

Country profile – Sweden

The section 'Key climate- and energy-related data' was prepared by the EEA. It includes the latest data available as of 31 July 2014

The section 'Climate and energy policy framework' was prepared by eclareon and Ecologic Institute, Germany. It includes the latest information on national policies and measures available as of 31 May 2014.

For methodological details and other country profiles, see www.eea.europa.eu/themes/climate/country-profiles.

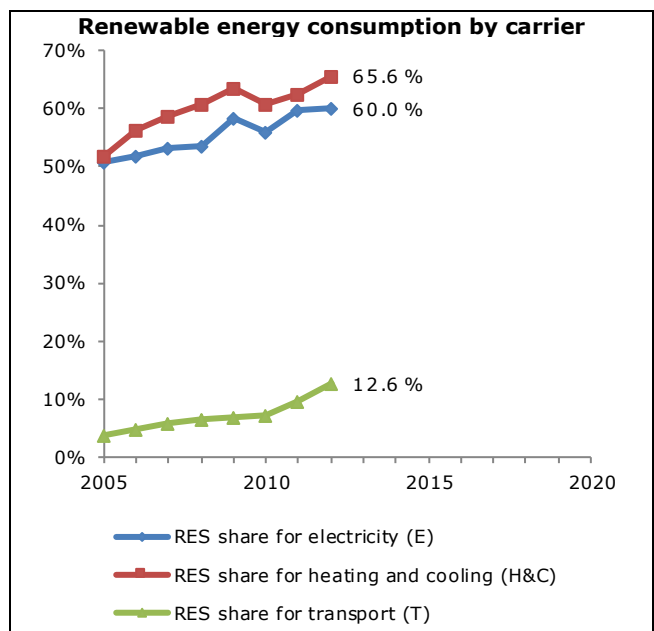
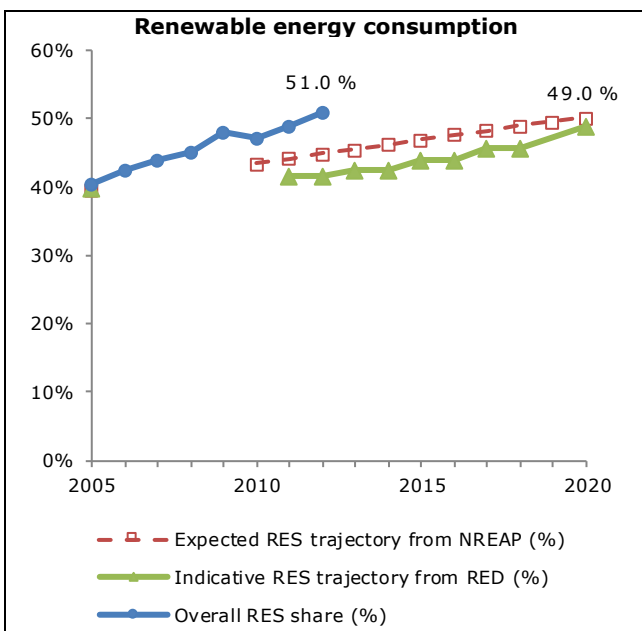
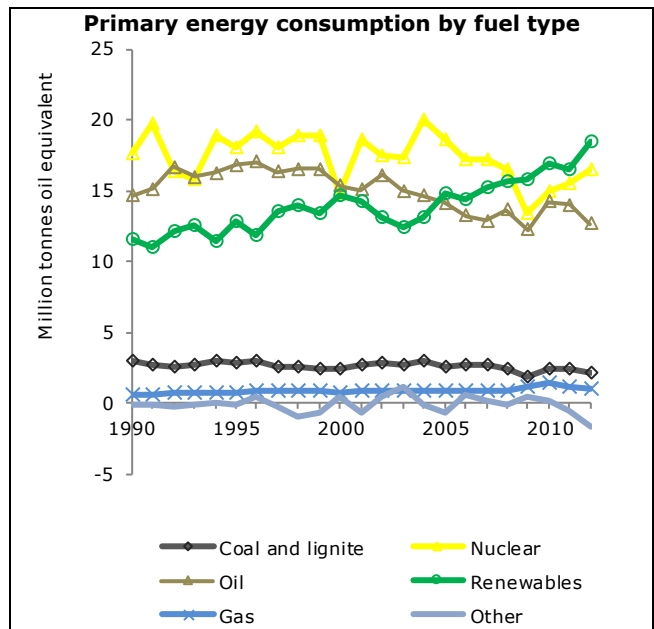
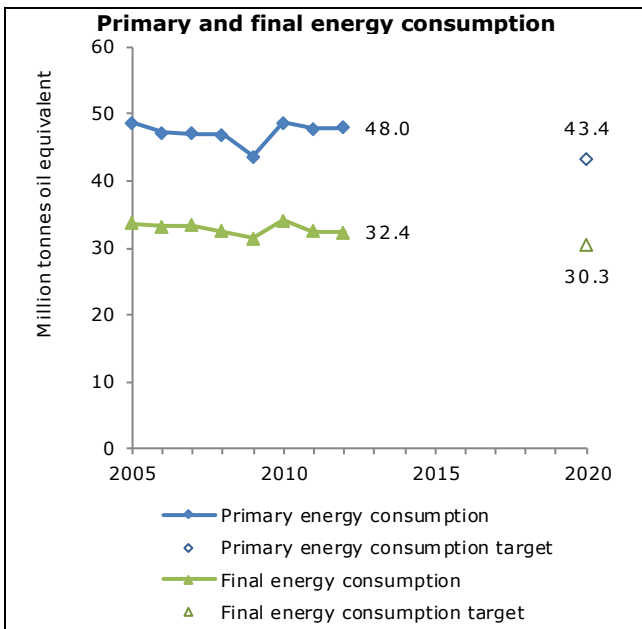
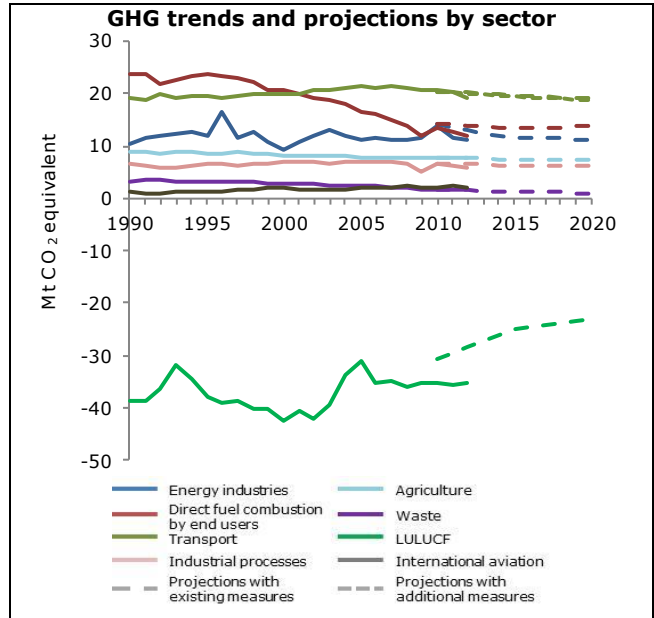
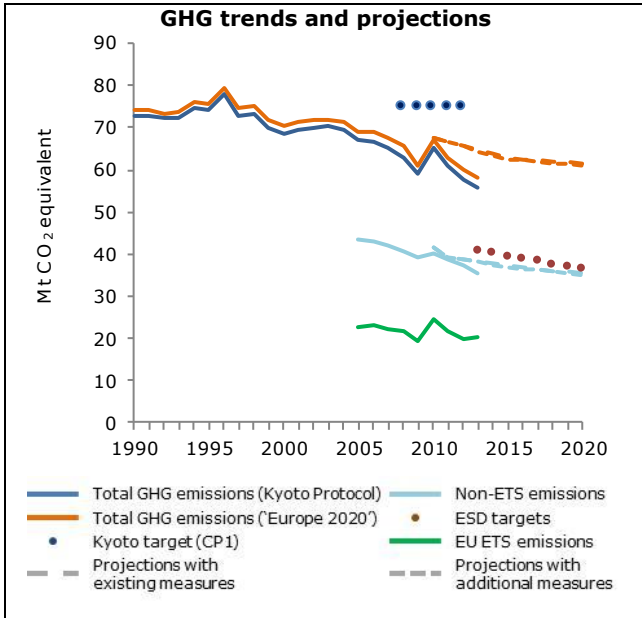
Key climate- and energy-related data — Sweden

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO ₂ -eq.)	66.9	60.8	57.6	56.0	4 544.2
GHG per capita (t CO ₂ -eq./cap.)	7.4	6.5	6.1	5.9	9.0
GHG per GDP (g CO ₂ -eq./PPS in EUR)	271	205	188	179	350
Share of GHG emissions in total EU-28 emissions (%)	1.3 %	1.3 %	1.3 %	1.3 %	100.0 %
EU ETS verified emissions (Mt CO ₂ -eq.)	19.4	19.9	18.2	20.1	1 848.6
Share of EU ETS emissions in total emissions (%)	29.0 %	32.7 %	31.5 %	35.9 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	- 13.0 %	- 12.6 %	- 20.1 %	- 46.8 %	- 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	8.1 %	36.9 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO ₂ -eq.)	43.5	38.7	37.2	35.3	2 566.6
Key data on renewable energy	2005	2010	2011	2012	EU 2012
Share of renewable energy in gross FEC (%)			48.8 %	51.0 %	14.1 %
() = including all biofuels consumed in transport	(40.5 %)	(47.2 %)			
Share of renewable energy for electricity (%)	50.9 %	56.0 %	59.9 %	60.0 %	23.5 %
Share of renewable energy for heating and cooling (%)	51.8 %	60.9 %	62.5 %	65.6 %	15.6 %
Share of renewable energy for transport (%)			9.4 %	12.6 %	5.1 %
() = including all biofuels consumed (%)	(3.9 %)	(7.2 %)			
Key data on energy consumption	2005	2010	2011	2012	EU 2012
Primary energy consumption (Mtoe)	48.7	48.7	47.8	48.0	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	5.4	5.2	5.1	5.1	3.1
Final energy consumption (Mtoe)	33.7	34.1	32.4	32.4	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.7	3.6	3.4	3.4	2.2
Efficiency of conventional thermal electricity and heat production (%)	89.7 %	87.2 %	88.5 %	88.3 %	50.0 %
Energy consumption per dwelling by end use	2005	2009	2010	2011	EU 2011
Total energy consumption per dwelling (toe/dwelling)	1.71	1.61	1.47	1.08	1.42
Space heating and cooling (toe/dwelling)	1.17	1.09	0.94	1.08	0.96
Water heating (toe/dwelling)	0.18	0.17	0.17	n.a.	0.18
Cooking (toe/dwelling)	0.03	0.03	0.03	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.33	0.32	0.32	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)			
2013 ESD target (% vs base year)	- 7.0 %	2020 ESD target (% vs base year)	- 17.0 %
2013 ESD emissions (% vs base year)	- 19.5 %	2020 ESD projections WEM (% vs base year)	- 19.3 %
		2020 ESD projections WAM (% vs base year)	- 20.3 %
Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.			

Progress towards renewable energy targets			
2012 RES share in gross final energy consumption (%)	51.0 %	2011–2012 indicative share from RES Directive (%)	41.6 %
2020 RES target	49.0 %	2012 expected share from NREAP (%)	44.9 %
The average share of renewable sources in gross final energy consumption for 2011–2012 was 49.9% (17.5 Mtoe), which is higher than the indicative RED target for 2011–2012 (41.6%). At the same time, the share of renewables in 2012 (51.0 %) is higher than the expected 2012 NREAP target (44.9 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 3.4%. In order to reach its 2020 NREAP target, Sweden needs an average annual growth rate of 1.2% in the run-up to 2020. In absolute terms, this is equivalent to 0.5 time its cumulative effort so far.			

Progress towards energy efficiency targets			
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	- 0.2 %	2005–2012 average annual change	- 0.6 %
2012–2020 average annual change to target	- 1.2 %	2012–2020 average annual change to target	- 0.8 %
Between 2005 and 2012, primary and final energy consumption did not decrease at a sufficient pace for Sweden to be on track to meet the 2020 reduction targets, despite energy efficiency improvements in conversion (through the penetration of renewable powered CHP) and in end-user sectors (through dedicated programs for energy intensive industries, measures targeting the building stock, such as building labelling requirements, and high penetration of renewables in the commercial sector). Tackling the increasing consumption of the energy sector (+ 15 % between 2005 and 2012) and electricity consumption in the service sector (+ 18 % over the same period) could contribute to further reduce energy consumption and put Sweden fully on track to meet its 2020 energy targets.a			



Climate and energy policy framework

Challenges and opportunities

While Sweden is very successful in deploying renewable energy, other sectors such as transport, energy efficiency in industry and buildings, and agriculture remain a challenge. Transport is the largest emitter with 33 % of national emissions. Carbon dioxide (CO₂) emissions per kilometre of newly registered cars have declined considerably during the last decade but remain at the upper end of old EU Member States, despite targeted tax measures. If 12 % of all petrol cars were replaced by plug-in hybrids and electric cars, emissions could be reduced by 20 %, according to Vägval Energi (2008).

Industrial energy efficiency is noticeably lower in Sweden than the EU average and the main policy instrument — voluntary agreements with industry in exchange for tax reductions — was discontinued in 2012. However, the reduction of energy consumption of industry would reduce GHG emissions and would also help to increase competitiveness of Swedish companies in the long term. Studies suggest that cumulative energy savings potential among the Swedish energy-intensive industry is high and that many measures would have payback times of less than a year, including industrial insulation (Xylia and Silveira, 2014; Ecofys, 2012).

Also, energy efficiency of households scores low in comparison to other EU Member States. Residential buildings currently account for 21 % of Sweden's overall energy consumption. A recent study suggests that annual energy demand in residential buildings could be reduced by 53 % and associated CO₂ emissions by 63 % (compared to 2005 levels) if a catalogue of measures was implemented, such as heat recovery systems or reduction of indoor temperatures (Mata et al., 2013).

Climate and energy strategies

Sweden has established so-called generational goals for 2020, including the limitation of climate impacts. An Environmental Objectives Council, a special government-appointed body, is monitoring the progress towards these objectives. The 2009 Integrated Climate and Energy Policy sets out Sweden's targets for 2020, including 40 % GHG reduction, 50 % share of renewable energy in total energy use, 10 % renewable energy in the transport sector and a 20 % increase in energy efficiency (Climate Bill 2008/09: 162 and 163). Furthermore, Sweden aims at a fossil fuel-independent vehicle fleet by 2030 and zero net GHG emissions by 2050. Various action plans aim at implementing these objectives, including an action plan on energy efficiency and renewable energy. Sweden is currently in the process of agreeing on a 2050 Climate Roadmap for net carbon neutrality, of which a first proposal was published in spring 2014. To implement its climate targets, Sweden mainly makes use of pricing instruments, such as high energy taxes, and additional CO₂ taxation since 1991.

Renewable energy

Sweden has a very high proportion of renewable energy production, due to long-standing utilisation of bioenergy and hydroelectric installations and recent advances in the deployment of wind power. The principal instrument for the promotion of **renewable electricity** is a quota system involving tradable renewable energy certificates, introduced in 2003. In this scheme, electricity suppliers are required to hold certificates for a specific share of their supply. This amount is determined by the government. Since 2012, Norway and Sweden have a common electricity certificate market and a common target.

Since 2009, Sweden also offers investment support for the installation photovoltaics with a funding of SEK 210 million (EUR 24.5 million) between 2013 and 2016 (RES Legal, 2013). Various funding programmes are dedicated to research on hydropower, wind power, solar cells and biofuel production. For wind power, Sweden adopted more favourable conditions in spatial planning. To raise awareness, the 2010 Guarantees of Origin of Electricity Act obliges electricity providers to give final customers clear information on the origins of their electricity.

Sweden supports **renewable heat** through an exemption from the energy tax, the carbon tax and the tax on nitrogen oxide emissions (§ 1 Act No. 1990:613), and household also can benefit since 2009 from an income tax deduction of labour costs of the installation of renewable heat systems. Sweden estimates that fossil-based heating will be discontinued by 2030 with existing instruments only (MoE, 2014).

Energy efficiency

Sweden's energy intensity is still high but the country aims to reduce its energy consumption by 20 % by 2020 and currently is, with some uncertainties, on track to meet this target. The country mainly relies on taxation instruments, research and voluntary measures to promote energy efficiency.

Sweden has the third highest implicit **tax rate** on energy in the EU, with high excise duties on energy products, and a high VAT rate of 25 %. Since 1991, Sweden also levies a CO₂ tax on petrol, diesel oil, heating oil and coal that is gradually increasing. These taxes have helped to reduce emissions from district heating and from the residential and commercial/institutional sectors.

Cogeneration of electricity and heat is promoted through the quota system for renewables as described above. As of 1 January 2013, cogeneration covered by the EU Emissions Trading System (ETS) is exempt from CO₂ tax (MoE, 2014).

To address energy efficiency in **industry**, Sweden has established the Programme for Energy Efficiency in Energy Intensive Industry (PFE), which offered companies an exemption from the energy tax on the electricity used in manufacturing processes. In return, companies have to commit to carry out an energy survey, to introduce an energy management system and to undertake energy efficiency measures with short payback periods. The PFE was introduced in 2004 but is not open anymore to new entrants since it violates EU state aid rules. Sweden is currently working on a new policy instrument (MoE, 2014). Small and medium-sized enterprises and farms are eligible for grants covering 50 % of the costs of energy surveys since 2010. This scheme will continue at least until the end of 2014.

For **buildings**, minimum energy performance standards are in place for new and modernised buildings and Energy Performance Certificates are mandatory. The building regulation setting the performance standards was tightened in 2011 to ensure a more efficient use of heating and electricity in refurbished buildings. The government also supports the demonstration of low-energy and zero-energy buildings (IEA, 2013). Sweden has rolled out smart meters in almost every household, and consumers have the choice of hourly metering. A Smart Grid Council was established to

set up a national action plan by end 2014 (IEA, 2013).

Transport

Sweden recently adopted a national transport plan for 2014–2025, with a budget of SEK 522 billion (EUR 58 billion). Sweden also aims at having a vehicle fleet independent of fossil fuels in 2030. Consultations on a new government report, 'Fossil Freedom on the road', were completed in spring 2014. Proposed measures include developing attractive and accessible cities, infrastructure measures, more efficient vehicles, use of biofuels and electric vehicles.

While Sweden does not charge a registration **tax**, its circulation tax is partly based on CO₂ emissions, and cars emitting less than 120 g CO₂/km, alternative fuel cars and electric cars are exempt from the tax for 5 years (environmental car premium). 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).

To promote **renewable energy** in transport, the 2006 Renewable Fuels Act requires the majority of filling stations to provide at least one renewable fuel. Since 2013, Sweden exempts sustainable biofuels from the CO₂ tax, and applies reduced energy tax rates. In the 2014 budget, the government proposed a new green car package that will partly replace former policy instruments. It includes continued tax deduction for green cars until 2016, a new compulsory biofuel quota system to increase the proportion of low-blended renewable fuels in petrol and diesel, and continued tax exemption for high-blended biofuels (MoE, 2014).

The new national transport plan promises major investments in railway infrastructure, including new high-speed tracks between major cities, and in 400 km of new cycling paths.

Fluorinated gases (F-gases)

In 2009, Sweden considered introducing a tax on F-gases (Regeringskansliet, 2009) but since then the topic has not been taken up again.

Agriculture

There is no comprehensive strategy for addressing emissions from agriculture and there are few policies that directly address agricultural emissions. Sweden is gradually phasing out the CO₂ tax relief on fuels used in agriculture (currently at 30 % of the standard rate), and full rates will apply from 2015 onwards (MoE, 2014). A tax on fertilisers was abolished in 2010. In addition, the government did not decide to implement a proposal for an action plan to reduce nutrient losses and GHG emissions from agriculture presented in the 2010 programme (MoE, 2014). Reducing nitrogen leakage in agriculture has the potential to reduce CO₂ emissions by 0.5 million tonnes by 2020 (McKinsey, 2008).

Waste

Sweden is a frontrunner in waste management with 50 % of household waste being recycled and only 4 % being sent to landfill. The remainders are used in a Waste-to-Energy programme that helps Sweden to fuel 20 % of its district heating. Forecasts indicate that Sweden will be able to reduce its GHG emissions from waste by 76 % by 2020 compared to 1990 levels (Avfall Sverige AB, n.d.). The 2012–2017 Waste Management Plan sets out the policy measures for waste in the construction sector, in households, resource management in the food chain, waste treatment and illegal export of waste (Naturvårdsverket, 2012). Since 2000, Sweden levies a landfill tax with gradually increasing rates. Additionally, landfill bans were established for separated combustible material (2002) and organic material (2005).

Land use, land-use change and forestry

Over 65 % of land in Sweden is characterised as forest land, and removals from land use, land-use change and forestry have gradually decreased in recent years. In 2011, Sweden started its 'Forest Kingdom' initiative that promotes the sustainable use of forests. As part of this initiative, the government provides increased advice to the forestry sector on improved forest management, started information campaigns on forestry and climate change in the framework of the programmes Forestry in a changed climate and Forest owners and climate (Ministry for Rural Affairs, 2013).

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