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Assessment of climate change policies in the context of the European Semester

Country Report: Sweden



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The report provides an overview of current emission trends and progress towards targets as well as policy developments that took place over the period from February 2013 to November 2013.

Please feel free to provide any comments or suggestions to the authors through the contacts listed above.

Short summary

Background: Sweden has long been a leader in climate-friendly policies. It has a very high proportion of renewable energy production, due to long-standing utilization of hydroelectric installations and recent advances in the deployment of wind power. Current fuel taxes are also among the highest in the EU. Transport was once quite inefficient by European standards, but has rapidly transformed due to policy changes.

Non-ETS emission reduction target: The Swedish 2020 target is -17% (compared to 2005). Between 2005 and 2011 emissions fell by -10%. According to the latest national projections submitted to the Commission and based on existing measures, emissions are projected to decrease by 19% (compared to 2005) by 2020, slightly overachieving the target by a margin of 2 percentage points.

Key indicators 2011:

GHG emissions	SE	EU
ESD EU 2020 GHG target (comp. 2005)	-17%	
ESD GHG emissions in 2011 (comp.2005)	-10%	-9%
Total GHG emissions 2012 (comp.2005)	-13%	-12%
GHG emissions/capita (tCO ₂ eq)	6.5	9.0

→ **28% lower** per capita emissions than EU average

GHG emissions per sector	SE	EU
Energy/power industry sector	26%	33%
Transport	25%	20%
Industry (incl. industrial processes)	24%	20%
Agriculture (incl. forestry & fishery)	14%	12%
Residential & Commercial	7%	12%
Waste & others	4%	3%

→ **Energy/power industry** sector followed by Transport and Industry

Energy	SE	EU
EU 2020 RES target	+49%	
Primary energy consumption/capita (toe)	5.3	3.4
Energy intensity (kgoe/1000 €)	149	144
Energy to trade balance (% of GDP)	-6.5%	-3.2%

→ **56% higher** per capita consumption; **approximately the same** energy intensity, contribution of energy to trade balance as EU average.

Taxes	SE	EU
Share of environmental taxes (% of GDP)	2.5%	2.4%
Implicit tax rate on energy (€/toe)	219	184

→ **Slightly higher** share of environmental taxes; **19% higher** implicit tax rate on energy than EU average.

Key policy development in 2013: In the last year Sweden has committed significant funds towards research in renewable energy development and deployment, supporting projects to improve the efficiency of hydroelectric installations and solar photovoltaic (PV) cells, to enhance wind turbine siting to utilize more potential locations without interfering with weather radar, and to create efficient processes for the production of renewably produced natural gas alternatives. Significant funds were also dedicated to supporting new solar PV installations. The government has also proposed to impose a biofuel blending quota for transport fuels in its 2014 budget.

Key challenges: While Sweden has made impressive progress on renewable energy and taxation, Sweden's emissions from transport, which make up 25% of national emissions, remain high. Despite government policy measures aimed at addressing these emissions, the sector's contribution is such that additional effort is likely to be required. Additionally, industrial energy efficiency is noticeably lower in Sweden than the EU average. Sweden also lacks an overarching plan for the mitigation of GHG emissions from agriculture and forestry. The agricultural sector makes up over 10% of Sweden's annual emissions and this proportion is growing.

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I Background on climate and energy policies

Climate change mitigation is an important component of Swedish policy-making, as the country prides itself on being at the forefront of greenhouse gas emissions reduction and seeks to continue its green image and legacy.

Sweden is close to reaching its EU target, under which renewable energy is to account for half of all energy consumption by 2020 (Regeringen 2012). In light of this, further promotion of renewable energy focuses less on the electricity sector and rather on sectors with relatively greater greenhouse gas abatement potential, such as transport. Sweden is aiming for net zero greenhouse gas emissions by 2050 (Regeringskansliet 2012e), with part of this target being reached through investments in emissions reductions abroad.

The Swedish Parliament decided in June 2009 on its national climate and energy targets through 2020 (Climate Bill 2008/09: 162):

- 40% reduction in GHG emissions by 2020, compared to a 1990 baseline (emissions and removals from land use, land-use change, and forestry (LULUCF) are not included)
- 20 million tonnes less CO₂e emitted from the non-ETS sectors compared to 1990 levels (this results in a much higher reduction obligation compared to the ESD target ⁽¹⁾)
- 50% renewable energy by 2020
- 10% renewable energy in the transport sector by 2020
- 20% increase in energy efficiency by 2020

The targets are to be reached by strengthening existing policies (e.g. taxes), implementing EU decisions and purchasing international carbon credits under the UNFCCC (CDM) and EU (Art 24a EU ETS Directive), with the aim of achieving two-thirds of the reductions domestically and one-third through international investments (Climate Bill 2008/09: 162).

In 2013, the Swedish government focused its activity in the climate change area on funding numerous research programmes. Projects addressing the following research areas have been awarded financing already this year: construction, maintenance, and efficiency techniques for hydropower installations (Energimyndigheten 2013a); identifying regions for future wind power development (Energimyndigheten 2013c); development of less expensive thin-film solar cells (Energimyndigheten 2013b); increasing efficiency in the production of renewable fuels (Energimyndigheten 2013f); development of techniques to create natural gas substitutes such as biogas, hydrogen, and dimethyl ether from renewable energy sources (Energimyndigheten 2013d); increasing the efficiency of district heating and cooling grids (Energimyndigheten 2013g); as well as support for basic “needs-driven” research and development (Energimyndigheten 2013h); environmentally sensitive innovations by small and medium-sized businesses (Regeringen 2013e), and; the

¹ In 1990, Sweden emitted about 72.8 Mt CO₂e. Assuming that around 65% of the emissions can be attributed to the non-ETS sectors, the reduction target would result in non-ETS emissions of 28 Mt CO₂e in 2020 (minus 33% compared to 2005 non-ETS emissions). The ESD target of Sweden is set to minus 17% of non-ETS emissions in 2020 compared to 2005 levels or 36.4 Mt CO₂e in 2020 (see also Chapter 2) (EEA 2013).

development of a method to reduce the conflict between weather radars and wind power plants (Energimyndigheten 2013k).

2 GHG projections

Background information

In 2011, Sweden emitted 61.4 Mt CO₂e (UNFCCC inventory 2011) with transport accounting for one-third of total emissions. Emissions from that sector increased slightly between 1990 and 2010, but sank between 2010 and 2011 due to the increased use of biofuels, higher fuel prices, and the use of more efficient vehicles. Emissions from energy supply increased by almost 30% from 1990 to 2010, but also declined slightly between 2010 and 2011. Emissions from energy use declined by 43% between 1990 and 2011, mainly because of Sweden's successful shift from fossil fuels to biomass in district heating that began in some areas as early as the 1970s - more than 60% of Sweden's district heating is now supplied by biofuels, such as wood pellets. Emissions from agriculture decreased slightly, due to a reduced number of dairy cows and a decrease in fertilizer use (UNFCCC inventory 2011, EEA 2012, UNFCCC 2012). From 2011 to 2012, GHG emissions are expected to be reduced further mainly through reduced emissions from energy supply and use outbalancing slight emission increases from the transport sector (EEA 2013c).

Progress on GHG target

There are two sets of targets to evaluate: 1) the Kyoto Protocol targets for the period 2008-12 (which has just ended) and 2) the 2020 targets for emissions not covered by the EU ETS.

Under the Kyoto Protocol the emission reduction target for the period 2008-2012 is plus 4% based on 1990 for CO₂, CH₄ and N₂O and on 1995 for F-gases. An evaluation of the latest complete set of greenhouse gas data (for the year 2011; there is only preliminary data for 2012) shows that Sweden's emissions have decreased by 14.8% since 1990 (EEA 2013a). The country is thus expected to meet its commitment by a comfortable margin through direct domestic emission reductions.

By 2020, Sweden needs to reduce its emissions not covered by the EU ETS by 17% compared to 2005, according to the Effort Sharing Decision (ESD) ⁽²⁾. The latest data for 2012 suggests that Sweden is on track at present to meet the Annual Emissions Allocation ⁽³⁾ for the year 2013. National projections (EEA 2013b) show that Sweden will reduce its non-ETS emissions by 19% in 2020 compared to 2005 in scenarios with existing measures. Thus, Sweden is expected to overachieve its 2020 target by 2

² Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020.

³ Commission decision of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council. Online available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:090:0106:0110:EN:PDF>

percentage points (see Table 1). However, the emissions cuts are not enough to meet the self imposed national target for non-EU ETS sectors of around 33% embodied in the respective national legislation (Climate Bill 2008/09: 162) (see footnote 1 above).

Table I: GHG emission developments, ESD-targets and projections (in Mt CO₂e)

	1990	2005	2010	2011	2012*	ESD target**		2020 Projections***	
						2013	2020	WEM	WAM
Total	72.8	67.3	65.5	61.4	58.3				
Non-ETS (% from 2005)		45.6	42.8	41.6	39.6 -13%	42.5 -7%	36.4 -17%	35 -19%	35 -20%
Energy supply (% share of total)	10.1 14%	10.8 16%	13.1 20%	10.7 17%					
Energy use (w/o transport) (% share of total)	23.0 32%	16.6 25%	14.1 21%	13.2 21%					
Transport (% share of total)	19.3 27%	21.5 32%	20.5 31%	20.0 33%					
Industrial processes (% share of total)	6.3 9%	7.0 10%	6.8 10%	6.7 11%					
Agriculture (% share of total)	9.0 12%	8.0 12%	7.8 12%	7.8 13%					

Source: UNFCCC inventories; EEA (2013b); Calculations provided by the EEA and own calculations.

* proxies for 2012

** The ESD target for 2013 and for 2020 refer to different scopes of the ETS: the 2013 target is compared with 2012 data and is therefore consistent with the scope of the ETS from 2008-2012; the 2020 target is compared to 2020 projections and is therefore consistent with the adjusted scope of the ETS from 2013-2020. 2005 non-ETS emissions for the scope of the ETS from 2013-2020 amounted to 44 Mt CO₂e.

*** Projections with existing measures (WEM) or with additional measures (WAM).

Legend for colour coding: green = target is being (over)achieved; orange = not on track to meet the target

Total greenhouse gas emissions (GHG) and shares of GHG do not include emissions and removals from LULUCF (carbon sinks) and emissions from international aviation and international maritime transport.

National projections of GHG emissions up to 2020 need to be prepared by the Member States in accordance with the EU Monitoring Mechanism ⁽⁴⁾ every two years, and the latest submission was due in 2013. The projections need to be prepared reflecting a scenario that estimates total GHG emissions reductions in line with policies and measures that have already been implemented (with existing measures, WEM), and an additional scenario that reflects developments with measures and policies that are in the planning phase (with additional measures, WAM) may also be submitted.

In the following two tables, these measures have been summarised with a focus on national measures and those EU instruments expected to reduce emissions the most. Please note that the table includes also measures that address GHG emissions covered under the ETS such as measures reducing emissions from electricity generation (e.g.

⁴ Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.

feed-in tariffs). An update on the status of the policies and measures is included in order to assess the validity of the scenarios.

Table 2: Existing and additional measures as stated in the 2013 GHG projections

Existing Measures (only important national measures)		Status of policy in November 2013
Energy	Electricity certificate system: a certain percentage of electricity used must come from renewable sources; users must purchase certificates to meet this quota.	Implemented in 2003 through the Act on Electricity Certificates (Lag om elcertifikat) and Regulation on Electricity Certificates (Förordning om elcertifikat). There were no changes in 2013.
	Grants for wind power and solar power.	Subsidies are granted for installing PV systems, introduced through Regulation No. 2009:689 on State Subsidies for Solar Panels (Förordning (2009:689) om statligt stöd till solceller). There are no special grants for wind power plants in Sweden. Wind power is eligible for support only under the electricity certificate system.
Energy Efficiency	Tax on fossil fuels: Energy taxation is based on energy content; Carbon dioxide tax: Payments according to CO ₂ emissions (per kg carbon dioxide)	Implemented under the Act on Energy Tax from 1994 including: the energy tax, carbon dioxide tax, and nitrous oxide tax (Lag (1994:1776) om skatt på energi; Lag (1990:613) om miljöavgift på utsläpp av kväveoxider vid energiproduktion).
	Building regulations, standards for energy efficiency.	Implemented. On 1 July 2013, these regulations were amended in accordance with changes to EU legislation regarding building products (Directive 305/2011 of 9 March 2011 laying down harmonised conditions for the marketing of construction products).
Waste	Rules on municipal waste planning, rules on producer responsibility for certain goods, tax on landfilling of waste, prohibition of landfilling of combustible and organic waste 2002 and 2005	Implemented since 1991.
Transport	Vehicle fuel taxes	Implemented: Tax on fossil fuels.
	Biomass fuels exempt from fuel tax	Implemented (Act on Energy Tax – Lag om skatt på energi from 1994).
	EU Requirements on new vehicles CO ₂ emissions	Implemented since 2009.
	Law on supply of renewable fuels	Implemented (Act No. 2005:1248 on the Obligation to Supply Renewable Fuels).
	Annual vehicle tax exemption for cars that are electric, hybrid, or capable of running on biofuels	Tax rebates are available for electric, plug-in hybrids that can be recharged from the electricity grid, and for cars that run on natural gas (excluding LPG) (Skatteverket 2013a).

Source: Reporting of MS in accordance with Decision No 280/2004/EC about their GHG emission projections up to 2020, May 2013.

Additional Measures (only important national measures)		Status of policy in September 2013
Transport	Quota obligation for low admixture of biofuels	In March 2013, the Swedish government proposed a new mandatory quota for renewable fuel content in gasoline and diesel: currently, renewable fuels account for about 5% and 4% of petrol and diesel, respectively. A higher quota would in practice involve introducing a new petrol variety, E10, which includes 10% renewable content. The proposed quota for diesel is 9.5%. The proposed changes will enter into force on 1 May 2014 (Regeringen 2013a).

Source: Reporting of MS in accordance with Decision No 280/2004/EC about their GHG emission projections up to 2020, May 2013.

As of November 2013, Sweden has implemented most measures listed under the WEM scenario and can hence be expected to achieve the respective emission reductions. The principal measures to be mentioned here are different fuel taxes. Sweden has also taken first steps in 2013 to implement the only additional measure that is listed under the WAM scenario, namely a new quota obligation for low admixture of biofuels. It is thus likely that Sweden will achieve its EU related 2020 target as outlined by the projections.

3 Evaluation of National Reform Programme 2013 (NRP)

In April of each year, Member States are required to prepare their National Reform Programmes (NRPs), which outline the country's progress regarding the targets of the EU 2020 Strategy. The NRPs describe the country's national targets under the Strategy and contain a description of how the country intends to meet these targets. For climate change and energy, three headline targets exist: 1) the reduction of GHG emissions, 2) the increase of renewable energy generation, and 3) an increase in energy efficiency.

The NRP focuses on various support schemes for renewable energy in both the electricity and transport sectors. In the following table, the main policies and measures as outlined in the NRP of April 2013 have been summarised, and their current status (implemented, amended, abolished, or expired) is given, with specifics on latest developments.

Table 3: Main policies and measures as outlined in the NRP, April 2013

A report on proposed legislation on a system of net debiting for offsetting energy tax and value-added tax.	
Status as stated in the NRP	The report should be presented by 14 June 2013.
Status as per Nov 2013	The report was presented as planned (SOU 2013:46).
Description of policy or measure	The report states that the introduction of net debit does not comply with EU rules on VAT. As an alternative, the report proposed the introduction of tax cuts for self-generated renewable electricity (SOU 2013:46).

Extension of the support to solar cell installation

Status as stated in the NRP "...support for solar cell installation was extended up to and including 2016 by a further SEK 210 million."

Status as per Nov 2013 Implemented through an amendment in February 2013: Förordning (2009:689) om statligt stöd till solceller - Regulation No. 2009:689 on State Subsidies for Solar Panels (Förordning 2009:689). In November 2013, the Swedish Energy Agency redistributed the funds for the years 2014-2016 to 2013, due to the large number of applications received since February 2013, including some which still have decisions pending (Energimyndigheten 2013j).

Description of policy or measure A subsidy programme for the installation of grid connected photovoltaic installations. Construction of the installations must have commenced on or after 1 July 2009 and must be completed by 31 December 2016 (Förordning 2009:689).

"A quota system for biofuel to achieve blends including biofuel in petrol and diesel in accordance with the levels permitted by the Fuel Quality Directive"

Status as stated in the NRP The Government intends to introduce it in 2014.

Status as per Nov 2013 In March 2013, the Ministry of Industry published for consultation a memorandum on measures aimed at increasing renewable fuel content in the nation's petrol and diesel (Regeringen 2013a).

Description of policy or measure The Ministry proposes extending existing tax exemptions for highly blended and clean biofuels, biogas, and E85 that would otherwise expire in 2013. It also proposes a new mandatory quota for renewable fuel content in gasoline and diesel - currently, renewable fuels account for about 5% and 4% of Swedish petrol and diesel, respectively. A higher quota would in practice involve introducing a new petrol variety, E10, which contains 10% renewable content. The proposed quota for diesel is 9.5%. The proposed changes will enter into force on 1 May 2014 (Regeringen 2013a).

4 Policy development

This section covers significant developments made in key policy areas between February and November 2013. It does not attempt to describe every instrument in the given thematic areas.

Horizontal Issues

The Swedish Environmental Protection Agency (Naturvårdsverket), in collaboration with other agencies, has begun a process for envisioning how to achieve the vision of a carbon dioxide neutral Sweden by 2050. The roadmap was published in February 2013 and names the following measures (Naturvårdsverket 2013a):

General instruments:

- a. Climate vision should permeate policy.
- b. Emissions trading.
- c. Energy and carbon taxes.
- d. Research and innovations in technologies strategic for climate.
- e. Energy efficiency.
- f. Sustainable Consumption.

Targeted instruments:

- a. The transport sector: energy efficient modes of transport, more efficient vehicles and renewable fuels.
- b. Industry: development of new carbon-free or low-carbon technologies for industrial processes
- c. Agriculture: agricultural emissions can be influenced by policy instruments directed at both the production and consumption.
- d. Absorption of carbon dioxide in forests and fields.

Concrete further steps in the process have not yet been identified.

Environmental Taxation

In Sweden, the share of environmental tax revenues in total tax revenues was at 5.66% in 2011 and thus the fourth-lowest value compared with other MS. When these revenues are compared with Sweden's GDP the share amounts to 2.51%, which is above the EU average. Since 1991, Sweden has levied an explicit carbon tax. The tax applies to fossil fuels that are used outside the EU ETS for motor and heating purposes. The country had the third-highest implicit tax rate on energy in 2010 of all EU MS, with a value of €219.3 per tonne of oil equivalent. The energy intensity of Sweden's economy in 2010 was approximately average for the EU. Despite the fact that Sweden has a very high implicit tax rate, the share of energy tax revenues in total tax revenues is the fifth-lowest in the EU (Eurostat 2013a).

No relevant changes in the regulations were identified in 2013.

Energy Efficiency

The energy intensity of Sweden's economy decreased by 15% from 2005 to 2011, although it spiked considerably between 2009 and 2010, rising 5.5% during that time. Total energy consumption decreased over the time from 2005 to 2011 by 4%. The progress even increased between 2010 and 2011, when consumption dropped 7%. Thus Sweden successfully outperformed the EU average, where the reduction rate was 4% between these years (Eurostat 2013a).

Sweden's industrial sector improved its energy efficiency between 2000 and 2010 by 6%. While significant improvements have been achieved by the machinery industry and to a smaller extent also by the paper industry, large efficiency losses can be reported for energy intensive industries. In the household sector efficiency improvements went up by 17% in the same period of time. Advancements in the efficiency of large electric appliances were most responsible for this development (Odyssey 2012).

Industrial energy consumption totaled 167,655 GWh in 2012, representing a 1% decrease compared to 2011. The reduction in energy consumption occurred primarily in the pulp and paper, metals, and chemicals industries. According to the Swedish Energy Agency, the decline in energy consumption is partly caused by the economic recession (e.g. in iron and steel industry). Also, the decreasing demand for newsprint affected the energy demand in the paper industry (Energimyndigheten 2013i).

In October 2013, the Swedish government announced new rules, which require all people involved in energy assessments to be certified by an accredited certification body (Regeringen 2013f). The rules will come into force on 1 January 2014 with a six-month transition period.

Renewable Energy

Sweden's share of renewable energy in total energy consumption was the highest in the EU in 2011 due to extensive use of biomass for heating and the fact that hydroelectric power accounts for about one-third of total energy consumption. At roughly 46.8% of the total, Sweden is coming close to achieving its EU target (49%) and its domestic goal of obtaining at least 50% of its energy from renewable sources by 2020. The share of electricity consumed that is generated from renewable sources is likewise very high at approximately 60% in 2011. Sweden has slightly increased this value compared to previous years, when it hovered around approximately 55% (Eurostat 2013b).

The main policy to promote renewable power in Sweden is a quota system involving tradable renewable energy certificates, introduced in 2003. A specified amount of the power that electricity suppliers provide to end users each year must come from renewable sources. This amount is determined by the government and increases every year. The providers (power companies) must hold a certificate for each megawatt hour (MWh) of renewable electricity generated annually to show they have fulfilled their quota. Producers of renewable power receive a certificate for each MWh they generate, meaning they can sell those to the power providers and get money not only for the actual electricity, but also for the fact that it is renewable. There is a market for the certificates, which are a tradable commodity. In 2012, this market was linked to Norway's market, which has a similar quota programme (RES LEGAL Europe 2013a).

Beyond the certificate programme, Sweden offers investment supports for certain types of renewable technologies. A recent development in this area is the implementation of new terms for such investment support for photovoltaics. As of 1 February 2013, the Swedish Energy Agency will use the funding allocated for this investment support (SEK 210 million (€24.5 million) over 4 years) to cover 35% of the costs of photovoltaic facilities, rather than 45% as before (RES LEGAL Europe 2013b).

The share of employment in the renewable energy sector was above 1% of total employment in 2010 (Green Jobs 2012, p. 3-4).

In the last six months Sweden announced numerous funding programmes for research in more efficient renewable energy technologies. Following support measures have been announced:

- Research regarding hydropower will be supported with 11 million SEK (approx. €1.25 million). The *Vattenbyggnadsbyrån* project aims at developing tools and methods for new construction, renovation, operation and maintenance of hydraulic structures in the hydropower industry and has been granted 3.6 million SEK (approx. €410,000). The *Water Turbines and Generators* aims to make existing hydropower generation more efficient, improving electromechanics, rotor dynamics, fluid mechanics and machine elements (Energimyndigheten 2013a).
- Wind power research will receive 40 million SEK (approx. €4.5 million). The research programme focuses on geographic areas of future wind power development, including the forest environment, very cold climatic zones, and offshore (Energimyndigheten 2013c).
- Research into developing cheaper solar cell varieties using copper indium gallium selenide (CIGS) film will receive 16.4 million SEK (approx. €1.86 million) (Energimyndigheten 2013b).

- Research on biofuel production will be supported with a grant of 21 million SEK (approx. €2.38 million). This research aims to solve problems that occur during energy conversion of waste and biofuels for heat and electricity production including supply, processing, and turbine technology (Energimyndigheten 2013k).
- Research in renewable energy gases will be given 32 million SEK (approx. €3.7 million) in funding. This research is aimed at creating new knowledge for the development of production, distribution and use of renewable energy gases. The goal of the research programme is to find energy-efficient technologies for the production of renewable energy gases such as biogas, hydrogen and dimethyl ether (DME) (Energimyndigheten 2013d).

Apart from funding, in September 2013, the Marine and Water Authority and the Swedish Energy Agency decided to develop a joint national strategy for hydropower plants in Sweden where both energy and environmental interests will be taken into account. The goal of the strategy is to envision how water power can best be used with minimal environmental impact. Work on the strategy is expected to be completed in spring 2014, and the proposal will then be forwarded for consultation to various government agencies, interest groups, and environmental organizations (Energimyndigheten 2013e).

In the framework of the state budget for 2014, the Swedish Government proposed tax cuts for self-generated renewable electricity. The tax reduction will make it more attractive for property owners to produce their own electricity by installing small-scale renewable electricity plants. It is planned that the tax reduction will come into force on 1 July 2014 (Regeringen 2013d).

During the period 2013 – 2016, the Government will allocate 210 million SEK (approx. €23.6 million) to support PV installations. In 2013, 107.5 million SEK (approx. €12 million) were allocated to county administrative boards in Sweden, who are responsible for these budgets. Since 1 February 2013, when the new regulation to support solar cells came into force, over 1,600 applications were received for a total of approximately 220 million SEK (approx. €24.7 million), and some of them still have decisions pending. Therefore, on 6 November 2013, the Swedish Energy Agency redistributed the funds for the following years to the year 2013 (Energimyndigheten 2013j).

Beginning in October 2013, the Swedish Energy Agency will support the Swedish Meteorological and Hydrological Institute (Sveriges meteorologiska och hydrologiska institutet – SMHI) project Wind Power Plant + Complementary Radar (VINDRAD + Kompletteringsradar), aiming at the development of a method to reduce the conflict between weather radars and wind power plants. This may then open significant new areas for wind power projects in prime locations across the country, as one of the many obstacles to the establishment of wind plants in favourable situations are the weather radar stations operated by the Armed Forces and the SMHI. Wind turbines affect the measurements of the radars and through the use of a complementary radar system, images from the areas "shadowed" by the wind turbines can be gathered. The project will run from October 2013 until January 2015. The Energy Agency's support totals 1,995,000 SEK (€ 230,000) (Energimyndigheten 2013k).

Energy Networks

The effort to establish a knowledge platform on smart grids continues. The council that runs this platform is working on a draft action plan for how the smart grid can and should be developed in Sweden and what barriers exist for such development. The plan will also

address the division of responsibilities between different actors, how the smart grid business model might look, and what new services will be required. The final report is due to be published by 1 December 2014 (SOU 2012a).

Transport

Emissions from transport have in general increased between 1990 and 2011, but since 2005 there has been a downward trend. However, due to emissions reductions in other sectors, their proportion among Sweden's total emissions has increased to 33%. These emissions are therefore especially important to address in the future (see Table 1).

Average emissions for newly registered cars are moderate in Sweden with a level of 135.4 g CO₂/km. This value is the 15th highest in the EU, but has decreased at a higher rate than the EU average between 2005 and 2012 (Eurostat 2013a). While Sweden does not charge a registration tax, its circulation tax is partly based on CO₂ emissions and cars emitting less than 120g CO₂/km, alternative fuel cars, and electric cars are exempt from the tax for five years ("environmental car premium"). Additionally, Sweden levies a time-based road toll for Heavy Duty Vehicles (HDVs) above 12t, which is called Eurovignette (ACEA 2012, CE Delft 2012).

In 2011 the total carbon emissions from transport fell by one percent compared to 2010. The reason for the decrease is a higher share of energy efficient cars and increased share of biofuels. CO₂ emissions from new produced passenger cars fell from an average of 153 gCO₂/km in 2010 to 144 gCO₂/km in 2011. It is the third year in a row of large efficiency increases. In 2011 for new light trucks, the average CO₂ emissions amounted to 179 g CO₂/km (Transportstyrelsen 2012). Recent and up to date projections on transport emission developments could not be identified – but forecasts on final energy consumption by fuel for the next years show a stabilisation of overall energy use (see table below).

Final energy consumption in 2012 and forecast for 2013-2015, domestic transport

	Unit	2012	2013	2014	2015
Petrol	1,000 m ³	3,724	3,560	3,405	3,262
Low- ethanol blends	1,000 m ³	192	180	172	165
Diesel	1,000 m ³	4,577	4,583	4,718	4,853
Low-FAME blends	1,000 m ³	251	239	246	253
Low-HVO blends	1,000 m ³	111	200	200	200
Eo 1	1,000 m ³	23	23	25	27
Eo 2-5	1,000 m ³	50	48	48	48
Jet fuel domestic	1,000 m ³	213	202	202	204
Ethanol	1,000 m ³	215	219	217	212
FAME	1,000 m ³	42	44	46	48
Electricity	GWh	3,043	3,049	3,088	3,138
Biogas	million m ³	83	100	109	123
Natural gas	million m ³	56	61	66	74
Sum	TJ	331,758	329,462	329,932	331,172
	TWh	92.2	91.5	91.6	92.0

Source: Energimyndigheten 2013k. Abbr.: FAME: fatty acid methyl ester; HVO: hydrotreated vegetable oil

Energy tax rates for both diesel and petrol are among the highest in the EU. Lower rates apply to diesel but this is outweighed by a higher CO₂ tax (European Commission 2013).

Numerous policies aim at cutting Sweden's transport sector emissions. Biofuels receive a tax exemption and vehicles ranked as most fuel efficient in their class are exempted from regular vehicle taxes for five years (Skatteverket 2013c).

In the 2014 budget, the Government has proposed a green car package, which will consist of three parts:

- Continued tax deduction on green cars through 2016;
- New compulsory biofuel quota system to increase the proportion of low-blended renewable fuels in petrol and diesel;
- Continued tax exemption for high-blended biofuels (Regeringen 2013c).

Agriculture

Emissions from Swedish agriculture accounted for 13% in 2011. These came largely from agricultural soils and livestock production (enteric fermentation and manure management emissions) (UNFCCC (n.d.)). Agricultural soils contributed 57% of the agricultural GHG emissions, excluding CO₂ which is accounted for under LULUCF and estimated to be 3,000 kt of CO₂ per year (Regeringen (n.d.)). In line with the overall generational goal for 2020, Swedish environmental policy has 16 environmental quality objectives that include "Reduced climate impact" and "A varied agricultural landscape" (Swedish Government 2013). Emissions from agriculture declined by 13.6% from 1990 to 2011, which is attributed to decreasing numbers of farm animals (UNFCCC n.d.; Swedish Government 2013). However, there are few policies which directly address agricultural emissions in Sweden, mainly based on the EU-level Common Agricultural Policy (CAP). The recent CAP reform for 2014-2020 aims to "green" the Pillar 1 direct farm payments by requiring more environmental measures be met by farmers ⁽⁵⁾. Additionally, Pillar 2 of the CAP regarding rural development requires Member States to include "agri-environment-climate" measures into their Rural Development Programmes ⁽⁶⁾. This may incentivise decreases in emissions from agricultural land management in Sweden even further.

Land Use, Land Use Change and Forestry

Emissions from LULUCF and agriculture in Sweden decreased by almost 20% from 1990 to 2011 (UNFCCC (n.d.)). A significant portion (over 65%) of land in Sweden is forest land, defined under the Swedish Forestry Act (SLU 2012). Additionally, Sweden has 5 million hectares of bog- and marshlands, which are extremely important stores of carbon (Skoggstyrelsen 2013a). These land types are part of the land use, land use change and forestry (LULUCF) category in Sweden. LULUCF is very important in terms of overall emissions due to its potential for removals of GHG emissions, which constituted -

⁵ Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 december 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009.

⁶ European Commission (2013) Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 december 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005.

35,231.7 Gg CO₂eq in 2011. Sweden's overall GHG emissions reduced by over 50% when those LULUCF removals were included (UNFCCC (n.d.)).

Accordingly, the Swedish Forest Agency (Skogsgstyrelsen 2013b) states that "The total amount of carbon in above-ground tree biomass is steadily increasing". However, the Swedish Environmental Protection Agency noted that net removals from LULUCF have gradually decreased in recent years. The decrease is primarily due to the fact that felling increased more than forest growth and to some extent to the storms in 2005 and 2007 (Naturvårdsverket 2013b).

Sweden's forest production is a strong industry and is export-oriented. Swedish forestry policy passed in 1993 by the Swedish Parliament, the Riksdag, aimed to promote two objectives in forestry: production and environmental quality (Regeringskansliet 2013h). Under the Swedish Forestry Model, the ability of forest owners to manage forests largely independent from regulation, aside from "ambitious environmental objectives", is noteworthy since over 80% of forests in Sweden are privately owned (Swedish Forest Industries Federation 2011). Sweden's national climate and energy targets for 40% below 1990 levels in 2020 include non-ETS emissions, such as LULUCF, and only a few policies directly address carbon emission from this specific sector. An initiative called the "Forest Kingdom" by the Swedish Government aims to increase advice to the forestry sector in order to improve environmental consideration and forest management. Also, a new strategy for long-term sustainable use is being developed, with final proposals due in 2014. Forest emissions and removals are indirectly affected by existing legislation as well, and particularly the adoption of voluntary certification schemes in which private forest owners participate has led to more land set-asides and increased uptake of carbon (NRP 2013).

5 Policy progress on past CSRs

As part of the European Semester, Country Specific Recommendations (CSRs) for each Member State are provided by the EU Commission in June of each year for consideration and endorsement by the European Council). The recommendations are designed to address the major challenges facing each country in relation to the targets outlined in the EU 2020 Strategy.

No CSRs related to climate change and energy were issued for Sweden in 2013.

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