–0.06	–0.06	–0.06	–80%	–81%
Wetlands	0.04	0.05	0.05	0.05	0.05	0.05	37%	37%
Settlements	1.2	2.7	2.6	2.6	2.6	2.6	122%	122%
Total emissions	**–37.2**	**–35.2**	**–24.9**	**–23.0**	**–21.9**	**–23.9**	**–38%**	**–36%**

Table 4.19 **Historic and projected emissions from international transport (million tonnes of CO_2 equivalent)**

	1990	2011	2015	2020	2025	2030	1990–2020	1990–2030
Shipping	2.3	6.0	7.6	7.8	7.8	7.8	242%	245%
Aviation	1.4	2.3	2.3	2.4	2.5	2.6	76%	93%
Total emissions	**3.6**	**8.3**	**9.9**	**10.1**	**10.3**	**10.4**	**180%**	**188%**

4.2.2.11 INTERNATIONAL BUNKERS

Total greenhouse gas emissions from international shipping and aviation – international bunkers – increased between 1990 and 2011 and are projected to go on rising up to 2020, though not at the same rate as before (see Table 4.19). The increase in emissions up to 2020 is primarily due to rising emissions from international shipping, driven by growth in exports of goods.

Greenhouse gas emissions from international aviation are also projected to increase up to 2020. This can be attributed to an expected rise in private consumption, which will be accompanied by increased travel.

4.3 Changes in projection methodologies

The projection presented in Sweden's Fifth National Communication on Climate Change (NC5) showed reductions in total greenhouse gas emissions of 10% between 1990 and 2010 and 12% between 1990 and 2020. The projection set out here, in the Sixth National Communication (NC6), uses partly different assumptions and assessments, based on trends over the last few years (see Table 4.20). The new projection shows a decrease in aggregate greenhouse gas emissions of 19% between 1990 and 2020 and of 21% between 1990 and 2030. A comparison of percentage changes in emissions between 1990 and 2020, overall and by sector, is shown in Fig. 4.3.

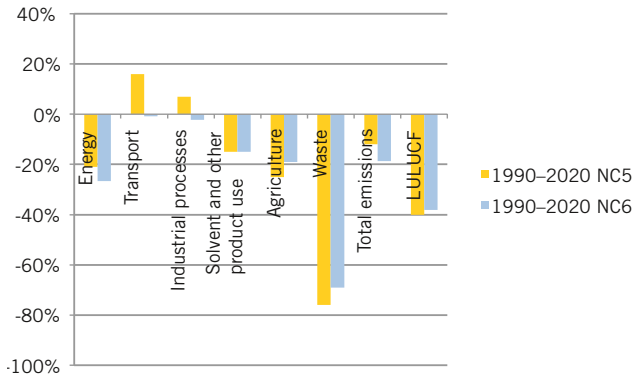

Figure 4.3 **Percentage changes in emissions between 1990 and 2020 as projected in NC5 and NC6, overall and by sector.**

The projection presented here for the energy sector, excluding transport, indicates a larger reduction of emissions by 2020 compared with that in NC5. The difference is mainly due to differing assumptions, for instance regarding fossil fuel prices and electricity certificates.

For transport, the new projection shows a small decrease in emissions up to 2020, compared with a relatively large increase as projected in NC5. The difference between the two projections is above all a result of assumptions of greater improvements in energy efficiency and higher fossil fuel prices in NC6 than in NC5.

Table 4.20 **Key assumptions for projections in the Fifth and Sixth National Communications (NC5 and NC6).**

	NC5		NC6	
	2005–2010	2010–2020	2010–2020	2020–2030
GDP (annual change, %)	2.6	2.1	2.4	1.9
	2010	**2020**	**2020**	**2030**
Price of crude oil (US$/barrel)	90	90	112	128
Price of coal (US$/tonne)	96	96	104	110
Price of natural gas (US$/Mbtu)	9.2	9.2	10	12
Emissions trading (€/tonne CO_2)	30	30	16.5	36
Electricity certificates (new renewable electricity)	17 TWh by 2016		25 TWh by 2020	
Nuclear power (economic life)	60 years		60 years	

The projection for industrial processes shows a fall in emissions by 2020, compared with a rise in NC5. The difference is partly due to different assumptions and assessments in the new projection, based on developments in recent years.

For agriculture, the projection indicates a smaller reduction of emissions up to 2020. This is because a new projection has been developed, with new assumptions regarding trends in production, productivity and other factors.

For the waste sector, a somewhat smaller decline in emissions is projected for 2020. The difference is due to a new projection having been developed, based on new assumptions.

Emissions from solvent and other product use decrease to the same extent in the projection for NC6 as in that for NC5.

The projection for the land use, land-use change and forestry sector shows a somewhat smaller net sink compared with NC5. The difference is partly attributable to a revision of the time series of greenhouse gas emissions and removals and the development of a new projection.

5 Provision of financial, technological and capacity-building support to developing countries

5.1 Governing policies and principles

5.1.1 Sweden's policy for global development

The policy for global development was adopted by the Riksdag (the Swedish Parliament) in 2003. Its adoption was preceded by the work of a parliamentary committee, which was given a broad mandate to examine how such a policy should be designed. The committee concluded that Sweden's contribution to global development and poverty reduction could not be limited to development cooperation alone. The overarching objective of the policy for global development – to contribute to achieving equitable and sustainable global development – therefore applies to all policy areas. Two perspectives permeate all parts of the policy: a rights perspective, based on international human rights conventions, and the perspectives of the poor.

In 2008 a new Government Communication on Sweden's Policy for Global Development was submitted to the Riksdag. In it, the Government identified key challenges in attaining equitable and sustainable global development, where Sweden is in a position to make an effective contribution. Climate change and environmental impact were one of the six key challenges identified.

5.1.2 Policy for environmental and climate issues in development cooperation

In 2010 the Swedish Government adopted a specific policy for environmental and climate issues in development cooperation. This policy establishes fundamental principles and sets out the Government's general position regarding environmental and climate issues within development cooperation. The overarching objective is to achieve a better environment, sustainable use of natural resources, stronger resilience to environmental impact and climate change in developing countries, and limited climate impact. Under the policy, Sweden is to focus its efforts on the following areas in particular:

- Strengthened institutional capacity in public administration
- Improved food security and sustainable use of ecosystem services
- Improved water resources management, greater access to safe water and basic sanitation
- Increased access to sustainable energy sources
- Sustainable urban development

The policy establishes that environmental and climate aspects are a central basis for all development cooperation, and that cooperation is to be based on partner countries' own plans and strategies.

5.1.3 Paris Declaration, Accra Agenda and Busan Partnership

The principles contained in the Paris Declaration of 2005, the Accra Agenda of 2008 and the Busan Partnership of 2011 are of key significance to Swedish development cooperation. National ownership is key to securing long-term sustainability of climate change-related initiatives, and external actors should seek to improve coordination and alignment to the national systems/processes of developing countries, so as to ensure transparency and mutual accountability.

5.1.4 New and additional financial resources

According to the UN Framework Convention on Climate Change, 'The developed country Parties ... shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations'. 'New and additional resources' is a term used in many multilateral contexts. There is currently no international agreement on how it should be defined. One common definition, supported by many countries, is that climate financing should be additional to the international development aid goal of

0.7% of gross national income (GNI). According to this definition, Sweden's climate finance could be viewed as new and additional, since the country's development cooperation has for many years exceeded the 0.7% target. Sweden has, since 2006, provided 1% of GNI in international development aid. Figures for total Swedish ODA are shown in Table 5.1. All exchange rates used in this report are based on the annual average dollar exchange rates for OECD Development Assistance Committee (DAC) members. For Sweden, this means US$ 1 = SEK 6.4892 (2011) and SEK 6.7689 (2012).

Table 5.1 **Total Swedish official development assistance in SEK million and US$ million, 2011–2012.**

2011	2012
SEK 36 380 million	SEK 35 483 million
US$ 5 606 million	US$ 5 242 million

5.2 The Swedish Government's Special Climate Change Initiative

In 2008 the Swedish Government launched a Special Climate Change Initiative for the period 2009–12, providing a total of about SEK 4 billion for multilateral and bilateral climate change initiatives within the framework of development cooperation.

Around two-thirds of funding for the Climate Change Initiative, SEK 2.9bn, was channelled through multilateral organisations by the Ministry for Foreign Affairs. These efforts focused on both mitigation and adaptation, and the money was disbursed to multilateral climate funds and initiatives such as the Adaptation Fund, the Least Developed Countries Fund, the Climate Investment Funds and the United Nations Office for Disaster Risk Reduction (UNISDR).

Around a third of the funding, SEK 1.15bn, was channelled through the Swedish International Development Cooperation Agency (Sida) to bilateral and regional initiatives. Here, the focus was on adaptation measures and on the existing partner countries Burkina Faso, Mali, Bangladesh, Cambodia and Bolivia, which are exposed to a high climate risk combined with high vulnerability. In addition, support was provided for regional cooperation in Africa and in Asia. The total funding outcome for the period 2009–12 was SEK 1.12bn, and the remaining amounts were disbursed during 2013.

The Climate Change Initiative formed part of Sweden's contribution to 'fast-start finance', a collective commitment made by developed countries at COP 15 in Copenhagen in 2009. The total Swedish fast-start contribution amounted to more than SEK 8bn for 2010–12, making Sweden one of the largest per capita contributors to the fast-start finance initiative.

Examples of contributions under the Special Climate Change Initiative:

- The Adaptation Fund finances projects and programmes to help developing countries adapt to the adverse effects of climate change. Sweden is one of the largest donors and the only country to have contributed an annual US$ 100m since the fund became operational in 2010.
- The LDCF was established to address the special needs of least developed countries by financing the preparation and implementation of National Adaptation Programmes of Action (NAPAs). Sweden is one of the largest donor countries to the fund.
- Support to Mangroves for the Future in several countries in South-East Asia has contributed to the rehabilitation of large areas of mangrove forest. It has also helped to raise awareness about the importance of mangroves and led to improved coastal zone management involving local fishing communities.
- Support to the Water Reservoir Programme in Burkina Faso has reduced the vulnerability of small dams affected by climate change. The programme has contributed to improved food security for more than 1,000 people living in poverty by securing 24 million cubic metres of water for food production. Irrigated plots have been distributed and production of vegetables for the local market has started. A guide for climate integration in the construction of dams has also been produced, and awareness among different stakeholders has been raised.
- Support to the African Union has contributed to the establishment of African Risk Capacity, a specialised agency for sovereign disaster risk solutions. It is a first step towards establishing an innovative African insurance solution for natural disasters and weather events, which aims to improve food security in Africa and decrease dependence on international humanitarian assistance.
- Support to Programa de Desarrollo Agropecuario Sustentable in Bolivia has increased farmers' resilience to climate change through soil conservation, more efficient use of water, access to irrigation and new crops. Diversification of production has also increased household incomes.
- In Mali, support to the International Union for Conservation of Nature has reinforced the restoration and sustainable management of natural resources in nine municipalities in the inner delta of the Niger River. The project has increased productive land areas, constructed a database on the hydrological system, and improved women's and communities' capacities to adapt to climate change, including through awareness creation, tree planting and income diversification.

5.3 Multilateral financial support

Nearly half of Swedish development cooperation is allocated to international multilateral development bodies and funds.

Sweden provides assistance to the financial mechanism of the UN Framework Convention on Climate Change (UNFCCC), as well as through a variety of other multilateral financing channels.

Table 5.2 shows Sweden's payments to the Global Environment Facility (GEF) Trust Fund for the period 2011–12. This data is also included in CTF Table 7a. The GEF is the financial mechanism for a number of important environmental conventions, including the Convention on Climate Change. For the fifth replenishment, negotiations on which were completed in 2010, Sweden contributed a total of SEK 1,045m. In addition to the share decided, Sweden undertook a voluntary contribution of SEK 265m. About 30% of total GEF funding is allocated to climate-related projects.

Table 5.2 **Disbursed financial contributions to the Global Environment Facility (GEF).**

	2011	2012
US$ million	39.3	30.2

Furthermore, the Swedish Government contributes to a number of programmes and funds outlined in Table 5.3. This data is also included in CTF Table 7a. Several of these funds and programmes were also covered by the Swedish Special Climate Change Initiative 2009–12. During the period of the initiative, a total of almost US$ 3bn was channelled through multilateral initiatives designed to support adaptation and mitigation in developing countries.

During 2011–12, Sweden contributed SEK 315m to the Least Developed Countries Fund (LDCF), for example, with a focus on adaptation to climate change. Furthermore, with an annual contribution of SEK 100m, starting in 2010, Sweden is among the largest contributors to the Adaptation Fund. SEK 5m was also allocated for administrative costs during the start-up of the Green Climate Fund (GCF) in 2012. The GCF is expected to become a central actor in the future climate change finance architecture.

Sweden also contributed a total of SEK 370m to the World Bank's Climate Investment Funds (CIFs): SEK 100m to the Clean Technology Fund (CTF), SEK 170m to the Scaling Up Renewable Energy Programme (SREP) and SEK 100m to the Forest Investment Programme (FIP). The CIFs are designed to help developing countries pilot low-carbon and climate-resilient development, and are thus involved in both mitigation and adaptation projects.

Other non-conventional channels used have been the World Bank's Partnership for Market Readiness, IFAD's Adaptation for Smallholder Agriculture Programme (ASAP), and the Climate and Clean Air Coalition (CCAC) and its programme on short-lived climate pollutants. These pollutants, which include methane, are short-lived in the atmosphere compared with carbon dioxide, yet responsible for a substantial share of current global warming.

Table 5.3 **Provision of disbursed public financial support: contributions through multilateral climate institutions.**

	2011		2012	
	SEK m	US$ m	SEK m	US$ m
Least Developed Countries Fund	200	30.8	115	17.0
Adaptation Fund	100	15.4	100	14.8
Green Climate Fund	0	0	5	0.7
UNFCCC Trust Fund for Supplementary Activities	3.05	0.5	0.75	0.1
UNFCCC Trust Fund for Participation	2.5	0.4	2.0	0.3
Clean Technology Fund	100	15.4	0	0
Forest Investment Programme	100	15.4	0	0
Scaling Up Renewable Energy Programme	0	0	170	25.1
IFAD – Adaptation for Smallholder Agriculture Programme	0	0	30	4.4
Partnership for Market Readiness	0	0	50	7.4
World Bank – IDA replenishment 15	185	28.5	0	0
Consultative Group on International Agricultural Research	50	7.7	0	0
Global Facility for Disaster Risk Reduction	40	6.2	0	0
UNISDR	0	0	7.5	1.1
UNDP – BCPR	0	0	23.5	3.5
World Food Programme	0	0	44	6.5
Climate and Clean Air Coalition	0	0	10	1.5
Nordic Development Fund	122	18.9	78	11.5
Sustainable Energy for All	0	0	20	3
Other climate-related support	6.1	0.9	1.8	0.3

A total of SEK 115m has been allocated through channels focusing on disaster risk management and resilience, such as the United Nations Office for Disaster Risk Reduction (UNISDR) and the Global Facility for Disaster Reduction and Recovery (GFDRR). The GFDRR aims to reduce the damage caused by natural hazards such as earthquakes, floods, droughts and cyclones. In addition, Sweden attaches great importance to cooperation with international research bodies such as the Consultative Group on International Agricultural Research (CGIAR), to which SEK 50m was allocated.

Sweden also provides assistance to the core budget of the UN Framework Convention on Climate Change according to the agreed UN scale, with an additional charge for the Kyoto Protocol. Voluntary contributions are in addition made to the Trust Funds for Participation and Supplementary Activities.

Sweden furthermore contributes significant amounts of core funding to a number of other multilateral specialised bodies, international and regional organisations, banks and institutes, and is actively engaged with a view to influencing their climate change work in various sectors. Table 5.4 below outlines examples of Swedish contributions to multilateral institutions and programmes. The table presents total contributions, of which a share is devoted to climate change activities. This data is also included in CTF Table 7a. Within the World Bank's International Development Association (IDA), for example, an estimated 16% of the budget for the financial year 2012 has climate change mitigation co-benefits, and an additional 16% has climate adaptation co-benefits.

5.4 Bilateral financial support

Roughly half of Swedish development cooperation is channelled to developing countries and countries with economies in transition, as bilateral ODA through Sida. In the area of climate change, Sida supports specific climate change contributions as well as integration at sector level, transfer of technology, capacity building and research cooperation, and in doing so collaborates with many government institutions in developing countries, non-governmental organisations, Swedish authorities and municipalities, the private sector, research institutions etc. ODA channelled through Sida (including 'multi-bi' support) is disbursed at the national, regional and global levels.

In bilateral development cooperation, Sweden's contributions are based on a strategy that takes the developing country's own strategic priorities and poverty reduction strategy as a point of departure. Local ownership is key to ensuring the sustainability of support.

Table 5.5 shows a summary of Swedish climate-related development assistance channelled through Sida for the period 2011–12. The numbers are slightly different from those presented in the National Communication, as only support to non-Annex I countries has been included in the Biennial Report. This data is also included in CTF Table 7b. Tracking has been performed through follow-up of the specific budget allocation for the Special Climate Change Initiative, and using the 'Rio markers' on climate change mitigation and adaptation. These markers have been developed and defined within OECD DAC (new methodology since the previous National Communication), and are commonly used by many donor countries to track public climate finance. Each component is marked on a scale of 0–2 by the officer responsible for the contribution, where 2 represents 'primary objective', 1 'significant objective' and 0 'not targeted'. In compiling the figures presented in Table 5.5 and Annex 3, Sweden has included 100% of the funding for contributions under the Special Climate Change Initiative and for other contributions which have mitigation and/or adaptation as a 'primary objective', but only 50% of the funding for contributions with mitigation and/or adaptation as a 'significant objective'. The figures presented represent net support provided, i.e. disbursed according to OECD terminology.

Table 5.4 **Examples of disbursed financial contributions to multilateral institutions and programmes.**

	2011		2012	
	SEK m	US$ m	SEK m	US$ m
World Bank – IDA	2 306	355	2 368	350
World Bank – IBRD	1 057	156	1 104	163
International Finance Corporation	40	6.3	47	7
African Development Bank	808	125	927	137
Asian Development Bank	125	19	150	22
European Bank for Reconstruction and Development	280	43	48	7
Inter-American Development Bank	11	2	10	2
United Nations Development Programme	1 808	279	2 076	307
United Nations Environment Programme	83	13	99	15

Table 5.5 **Summary of bilateral/regional/global climate finance channelled through Sida to non-Annex I countries**

(US$ m)	Mitigation	Adaptation	Cross-cutting	Total
2011	38	104	166	309
2012	34	150	160	343

Annex 3 shows this financial support further broken down by country/region/global for the period 2011–12. Only countries/regions where cooperation took place in a given year are included, and the list therefore varies from one year to another. For reasons of transparency, negative figures are also included; these represent repayments of unspent funds, e.g. when unrest in an area has delayed or prevented implementation of a project or programme, or a project/programme has performed more cost-effectively than budgeted. Sectors are reported according to the OECD DAC Creditor Reporting System (CRS) classification. Important sectors for mitigation are, for example, energy and multisector, such as environmental policy and administrative management. Interventions to improve climate change adaptation also include a great deal of capacity building relating to environmental policy and administrative management, but in addition focus strongly on sectors such as water and sanitation, and agriculture. Most contributions, however, create synergies and/or have cross-cutting benefits for both mitigation and adaptation, particularly under the agriculture and multisector headings. The individual countries that have received the largest share of climate change-related development cooperation include, for example, Mozambique, Kenya, Mali, Bolivia and Tanzania, countries that were in focus under the Government's Special Climate Change Initiative and/or where Sweden has been engaged in development cooperation for many years, especially in key sectors such as energy and water/sanitation.

5.4.1 Support through non-governmental organisations

Cooperation with civil society in the area of climate change is important, as these actors often focus on the local level and work directly with the people who are most vulnerable to and suffer most from the impact of climate change. Civil society organisations also have an important role to play when it comes to awareness raising and advocacy regarding climate change. Financial support from Sida is channelled through a number of Swedish organisations, such as the Swedish Society for Nature Conservation, PLAN Sweden, Forum Syd and the Swedish Cooperative Centre, as well as being allocated directly to key organisations in developing countries, including the Pan African Climate Justice Alliance and the Asia Pacific Forum on Women, Law and Development.

Sida has supported the Joint Climate Change Initiative of Capacity Development of Cambodian non-governmental organisations, implemented by Forum Syd and other partners. More than 20 local NGOs have increased their capacity and knowledge relating to climate change and disaster risk reduction. Awareness has increased and climate aspects have now been integrated in the strategic plans and programmes of the NGOs. Women have been key actors in many of the pilot projects, e.g. in cooperating with local authorities to develop disaster management plans, integrating adaptation in local investment plans, and improving livelihoods through climate-resilient fish farming and vegetable cultivation.

Sida has also provided support for the Asia Pacific Forum on Women, Law and Development, a member-based organisation focusing on women's rights and gender equality. Under its Climate Justice programme, the Forum has, for example, conducted research projects documenting climate-related impacts on rural women's rights and livelihoods. The results were presented at COP17, with rural and indigenous women from Asia Pacific taking part as official delegates of the gender constituency. In 2012 the UNFCCC passed a decision recognising the need for gender balance to improve the participation of women.

Sida also supports global non-governmental organisations and think tanks that are very important actors at the global, regional and national/local levels. Organisations such as the Stockholm Environment Institute, the International Institute for Environment and Development and the World Resources Institute all receive core support from Sida and play an active role in normative efforts, as well as in global policy research, pertaining to climate change.

The Stockholm Environment Institute (SEI) is an independent international research institute. It conducts research, develops tools, and builds capacity. Its work on climate change supports the design, development and implementation of effective and equitable strategies for adaptation and mitigation in developing and developed countries. It offers timely, authoritative and pertinent analysis that informs policymakers and negotiators, finance institutions, civil society, the private sector, and other stakeholders involved in the UNFCCC process. SEI explores both synergies and potential competition between climate policy and development. This is reflected in its work on climate governance and finance, climate economics, carbon markets, equity, bioenergy, energy efficiency, and vulnerability and adaptation.

5.4.2 Support through Swedish authorities to institutions in developing countries

Sweden channels funding through several Swedish authorities and universities to enable them to run programmes and project activities in developing countries, focusing on their areas of expertise. Key authorities involved in capacity building relating to climate change are, for example, the Swedish Environmental Protection Agency, the Swedish Energy Agency and the Swedish Meteorological and Hydrological Institute.

The Swedish Environmental Protection Agency manages Sweden's contribution to the Nordic Partnership Initiative on Up-scaled Mitigation Action. This is an initiative that aims to (i) build capacity in Peru and Vietnam to enable them to structure and implement 'Nationally Appropriate Mitigation Actions' (NAMAs) in the waste and cement sectors, respectively; (ii) explore ways to attract national and international climate finance; (iii) provide an input of lessons learnt to the international climate negotiations; and (iv) encourage other parties to take similar actions. The initiative was launched in 2011 and the two programmes will continue until 2015.

The Swedish Meteorological and Hydrological Institute, together with other partners, has implemented an international training programme focused on climate change mitigation and adaptation. About 450 participants (36% of them women) from 53 countries have been trained and provided with tools to identify vulnerable sectors in their countries and to develop projects there with support from the organisers. The target group has been individuals in leading positions in administration, national or local, NGOs, universities or companies. Evaluations show that participants rate the course highly and that the training has greatly increased their understanding of climate change. A large majority of the participants also thought that the content was of great significance to their ongoing work, and a number of important contacts with various experts were established.

5.4.3 Cooperation with the private sector

The dominant global capital flows are private, and to be able to manage climate change it is of the utmost importance to link these flows to both mitigation and adaptation efforts.

Sida cooperates with the private sector through its 'Innovations Against Poverty' programme, which is designed for companies that are based or operate in a poor country. The programme functions as a risk-sharing mechanism for sustainable business ventures (commercial companies or market-oriented organisations) which have a strong potential to reduce poverty. Many of the projects focus on climate-smart solutions.

In Indonesia, India, China, Vietnam, Namibia, Botswana and South Africa, Sida prioritises what is termed 'partner-driven cooperation', which is often undertaken in close cooperation with the private sector. The purpose is to establish sustainable relationships of mutual interest between Swedish and foreign actors. Effectively, this means that an actor in Sweden and an actor in the partner country initiate a partnership that falls within the framework of the strategic goals set for the country. Several of the initiatives focus on environment and climate change issues.

Environmental loans provided by Sida are another way to cooperate with the private sector – see section 5.5.

Most cooperation with the private sector includes an element of technology transfer. Examples are given in Table 5.7.

5.5 Mobilisation of private climate finance

In 2009, Sweden introduced an Ordinance on the Financing of Development Loans and Guarantees for Development Cooperation, and for the period 2009–13 the Swedish Government has a strategy with a special focus on environmental loans. These loans provide opportunities to expand and leverage available resources for economic development by linking grant aid with market finance. The Ordinance stipulates that the level of subsidy for development loans is to be a maximum of 80%, defined as Sida's grant in relation to the total amount financed, consisting of Sida's grant and the loan on market conditions.

Sida guarantees allow for mobilisation of capital, including the domestic capital of partner countries. The aim of a guarantee facility is essentially to tackle a market failure, to allow the market to better understand the true level of risk associated with particular investments. Sida can help lenders deal with these risks by insuring eligible projects against losses relating to the different market risks. If such problems arise and the borrower is not able to repay its loan to the bank, Sida covers parts of the loss. Sida guarantees are based on a set of simple key principles and conditions: additionality, risk-sharing, risk-reflecting premium to be charged, and that guarantees should be non-distortionary.

Thus, in all projects where Sida contributes either a development loan or a guarantee, other financial flows are generated. To date, the leveraging of funds has been calculated on a project-by-project basis. Since there is usually a long time lag between a decision being taken by Sida and the project being implemented and eventually completed, in Table 5.6 Sida has chosen to list the projects that have been decided on and the funds expected to be mobilised, rather than the funds eventually mobilised in a specific transaction. Sida's commitments are always made in SEK.

5.6 Technology development and diffusion

In September 2011 the Swedish Government launched a national environmental technology strategy. Its aim is to facilitate the development of new, sustainable Swedish solutions to meet the challenges of climate change and environmental degradation, while promoting new business and employment. Short- and long-term initiatives – targeting everything from research and innovation to exports – aim to make Sweden a green-tech pioneer. The Government has decided to invest SEK 400m in environmental technology over the period 2011–14.

The strategy outlines measures to promote the Swedish environmental technology sector. These include steps to intensify research and innovation, initiatives aimed at facilitating financing and business development at an early commercial stage, support and assistance with market analysis and start-ups in export markets for small and medium-sized businesses, and measures to improve coordination among government agencies and other actors of relevance to development in the environment sector.

To implement the strategy, a number of government agencies have been tasked with facilitating and improving conditions for the Swedish environmental technology sector to grow. They include the Swedish Energy Agency, the Swedish Agency for Economic and Regional Growth and the Swedish Trade and Invest Council (semi-governmental). The Swedish Trade and Invest Council is working to facilitate exports by Swedish companies, in areas such as waste management, recycling, bioenergy, solar power, wind power and energy efficiency.

The Government has signed cooperation agreements on environmental or energy technology with a number of countries, among them the United States, Brazil, China, Russia and India. In 2011, the Government appointed a special coordinator to be responsible for the coordination and development of bilateral cooperation with China, Russia and India in the field of environmental and energy technologies, including sustainable urban planning. As an example, cooperation between Sweden and India in the energy sector today includes energy efficiency and renewable energy, mainly biogas. Bilateral technological cooperation with China, focused on sustainable urban development, has been in progress since April 2008.

In 2011 the environmental sector exported goods and services adding up to SEK 38.9bn, which corresponds to 2.2% of Sweden's total exports.

The largest individual sector was waste management and recycling, but many of the current environmental technology solutions, such as district heating, biogas, underground waste collection, geothermal heating and geothermal cooling, have existed on a large scale in Sweden for many years.

Sweden considers the private sector to have an important part to play in technology development and diffusion. However, to create the necessary conditions for the sector to become involved in developing countries, support is often required to reduce the risk, and for this purpose loans and guarantees or risk credit can be used (see section 5.5 and below).

Through Swedfund, Sweden's development finance institution, Sweden invests in growth companies in developing countries. Swedfund aims to contribute to international development cooperation by helping to enable people living in poverty to improve their lives and, within the context of Sweden's reform cooperation in Eastern Europe, bringing about strengthened democracy, equitable and sustainable development, and alignment with the European Union and its core values. Swedfund seeks to establish sustainable and profitable companies in these markets with a view to contributing to poverty reduction. An important part of its work is

Table 5.6 **Summary of Sida loans and guarantees, and private finance leveraged.**

Country/region	Sida's contribution	Estimated private finance mobilised
Mozambique, 2011 (agriculture and tourism)	Guarantee SEK 16m Additional guarantee US$ 4m	SEK 30m Additional loans without guarantees US$ 2.5m
Region Asia, 2011 (ADB, UEIFPF, fund for environment and climate change-related actions)	Grant SEK 50m	SEK 500m
Bangladesh, 2012 (City Region Development Project)	Grant SEK 90m	SEK 850m + SEK 90m
Kenya, 2012 (GPOBA, output-based aid, water)	Grant SEK 85m	SEK 40m
Region Asia, 2012 (ADB, Clean Energy Fund)	Grant SEK 50m	SEK 500m
Pakistan, 2012 (Wind power)	Guarantee SEK 480m	SEK 1,000m

ensuring and maintaining excellence with respect to the environmental and social aspects of investments. Since 2009, Swedfund has administered Swedpartnership (previously StartSyd and StartÖst). Swedpartnership offers small and mid-sized enterprises financial support for investments in knowledge transfer and equipment when establishing new businesses in developing countries in Africa, Asia, Latin America and Eastern Europe.

From a development point of view, the issue of technology is more than the physical transfer of hardware or software; it is more a matter of building capacity in developing countries to receive, use and develop

Table 5.7 **Examples of provision of technology development and transfer support**

Recipient country	Targeted area	Measures and activities related to technology transfer	Sector	Source of funding for technology	Activities undertaken by	Status	Additional information
Bangladesh	Mitigation	Rural electrification through renewable energy	Energy	Private and Public	Private and Public	Implemented	Solar Home Systems is a renewable energy programme that provides people in rural Bangladesh with clean electricity from solar panels. The programme is designed to build a commercially viable system, but subsidies targeted at people living in poverty aim to make the initial investment possible. At least 1.2 million Solar Home Systems have been installed, improving the quality of life of millions of rural inhabitants. The programme has also improved the productivity and profitability of local businesses. It is operated by the World Bank, but financed by several partners (including local micro-finance organisations), and implemented by local companies in partnerships with local NGOs and partner organisations.
Uganda	Mitigation	Gas produced from waste will provide low-income communities with an alternative, renewable source of fuel	Energy	Private and Public	Private and Public	Implemented	Waste 2 Energy Ltd.'s aim is to develop commercial production of biogas from municipal waste collected in a densely populated urban centre in Kampala. The gas will be conventionally purified and pressurised to provide a safe, affordable and renewable energy source for poor households. Organic waste sorted by waste-pickers will be converted and purified into biogas. Subsequently the biogas will be marketed and sold at a price 20–30% lower than competing products. The gas will reach potential customers through a distribution network.
Bangladesh	Adaptation	Reduce people's vulnerability to natural disasters	Multi-sector/ Communication	Public	Public	Implemented	The Comprehensive Disaster Management Programme has helped to reduce people's vulnerability to natural disasters, including adverse effects of climate change. The programme has worked at many different levels to strengthen the legal framework for disaster management, build capacity and strengthen coordination between various ministries, agencies etc. It has also, among other things, contributed to an improved national early warning system for weather-related disasters. Through the use of mobile phones and the mobilisation of tens of thousands of volunteers, more than 50 million people can now be reached by the early warning system.

technology. Development cooperation has an important role to play in this context, and Sweden undertakes technology and research cooperation with significant elements of capacity development with a number of partner countries. This integrated approach is crucial if developing countries are to benefit from, and themselves contribute to, the development of sustainable technological solutions adapted to their specific circumstances. It does, however, make it challenging to track and distinguish specific technology transfer and/or capacity-building contributions.

5.7 Capacity building

Capacity development is a critical factor in enabling developing countries to tackle climate change. Sweden considers capacity building a cross-cutting issue, since capacity is required for developing countries to be able to receive financial and technology-related support for adaptation and mitigation, and to ensure that such support is sustainable. National expertise and know-how on climate change and its effects are crucial, as is strengthening of institutions so that the countries themselves are able to integrate climate change into their long-term planning processes and pursue their own national climate change policies. Sweden has found that the best results are achieved when capacity development is based on countries' own needs and priorities, is owned and operated nationally, and takes place in partnership as a joint learning process. It is therefore important to strengthen national systems instead of creating new ones.

Capacity development is primarily an integral part of the programmes and projects which Sida supports. This integrated approach is of key significance, as capacity cannot develop in a vacuum and is always linked to the relevant activity. It is important to ask: 'Capacity for what?' Sweden considers it important to take a broader view of capacity development in training and research, but also to raise capacity institutionally through various forms of support to cooperation with national and local institutions. In addition, Sweden regards it as crucial to contribute to building capacity among developing countries' climate change negotiators, in order to

Table 5.8 **Examples of provision of capacity-building support.**

Recipient country/ region	Targeted area	Programme or project title	Description of programme or project
Cambodia	Multiple areas	Cambodia Climate Change Alliance	In Cambodia, Sida has teamed up with the EU, Danida and UNDP in a multi-donor initiative to support the Cambodia Climate Change Alliance, a comprehensive approach seeking to systematically address climate change and disaster risk challenges. The overall objective is to strengthen the capacity of the National Climate Change Committee (a Government-mandated coordinating and policy support entity for all aspects of climate change) to fulfil its mandate to address climate change and to enable line ministries and civil society to implement priority climate change actions. The main achievements to date are: the development of a Cambodia Climate Change Strategic Plan (providing the basis for Cambodia's National Adaptation Plan); improved coordination with key line ministries in sectoral climate change plans; approval of 19 government and NGO projects; establishment of a Trust Fund; strengthening of Cambodia's negotiating capacity on climate change matters at the national and international levels; establishment of a web-based climate change knowledge and information platform; and completion of a climate change public expenditure and institutional review, aimed at strengthening governance and delivery of climate finance in line with MRV (monitoring, review and verification) requirements.
Global/LDCs	Multiple areas	European Capacity Building Initiative	Sida contributes funding towards the European Capacity Building Initiative (ecbi) for sustained capacity building in support of international climate change negotiations. The ecbi aims to promote a more level playing field between government delegations to the negotiations, and to facilitate mutual understanding and trust both between European and developing countries and among developing countries. Through trust-building seminars, regional training workshops, policy reports, bursaries for LDC negotiators from Africa and Asia, a website for awareness creation, mentoring and encouragement, ecbi has created an environment for negotiators that is conducive to honest and open discussions on climate change issues. Almost 300 negotiators have participated in its activities, giving them new skills, knowledge and confidence to play a more effective role in the climate change negotiations. The initiative is having a direct impact on the negotiations.
Western Indian Ocean/East Africa/ Southern Africa	Multiple areas	WIOMSA	The Western Indian Ocean Marine Science Association is a regional organisation promoting the educational, scientific and technological development of all aspects of marine sciences, with a view to sustaining the use and conservation of marine resources. As a result of Sida's support to WIOMSA, knowledge about the consequences of climate change for coral reefs and mangroves has been enhanced; climate change has become a priority on the regional agenda for sustainable management of marine and coastal natural resources in Indian Ocean; a dialogue has been established between researchers and decision makers regarding marine and coastal environments; and new models have increased the capacity to predict climate change among researchers and decision makers concerned with marine and coastal environments in East and Southern Africa.

create a level playing field and facilitate mutual understanding.

Sida's research cooperation aims to strengthen the research capacity of partner countries and to promote development-oriented research. This includes support that will help cooperating countries to establish enabling research environments and training of research scientists and to develop methods to plan and prioritise research. Promoting development-oriented research means supporting, both financially and scientifically, opportunities for partner countries to identify new knowledge in areas of significance for their development.

The cooperation pursued in natural science and technology, natural resources and the environment is relevant from the point of view of climate change. In addition, a contribution is made to capacity building for instance through support for the build-up of universities and research councils in developing countries.

Sweden often promotes capacity building by engaging with local partners in developing countries, but sometimes also uses combined studies at home and abroad for key groups such as civil servants, researchers, students etc. These approaches have proved successful in enabling course participants to remain in their countries on completing their education, thereby avoiding the capacity being lost through a 'brain drain'.

Examples of capacity-building actions are given in Table 5.8.

Annex 1
Underlying data for CTF Table 7

Provision of public financial support: summary information in 2011											
Allocation channels		**SEK**					**USD**				
		Core/General	**Climate specific**				**Core/General**	**Climate specific**			
			Mitigation	**Adaptation**	**Cross-cutting**	**Other**		**Mitigation**	**Adaptation**	**Cross-cutting**	**Other**
Total contributions through multilateral channels:		6,773,898,584	276,411,500	390,000,000	319,176,088	0	1,043,872,679	42,595,620	60,099,858	49,185,738	0
	Multilateral climate change funds*	254,705,000	276,411,500	390,000,000	319,176,088	0	39,250,601	42,595,620	60,099,858	49,185,738	0
	Other multilateral climate change funds	0	200,000,000	90,000,000	316,126,088	0	0	30,820,440	13,869,198	48,715,726	0
	Multilateral financial institutions, including regional development banks	4,627,593,616	0	0	0	0	713,122,360	0	0	0	0
	Specialized United Nations bodies	1,891,599,968	0	0	0	0	291,499,718	0	0	0	0
Total contributions through bilateral, regional and other channels			248,780,452	677,022,515	1,080,139,681			38,337,615	104,330,659	166,451,902	
Total			**525,191,952**	**1,067,022,515**	**1,399,315,769**	**0**		**80,933,235**	**164,430,517**	**215,637,640**	**0**

* GEF, LDCF, SCCF, Adaptation Fund, GCF, UNFCCC
Definitions and explanations of methodology is given in the narrative part of the report

Provision of public financial support: summary information in 2012											
Allocation channels		**SEK**					**USD**				
		Core/General	**Climate specific**				**Core/General**	**Climate specific**			
			Mitigation	**Adaptation**	**Cross-cutting**	**Other**		**Mitigation**	**Adaptation**	**Cross-cutting**	**Other**
Total contributions through multilateral channels:		7,032,445,337	311,418,400	320,000,000	87,265,781	0	1,038,934,736	46,007,239	47,275,037	12,892,166	0
	Multilateral climate change funds*	204,728,000	311,418,400	320,000,000	87,265,781	0	30,245,387	46,007,239	47,275,037	12,892,166	0
	Other multilateral climate change funds	0	250,000,000	105,000,000	81,515,781	0	0	36,933,624	15,512,122	12,042,692	0
	Multilateral financial institutions, including regional development banks	4,653,351,869	0	0	0	0	687,460,572	0	0	0	0
	Specialized United Nations bodies	2,174,365,468	0	0	0	0	321,228,777	0	0	0	0
Total contributions through bilateral, regional and other channels			231,398,110	1,013,198,271	1,080,004,509			34,185,482	149,684,331	159,553,917	
Total			**542,816,510**	**1,333,198,271**	**1,167,270,290**	**0**		**80,192,721**	**196,959,368**	**172,446,083**	

* GEF, LDCF, SCCF, Adaptation Fund, GCF, UNFCCC

Annex 2
Underlying data for CTF Table 7a

Underlying data for CTF Table 7a, 2011

Provision of public financial support: contribution through multilateral channels in 2011						Exchange rate 2011: 6.4892			
Exchange rate: 1 USD= 6,4892 SEK									
Donor funding	**Total Amount**				**Status**	**Funding source**	**Financial instrument**	**Type of support**	**Sector**
	Core/General		**Climate-specific**						
Multilateral climate change funds (1)	**SEK**	**USD**	**SEK**	**USD**					
	254,705,000	39,250,601	379,461,500	58,475,852					
1. Global Environmental Facility	254,705,000	39,250,601	76,411,500	11,775,180	Provided	ODA	Grant	Mitigation	cross-cutting
2. Least Developed Country Fund			200,000,000	30,820,440	Provided	ODA	Grant	Adaptation	cross-cutting
3. Special Climate Change Fund			0	0	Provided	ODA	Grant	Adaptation	cross-cutting
4. Adaptation Fund			100,000,000	15,410,220	Provided	ODA	Grant	Adaptation	cross-cutting
5. Green Climate Fund			0	0	Provided	ODA	Grant	cross-cutting	cross-cutting
6. UNFCCC - Trust Fund for Supplementary Activities			3,050,000	470,012	Provided	ODA	Grant	cross-cutting	cross-cutting
7. Other multilateral climate change funds									
Clean Technology Fund			100,000,000	15,410,220	Provided	ODA	Grant	Mitigation	cross-cutting
Forest Investment Program			100,000,000	15,410,220	Provided	ODA	Grant	Mitigation	forestry
International Development Association (replenishment 15)			185,000,000	28,508,907	Provided	ODA	Grant	cross-cutting	cross-cutting
Consultative Group on International Agricultural Research			50,000,000	7,705,110	Provided	ODA	Grant	Adaptation	Agriculture
Global Facility for Disaster Risk Reduction			40,000,000	6,164,088	Provided	ODA	Grant	Adaptation	other
Nordic Development Fund			122,496,088	18,876,917	Provided	ODA	Grant	cross-cutting	cross-cutting
UNFCCC - Trust Fund for Participation			2,500,000	385,256	Provided	ODA	Grant	cross-cutting	cross-cutting
Other climate related support			6,130,000	944,646	Provided	ODA	Grant	cross-cutting	cross-cutting
Subtotal	**254,705,000**	**39,250,601**	**985,587,588**	**151,881,216**					
Multilateral financial institutions including regional development banks									
1. World Bank - IDA	2,305,896,711	355,343,757			Provided	ODA	Grant		
World Bank- IBRD	1,057,113,357	162,903,495			Provided	ODA	Grant		
2. International Finance Corporation	40,655,413	6,265,089			Provided	ODA	Grant		
3. African Development Bank	807,948,097	124,506,580			Provided	ODA	Grant		
4. Asian Development Bank	125,122,498	19,281,652			Provided	ODA	Grant		
5. European Bank for Reconstruction and Development	280,211,700	43,181,240			Provided	ODA	Grant		
6. Inter-American Development Bank	10,645,840	1,640,547			Provided	ODA	Grant		
7. Other									
Subtotal	**4,627,593,616**	**713,122,360**							
Specialized United Nations bodies									
1. United Nations Development Programme (specific programmes)	1,808,724,993	278,728,502			Provided	ODA	Grant		
2. United Nations Environment Programme	82,874,975	12,771,216			Provided	ODA	Grant		
3. Other									
Subtotal	**1,891,599,968**	**291,499,718**	**0**	**0**					
Total	**6,773,898,584**	**1,043,872,678**	**985,587,588**	**151,881,216**					

Underlying data for CTF Table 7a, 2012

Provision of public financial support: contribution through multilateral channels in 2012						Exchange rate 2012: 6.7689			
Exchange rate: 1 USD= 6,7689 SEK									
Donor funding	Total Amount								
	Core/General		Climate-specific						
Multilateral climate change funds (1)	SEK	USD	SEK	USD	Status	Funding source	Financial instrument	Type of support	Sector
1. Global Environmental Facility	204,728,000	30,245,387	61,418,400	9,073,616	Provided	ODA	Grant	Mitigation	cross-cutting
2. Least Developed Country Fund			115,000,000	16,989,467	Provided	ODA	Grant	Adaptation	cross-cutting
3. Special Climate Change Fund									
4. Adaptation Fund			100,000,000	14,773,449	Provided	ODA	Grant	Adaptation	cross-cutting
5. Green Climate Fund			5,000,000	738,672	Provided	ODA	Grant	cross-cutting	cross-cutting
6. UNFCCC - Trust Fund for Supplementary Activities			750,000	110,801	Provided	ODA	Grant	cross-cutting	cross-cutting
7. Other multilateral climate change funds									
Scaling Up Renewable Energy Fund			170,000,000	25,114,864	Provided	ODA	Grant	Mitigation	energy
IFAD-Adaptation for Smallholder Agriculture Programme			30,000,000	4,432,035	Provided	ODA	Grant	Adaptation	Argiculture
Partnership for Market Readiness			50,000,000	7,386,725	Provided	ODA	Grant	Mitigation	cross-cutting
UNDP-Bureau for Crisis Prevention and Recovery			23,500,000	3,471,761	Provided	ODA	Grant	Adaptation	other
World Food Programme			44,000,000	6,500,318	Provided	ODA	Grant	Adaptation	agriculture
UN International Strategy for Disaster Risk Reduction			7,500,000	1,108,009	Provided	ODA	Grant	Adaptation	cross-cutting
Sustainable Energy for All			20,000,000	2,954,690	Provided	ODA	Grant	Mitigation	Energy
Climate and Clean Air Coalition			10,000,000	1,477,345	Provided	ODA	Grant	Mitigation	other
Nordic Development Fund			77,715,781	11,481,301	Provided	ODA	Grant	cross-cutting	cross-cutting
UNFCCC - Trust Fund for Participation			2,000,000	295,469	Provided	ODA	Grant	cross-cutting	cross-cutting
Other climate related support			1,800,000	265,922	Provided	ODA	Grant	cross-cutting	cross-cutting
Subtotal	204,728,000	30,245,387	718,684,181	105,613,051					
Multilateral financial institutions including regional development banks									
1. World Bank- International Development Association	2,368,000,000	349,835,276			Provided	ODA	Grant		
World Bank- IBRD	1,103,906,775	163,085,106			Provided	ODA	Grant		
2. International Finance Corporation	46,796,695	6,913,486			Provided	ODA	Grant		
3. African Development Bank	926,623,361	136,894,231			Provided	ODA	Grant		
4. Asian Development Bank	150,240,924	22,195,767			Provided	ODA	Grant		
5. European Bank for Reconstruction and Development	47,500,000	7,017,388			Provided	ODA	Grant		
6. Inter-American Development Bank	10,284,114	1,519,318			Provided	ODA	Grant		
7. Other									
Subtotal	4,653,351,869	687,460,572							
Specialized United Nations bodies									
1. United Nations Development Programme (specific programmes)	2,075,600,004	306,637,711			Provided	ODA	Grant		
2. United Nations Environment Programme	98,765,464	14,591,066			Provided	ODA	Grant		
3. Other									
Subtotal	2,174,365,468	321,228,777	0	0					
Total	7,032,445,337	1,038,934,736	718,684,181	105,613,051					

Annex 3
Underlying data for CTF Table 7b

Underlying data for CTF Table 7b, 2011.
Status is 'Provided', Funding source is 'ODA' and Financial instrument is 'Grant'

Provision of public financial support: contribution through bilateral, regional and other channels in 2011				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Afghanistan	441,692	68,066	Adaptation	Unallocated/Unspecified
	56,206,945	8,661,614	Cross-cutting	Education; Government and civil society
Albania	139,963	21,569	Mitigation	Forestry
	830,820	128,031	Adaptation	Multi sector; Government and civil society
	10,862,159	1,673,883	Cross-cutting	Multi sector; Water and sanitation
Bangladesh	11,000,000	1,695,124	Adaptation	Multi sector
	28,259,516	4,354,854	Cross-cutting	Multi sector; Education
Bolivia	52,183,625	8,041,611	Adaptation	Banking and financial services; Health; Multi sector; Agriculture; Government and civil society; Water and sanitation; Other social infrastructure and services
	33,200,964	5,116,342	Cross-cutting	Forestry
Bosnia-Herzegovina	561,825	86,578	Adaptation	Multi sector; Government and civil society
Botswana	126,500	19,494	Mitigation	Transport and storage
	2,012,925	310,196	Cross-cutting	Multi sector; Humanitarian aid; Education; Water and sanitation
Brazil	1,174,733	181,029	Cross-cutting	Multi sector
Burkina Faso	70,254,761	10,826,413	Adaptation	Multi sector; Agriculture; Government and civil society; Water and sanitation
	11,575,793	1,783,855	Cross-cutting	Multi sector; Forestry; Education
Burundi	6,350,000	978,549	Adaptation	Humanitarian aid
Cambodia	6,897,166	1,062,868	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	12,341,531	1,901,857	Cross-cutting	Multi sector; Government and civil society
Chad	135,000	20,804	Adaptation	Humanitarian aid
Chile	154,570	23,820	Cross-cutting	Multi sector
China	411,354	63,391	Mitigation	Multi sector; Business and other services
	2,990,520	460,846	Cross-cutting	Multi sector
Colombia	3,500,000	539,358	Adaptation	Government and civil society
	373,211	57,513	Cross-cutting	Multi sector; Government and civil society

Provision of public financial support: contribution through bilateral, regional and other channels in 2011				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Congo, the Democratic Republic	10,000,000	1,541,022	Mitigation	Forestry
	8,821,000	1,359,336	Adaptation	Banking and financial services; Government and civil society
Costa Rica	149,161	22,986	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	556,453	85,751	Cross-cutting	Multi sector
Ecuador	556,453	85,751	Cross-cutting	Multi sector
Egypt	-108,600	-16,735	Cross-cutting	Government and civil society
El Salvador	2,038,540	314,144	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Ethiopia	5,269,915	812,105	Adaptation	Agriculture; Government and civil society
	2,988,043	460,464	Cross-cutting	Multi sector; Industry; Government and civil society
Georgia	1,000,000	154,102	Mitigation	Water and sanitation
Ghana	-31,478	-4,851	Cross-cutting	Government and civil society
Guatemala	6,500,000	1,001,664	Mitigation	Government and civil society
	1,392,174	214,537	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	8,777,544	1,352,639	Cross-cutting	Multi sector; Industry; Government and civil society
Haiti	13,750,000	2,118,905	Adaptation	Humanitarian aid
Honduras	2,538,561	391,198	Adaptation	Banking and financial services; Health; Multi sector; Industry; Government and civil society; Other social infrastructure and services
	278,226	42,875	Cross-cutting	Multi sector
India	3,797,488	585,201	Mitigation	Multi sector; Health; Water and sanitation
	650,000	100,166	Adaptation	Multi sector
	8,289,954	1,277,500	Cross-cutting	Multi sector; Industry
Indonesia	1,000,000	154,102	Mitigation	Multi sector
	317,185	48,879	Adaptation	Water and sanitation
	8,888,345	1,369,714	Cross-cutting	Humanitarian aid; Multi sector; Industry; Transport and storage;
Iraq	3,561,300	548,804	Cross-cutting	Energy generation and supply; Government and civil society
Kenya	70,106,008	10,803,490	Adaptation	Humanitarian aid; Banking and financial services; Health; Multi sector; Agriculture; Government and civil society; Water and sanitation; Other social infrastructure and services
	69,735,900	10,746,456	Cross-cutting	Humanitarian aid; Banking and financial services; Multi sector; Agriculture
Korea, Democratic Peoples Rep	3,863,508	595,375	Cross-cutting	Multi sector
Laos	5,098,209	785,645	Cross-cutting	Multi sector; Agriculture
Liberia	8,000,000	1,232,818	Mitigation	Transport and storage
Macedonia	5,500,000	847,562	Mitigation	Agriculture
	286,277	44,116	Adaptation	Agriculture
	263,006	40,530	Cross-cutting	Agriculture; Unallocated/Unspecified
Malawi	1,243,013	191,551	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	-91,287	-14,067	Cross-cutting	Government and civil society
Malaysia	1,793,014	276,307	Cross-cutting	Multi sector

Provision of public financial support: contribution through bilateral, regional and other channels in 2011				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Mali	15,050,164	2,319,263	Adaptation	Multi sector; Government and civil society; Forestry; Water and sanitation
	89,203,018	13,746,381	Cross-cutting	Multi sector; Government and civil society; Forestry; General Budget Support;
Moldova	16,645,835	2,565,160	Mitigation	Energy generation and supply
	786,555	121,210	Adaptation	Multi sector; Government and civil society
	3,000,000	462,307	Cross-cutting	Multi sector
Mongolia	25,060	3,862	Mitigation	Energy generation and supply
Montenegro	72,255	11,135	Cross-cutting	Multi sector
Mozambique	9,671,783	1,490,443	Mitigation	Energy generation and supply; Government and civil society
	7,530,111	1,160,407	Adaptation	Banking and financial services; Health; Multi sector; Agriculture; Government and civil society; Humanitarian aid; Other social infrastructure and services
	195,210,948	30,082,437	Cross-cutting	Multi sector; General Budget Support; Health; Industry; Agriculture;
Namibia	560,000	86,297	Adaptation	Government and civil society; Water and sanitation;
	475,224	73,233	Cross-cutting	Multi sector; Industry
Nicaragua	37,750	5,817	Mitigation	Multi sector;
	1,529,419	235,687	Adaptation	Banking and financial services; Health; Multi sector; Agriculture; Government and civil society; Other social infrastructure and services
	-15,739	-2,425	Cross-cutting	Government and civil society
Niger	5,000,000	770,511	Cross-cutting	Humanitarian aid
Pakistan	-109,387	-16,857	Cross-cutting	Government and civil society
Palestinian Administrated Area	1,789,938	275,833	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	1,200,000	184,923	Cross-cutting	Multi sector
Paraguay	2,137,981	329,468	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	61,828	9,528	Cross-cutting	Multi sector
Peru	340,054	52,403	Cross-cutting	Multi sector
Philippines	1,541,335	237,523	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	525,539	80,987	Cross-cutting	Multi sector
Rwanda	5,000,000	770,511	Cross-cutting	Multi sector
Serbia	4,596,581	708,343	Cross-cutting	Multi sector; Water and sanitation
Somalia	20,000,000	3,082,044	Adaptation	Humanitarian aid
South Africa	2,889,073	445,212	Cross-cutting	Multi sector; Energy generation and supply; Business and other services; Education
Sri Lanka	21,897,301	3,374,422	Mitigation	Water and sanitation
	1,640,776	252,847	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	204,613	31,531	Cross-cutting	Water and sanitation
Sudan	9,283,238	1,430,567	Adaptation	Multi sector; Health; Government and civil society
	6,060,549	933,944	Cross-cutting	Government and civil society
Tanzania	50,238,144	7,741,809	Mitigation	Energy generation and supply
	1,591,056	245,185	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services

Provision of public financial support: contribution through bilateral, regional and other channels in 2011				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Tanzania	21,846,164	3,366,542	Cross-cutting	Multi sector; Unallocated/unspecified; Government and civil society
Thailand	772,851	119,098	Cross-cutting	Multi sector
Uganda	2,684,907	413,750	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	17,886,665	2,756,374	Cross-cutting	Multi sector; Industry; Government and civil society
Uruguay	432,797	66,695	Cross-cutting	Multi sector
Vietnam	153,038	23,583	Mitigation	Energy generation and supply
	5,444,165	838,958	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Water and Sanitation; Other social infrastructure and services
	15,116,639	2,329,507	Cross-cutting	Multi sector; Health; Industry; Government and civil society; Forestry
Zambia	5,930,155	913,850	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	41,345,412	6,371,419	Cross-cutting	Energy generation and supply; Multi sector; Business and other services; Government and civil society;
Zimbabwe	497,205	76,620	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	4,500,000	693,460	Cross-cutting	Government and civil society
Reg Africa	17,202,354	2,650,921	Mitigation	Multi sector; Energy generation and supply; Government and civil society; Transport and storage
	39,646,654	6,109,637	Adaptation	Multi sector; Fisheries; Industry; Agriculture; Government and civil society; Water and sanitation
	29,716,210	4,579,333	Cross-cutting	Multi sector; Industry; Forestry;
Reg Eastern Africa	2,171,811	334,681	Mitigation	Multi sector; Trade;
	43,886,473	6,763,002	Adaptation	Banking and financial services; Health; Multi sector; Trade; Government and civil society; Water and sanitation; Other social infrastructure and services
	23,694,897	3,651,436	Cross-cutting	Multi sector; Agriculture
Reg Lake Victoria	5,633,335	868,109	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Water and sanitation; Other social infrastructure and services
Reg Southern Africa	1,496,790	230,659	Mitigation	Business and other services; Water and sanitation
	12,052,874	1,857,374	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Water and sanitation; Other social infrastructure and services
	2,042,675	314,781	Cross-cutting	Energy generation and supply
Reg West Africa	20,205,855	3,113,767	Adaptation	Multi sector; Fisheries; Water and sanitation; Humanitarian aid
Reg Asia	59,998,690	9,245,930	Mitigation	Energy generation and supply; Multi sector
	29,000,000	4,468,964	Adaptation	Multi sector
	4,750,000	731,985	Cross-cutting	Multi sector; Health
Reg South Asia	3,800,000	585,588	Cross-cutting	Multi sector
Reg Southeast Asia	1,046,000	161,191	Mitigation	Trade
	44,284,469	6,824,334	Adaptation	Banking and financial services; Health; Multi sector; Fisheries; Government and civil society; Other social infrastructure and services
	5,656,449	871,671	Cross-cutting	Multi sector; Forestry
Reg Latin America	88,795	13,684	Adaptation	Multi sector
	1,000,000	154,102	Cross-cutting	Multi sector
Reg South America	309,140	47,639	Cross-cutting	Multi sector

Provision of public financial support: contribution through bilateral, regional and other channels in 2011				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Reg Central America	5,113,689	788,031	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Reg the West Indies	-112,027	-17,264	Mitigation	Multi sector
Reg Middle East	10,477,963	1,614,677	Adaptation	Water and sanitation
	5,720,401	881,526	Cross-cutting	Water and sanitation
Reg Central & Eastern Europe	1,605,567	247,421	Mitigation	Multi sector
	663,975	102,320	Adaptation	Multi sector; Government and civil society
	1,136,605	175,153	Cross-cutting	Multi sector
Global	30,227,051	4,658,055	Mitigation	Multi sector; Energy generation and supply; Communication; Forestry; Water and sanitation; Humanitarian aid;
	129,254,700	19,918,434	Adaptation	Multi sector; Energy generation and supply; Fisheries; Trade; Agriculture; Humanitarian aid; Business and other services; Education; Water and sanitation; Unallocated/ unspecified
	313,126,764	48,253,523	Cross-cutting	Multi sector; Energy generation and supply; Fisheries; Trade; Health; Industry; Agriculture; Communication; Business and other services; Government and civil society; Forestry; Water and sanitation; Unallocated/ unspecified
Total 2011	**2,005,942,648**	**309,120,176**		

Exchange rate 1$=6.4892 SEK

Underlying data for CTF Table 7b, 2012

Provision of public financial support: contribution through bilateral, regional and other channels in 2012				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Afghanistan	61,502	9,086	Adaptation	Unallocated/unspecified
	51,927,350	7,671,461	Cross-cutting	Government and civil society; Education
Albania	-7,003,706	-1,034,689	Mitigation	Forestry
	790,072	116,721	Adaptation	Multi sector; Government and civil society
	8,444,606	1,247,560	Cross-cutting	Multi sector; Government and civil society; Water and sanitation
Bangladesh	10,000,000	1,477,345	Mitigation	Multi sector
	44,750,000	6,611,118	Adaptation	Multi sector
	29,660,068	4,381,815	Cross-cutting	Multi sector; Health; Education
Benin	-5,885	-869	Mitigation	Humanitarian aid
Bolivia	68,062,790	10,055,222	Adaptation	Banking and financial services; Health; Multi sector; Agriculture; Government and civil society
	9,742,498	1,439,303	Cross-cutting	Forestry
Bosnia-Herzegovina	534,270	78,930	Adaptation	Multi sector; Government and civil society
	19,427,188	2,870,066	Cross-cutting	Multi sector; Water and sanitation; Other social infrastructure and services
Botswana	4,910,700	725,480	Adaptation	Multi sector; Humanitarian aid; Water and sanitation
	2,910,369	429,962	Cross-cutting	Multi sector; Education; Water and sanitation
Brazil	1,407,980	208,007	Cross-cutting	Multi sector
Burkina Faso	29,433,637	4,348,363	Adaptation	Multi sector; Agriculture; Government and civil society; Water and sanitation
	2,314,132	341,877	Cross-cutting	Multi sector; Forestry

Provision of public financial support: contribution through bilateral, regional and other channels in 2012				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Burundi	6,350,000	938,114	Adaptation	Humanitarian aid
Cambodia	12,270,291	1,812,745	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	20,425,713	3,017,582	Cross-cutting	Multi sector
Central African Republic	3,251,800	480,403	Mitigation	Humanitarian aid
Chad	5,000,500	738,746	Adaptation	Humanitarian aid
Chile	75,428	11,143	Cross-cutting	Multi sector
China	5,940,644	877,638	Adaptation	Multi sector
	8,661,260	1,279,567	Cross-cutting	Multi sector; Energy generation and supply; Water and sanitation;
Colombia	402,280	59,431	Cross-cutting	Multi sector
Congo, the Democratic Republic	13,751,800	2,031,615	Mitigation	Humanitarian aid; Forestry
	8,020,565	1,184,914	Adaptation	Banking and financial services; Government and civil society
Costa Rica	236,482	34,937	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	351,995	52,002	Cross-cutting	Multi sector
Ecuador	452,565	66,859	Cross-cutting	Multi sector
El Salvador	3,231,921	477,466	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Ethiopia	20,508,776	3,029,854	Adaptation	Humanitarian aid; Agriculture; Government and civil society;
	8,789,300	1,298,483	Cross-cutting	Multi sector; Government and civil society
Georgia	12,882,784	1,903,232	Mitigation	Water and sanitation
	11,000,000	1,625,079	Cross-cutting	Water and sanitation
Guatemala	-279,716	-41,324	Mitigation	Government and civil society
	2,207,166	326,075	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	5,427,423	801,818	Cross-cutting	Multi sector; Industry;
Haiti	9,000,000	1,329,610	Adaptation	Humanitarian aid
Honduras	3,172,548	468,695	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Industry; Other social infrastructure and services
	351,995	52,002	Cross-cutting	Multi sector
India	1,489,506	220,051	Mitigation	Multi sector; Health; Industry; Water and sanitation
	6,568,827	970,442	Adaptation	Multi sector; Health
	13,266,304	1,959,891	Cross-cutting	Multi sector; Health; Energy generation and supply; Industry; Government and civil society; Water and sanitation
Indonesia	147,700	21,820	Mitigation	Trade
	3,029,943	447,627	Adaptation	Multi sector; Water and sanitation
	11,534,457	1,704,037	Cross-cutting	Multi sector; Trade; Industry; Government and civil society; Forestry; Transport and storage
Iran	2,496,100	368,760	Mitigation	Humanitarian aid
Iraq	3,503,700	517,617	Mitigation	Humanitarian aid
	4,879,629	720,889	Cross-cutting	Government and civil society
Kenya	151,552,133	22,389,477	Adaptation	Banking and financial services; Health; Multi sector; Humanitarian aid; Agriculture; Government and civil society; Water and sanitation
	11,328,039	1,673,542	Cross-cutting	Banking and financial services; Multi sector; Agriculture; Humanitarian aid

Provision of public financial support: contribution through bilateral, regional and other channels in 2012				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Korea, Democratic Peoples Rep	2,993,000	442,169	Adaptation	Humanitarian aid
	1,155,236	170,668	Cross-cutting	Multi sector
Laos	326,359	48,214	Cross-cutting	Agriculture; Forestry
Macedonia	500,000	73,867	Mitigation	Agriculture
	281,193	41,542	Cross-cutting	Agriculture; Unallocated/unspecified
Malawi	1,970,684	291,138	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Malaysia	2,111,970	312,011	Cross-cutting	Multi sector
Mali	52,844,497	7,806,955	Adaptation	Multi sector; Agriculture; Government and civil society; Forestry
	14,240,863	2,103,867	Cross-cutting	Multi sector; Government and civil society; Forestry;
Moldova	24,901,609	3,678,826	Mitigation	Energy generation and supply
	747,978	110,502	Adaptation	Multi sector; Government and civil society
	1,500,000	221,602	Cross-cutting	Multi sector
Mozambique	24,656,063	3,642,551	Mitigation	Energy generation and supply; Agriculture; Government and civil society
	8,312,993	1,228,116	Adaptation	Banking and financial servicer; Health; Multi sector; Agriculture; Government and civil society; Humanitarian aid; Other social infrastructure and services
	194,527,355	28,738,400	Cross-cutting	Multi sector; General Budget Support; Health; Industry; Agriculture
Myanmar/Burma	4,007,500	592,046	Mitigation	Humanitarian aid
Namibia	5,311,352	784,670	Adaptation	Multi sector; Government and civil society; Water and sanitation
	691,170	102,110	Cross-cutting	Energy generation and supply; Multi sector; Industry
Nicaragua	214	32	Mitigation	Multi sector
	2,443,648	361,011	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Niger	2,782,298	411,041	Adaptation	Humanitarian aid
Palestinian Administrated Area	2,837,785	419,239	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	1,250,000	184,668	Cross-cutting	Multi sector
Paraguay	3,389,576	500,757	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Peru	276,568	40,859	Cross-cutting	Multi sector
Philippines	2,443,648	361,011	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	527,993	78,003	Cross-cutting	Multi sector
Rwanda	400,000	59,094	Cross-cutting	Trade; Unallocated/unspecified
Senegal	-25,143	-3,714	Cross-cutting	Multi sector
Serbia	4,952,494	731,654	Cross-cutting	Multi sector
Somalia	2,999,900	443,189	Mitigation	Humanitarian aid
	5,000,500	738,746	Adaptation	Humanitarian aid
South Africa	500,000	73,867	Mitigation	Industry
	1,481,607	218,884	Adaptation	Multi sector
	5,031,568	743,336	Cross-cutting	Multi sector; Health; Energy generation and supply; Industry; Business and other services; Government and civil society; Education

Provision of public financial support: contribution through bilateral, regional and other channels in 2012				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Sri Lanka	12,799,906	1,890,988	Mitigation	Humanitarian aid; Water and sanitation
	2,601,303	384,302	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	264,650	39,098	Cross-cutting	Water and sanitation
Sudan	-103,186	-15,244	Cross-cutting	Government and civil society
Syrian Arab Republic	1,488,500	219,903	Mitigation	Humanitarian aid
	5,986,000	884,339	Adaptation	Humanitarian aid
Tanzania	60,198,710	8,893,426	Mitigation	Energy generation and supply
	2,522,475	372,657	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	12,338,934	1,822,886	Cross-cutting	Multi sector; Communication; Business and other services; Unallocated/unspecified; Government and civil society
Thailand	955,415	141,148	Cross-cutting	Multi sector
Uganda	538,187	79,509	Mitigation	Energy generation and supply
	4,256,677	628,858	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	13,876,611	2,050,054	Cross-cutting	Multi sector; Energy generation and supply; Industry; Government and civil society
Uruguay	804,560	118,861	Cross-cutting	Multi sector
Vietnam	2,000,000	295,469	Mitigation	Energy generation and supply
	6,979,249	1,031,076	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	19,510,324	2,882,348	Cross-cutting	Multi sector; Energy generation and supply; Industry; Forestry
Zambia	5,596,742	826,832	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	5,306,804	783,998	Cross-cutting	Energy generation and supply; Multi sector; Business and other services; Government and civil society
Zimbabwe	788,274	116,455	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
	5,273,214	779,036	Cross-cutting	Government and civil society
Reg Africa	10,000,000	1,477,345	Mitigation	Multi sector
	191,770,759	28,331,156	Adaptation	Multi sector; Fisheries; Industry; Agriculture; Government and civil society; Water and sanitation
	91,719,151	13,550,082	Cross-cutting	Multi sector; Industry; Government and civil society; Forestry; Water and sanitation
Reg Eastern Africa	2,278,215	336,571	Mitigation	Trade
	88,570,862	13,084,971	Adaptation	Multi sector; Banking and financial services; Health; Humanitarian aid; Fisheries; Trade; Government and civil society; Water and sanitation; Other social infrastructure and services
	4,082,181	603,079	Cross-cutting	Multi sector; Energy generation and supply;
Reg Lake Victoria	8,434,527	1,246,071	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Reg Southern Africa	14,679,647	2,168,690	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Water and sanitation; Other social infrastructure and services

Provision of public financial support: contribution through bilateral, regional and other channels in 2012				
	Total amount Climate specific			
Country/Region/Global	SEK	USD	Type of support	Sector
Reg West Africa	847,495	125,204	Mitigation	Forestry
	4,961,675	733,011	Adaptation	Fisheries; Humanitarian aid
Reg Asia	7,768,551	1,147,683	Mitigation	Energy generation and supply; Trade
	30,356,361	4,484,682	Adaptation	Multi sector; Agriculture
	7,424,094	1,096,795	Cross-cutting	Multi sector; Industry
Reg South Asia	700,000	103,414	Adaptation	Multi sector
Reg Southeast Asia	48,465,936	7,160,090	Adaptation	Multi sector; Banking and financial services; Health; Fisheries; Government and civil society; Other social infrastructure and services
	13,971,648	2,064,094	Cross-cutting	Multi sector; Trade; Forestry
Reg Latin America	46,179	6,822	Adaptation	Multi sector
Reg South America	402,280	59,431	Cross-cutting	Multi sector
Reg Central America	8,119,217	1,199,488	Adaptation	Banking and financial services; Health; Multi sector; Government and civil society; Other social infrastructure and services
Reg Central & Eastern Europe	617,646	91,248	Mitigation	Multi sector
	631,410	93,281	Adaptation	Multi sector; Government and civil society
	1,378,846	203,703	Cross-cutting	Multi sector
Reg Middle East	8,964,395	1,324,350	Adaptation	Water and sanitation
	4,717,235	696,898	Cross-cutting	Water and sanitation
Reg North Africa	3,150,000	465,364	Adaptation	Government and civil society
Global	35,061,532	5,179,798	Mitigation	Multi sector; Health; Industry; Government and civil society, Humanitarian aid; Trade; Forestry; Unallocated/ unspecified
	97,424,253	14,392,923	Adaptation	Multi sector; Energy generation and supply; Fisheries; Trade; Health; Agriculture; Humanitarian aid; Transport and storage; Education; Water and sanitation; Unallocated/unspecified
	448,053,547	66,192,963	Cross-cutting	Multi sector; Energy generation and supply; Banking and financial services; Trade; Industry; Communication; Business and other services; Forestry; Water and sanitation; Humanitarian aid; Unallocated/unspecified
Total 2012	**2,324,600,890**	**343,423,731**		

Exchange rate 1$= 6.7689 SEK