

Information on LULUCF actions by Sweden

First progress report

2016

This information on LULUCF actions by Sweden responds the request set out in article 10 of Decision [529/2013/EU] on Land-Use, Land-Use Change and Forestry.

Sweden

Background

This information on LULUCF actions by Sweden responds the request set out in article 10 of Decision [529/2013/EU] on Land-Use, Land-Use Change and Forestry. In this report Sweden submits to the Commission information on the progress in the implementation of LULUCF actions.. Sweden also provides information on emissions and removals reported to the Kyoto protocol and the EU. Projections of emissions and removals are not included in this report. New projections of removals and emissions will be reported to EU in March 2017.

The information in this report builds on Sweden's initial report on LULUCF actions from 30th June 2014. This report also includes other sources such as "*Sweden's sixth national communication on climate change*", "*National Inventory Report Sweden 2016*" and "*Sweden's Second Biennial Report under the UNFCCC*".

The work has been conducted by the Swedish Environment Protection Agency in collaboration with the Swedish Forest Agency and the Swedish Board of Agriculture.

Stakeholders have been consulted and their comments have been taken into consideration.

1. Reported emissions and removals

Information on emissions and removals from LULUCF-activities was reported to EU on 15 January 2017. Information on past trends of emissions and removals 1990-2014 can be found in the "National Inventory Report Sweden 2016" submitted under the United Nations Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP). Sweden will submit the National Inventory Report 2017 to the UNFCCC in April 2017.

The total LULUCF sector has constituted a large carbon sink since 1990 although there are substantial emissions from forest and agriculture land on drained peatlands¹

¹ Swedish Environmental Agency (2016) National Inventory Report Sweden submitted to UNFCCC

Table 1. Emissions (+) and removals (-) from LULUCF-activities reported to EU (submission 15 January 2017).

	Emissions (+) and removals (-) in Mt CO ₂ -eq			
	Base year 1990/ FMRL corrected*	2013	2014	2015
Afforestation/Reforestation	N/A	-1,2	-1,3	-1,4
Deforestation	N/A	3,6	3,2	2,2
Forest Management	-34,1*	-53,2	-53,2	-53,5
Cropland Management	3,5	4,4	4,0	-0,6
Grazing land Management	-0,02	0,00	0,02	0,04

*Technical correction (7,268 Mton CO₂ eq) to the forest management reference level (-41,336 Mton CO₂ eq) submitted to UNFCCC on 16 April 2011 "Submission of information on forest management reference levels by Sweden".

The total size, variation and trend of the net removals in the LULUCF-sector are mainly affected by the carbon stock change in the activity Forest Management, dominated by the net removals in the living biomass pool. Forest management has been a large carbon sink from 1990 to 2015. The net removals in forests management during the years 2013-2015 are considerably larger than the corrected forest management reference level (FMRL), -34,1 Mton CO₂ eq, table 1. The FMRL is based on a scenario in which felling is assumed to be at the level of what is regarded as sustainable in the long term, i.e. set to the highest possible without decreasing the future standing stock while excluding areas for nature conservation and volumes not available for harvesting in production areas due to environmental legislation. However, in the reported years (until 2015) the harvest level has been lower than the highest possible level of what was regarded as sustainable which result in a difference between the FMRL and the reported figures. There is also an increased removal in mineral soils (about 5Mton CO₂eq between 2003 and 2015). In the forest management reference level it was assumed that the removals in mineral soils would be more stable.

The activities Afforestation/Reforestation and Deforestation are relatively uncommon in Sweden. The trend for Afforestation/Reforestation is an increasing removal due to increasing growth and due to increase in acreage (Table 1). The reported removals during the years 2013-2015 are slightly lower than the projected removals around -2 Mton CO₂ eq, reported in Sweden's initial report of LULUCF actions, 2014. There is no clear trend in Deforestation. The reported emissions during the years 2013-2015 are in the same range as the projected emissions, around 3 Mton CO₂ eq, reported in Sweden's initial report of LULUCF actions.

The carbon stock change in Grazing land Management was small during the period 1990-2015. The reported values during the years 2013-2015 are in the same range as the projected removals, around -0,1 Mton CO₂ eq, reported in Sweden's initial report of LULUCF actions.

In contrast, Cropland Management showed large inter-annual variation in emissions during the period 1990 to 2015 and there is no clear trend in emissions. The reported emissions during the years 2013-2014 are considerable higher than the projected emissions of around 1,7 Mton CO₂ eq, reported in Sweden's initial report of LULUCF actions, while the emissions in 2015 are considerable lower. The substantial difference between reported and projected emissions depends on the changes in methodology.

2. Agricultural land

The Swedish Board of Agriculture has estimated the potential to reduce the greenhouse gas emissions from Swedish agriculture to 2050, as a part of the government position to develop a road map towards an emissions-neutral Sweden 2050². In this context, carbon dioxide fluxes from soils and vegetation were also included. Appropriate areas for action and potential measures were presented in the report submitted on 30 of June, 2014. The ongoing work within these areas is presented below.

Sweden is currently compiling and reviewing actions taken within the agriculture sector to reduce emissions, including actions accounted within LULUCF, one purpose being to identify areas where further actions could be taken.

Carbon dioxide emissions from cultivated mineral soils

Different measures can be taken in order to increase soil carbon content, e.g. addition of organic material or including grass or catch crops in the crop rotation. Which measures that are suitable in order to increase soil carbon content differ among farms, and it is therefore difficult to suggest general measures to be applied broadly. To this end, the Swedish Board of Agriculture concluded that information and knowledge transfer is one suitable policy instrument. The Swedish Board of Agriculture works with information and knowledge transfer to farmers. Within the Rural Development Program, Sweden has developed an advising program called "Focus on Nutrients". One part of the program is giving advice on crop rotation and soil fertility, including advice regarding soil carbon management and the effect of different management practices on carbon content. Within the Rural Development Program, Sweden is also supporting grass production in intensive grain producing areas and the inclusion of catch crops in the crop rotation.

Outside the main grain producing regions, grass is the most commonly grown crop and the area of grass with long turnover is increasing. Also the share of permanent grassland, as calculated within the Green payment scheme under the Direct payment within CAP, is increasing in Sweden.

Based on the rules for direct payment to farmers, there is a cross-compliance requirement concerning soil carbon content. To receive full payment under the Basic Payment Scheme, Swedish farmers are not allowed to burn stubble.

Soil management and its effect on soil fertility, carbon content and economy is also a field of high interest for researchers and the farming community and there are various projects involving farmers and researchers on this topic.

Carbon dioxide emissions from organic soils

Several measures have been discussed in order to decrease emissions of carbon dioxide from cultivated organic soils, and research on their potential as effective measures are ongoing. Sweden is currently investigating whether it would be environmentally and economically feasible to rewet organic agriculture soils in order to reduce greenhouse gas emissions from these soils.

² Swedish Board of Agriculture (2012a) A climate friendly agriculture in 2050. Report 2012:35 (In Swedish).

In the Rural Development Program for 2014-2020 there is support for creating wetlands on agricultural soils and support could also be given for management of wetlands. The main purpose of the support is to promote biodiversity and reduce nutrient leakage and the wetlands can be established on mineral soils as well as organic soils. Organic soils could be prioritized by the Country Administrative Boards based on regional assessments.

Rules regarding land drainage are included in the Swedish Environmental Code, which is a coordinated, broad and stringent environmental legislation aimed at promoting sustainable development that will enable present and future generations to live in a good and healthy environment. In central parts of the southern Swedish highlands and north of the limes norrlandicus (the biogeographical boundary of northern Sweden), drainage – defined as drainage intending to permanently improve 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. Historically, organic soils were drained for agriculture production but with the current regulations, virtually no organic soils are drained and turned into agricultural use.

Carbon dioxide fluxes from grassland

In the Swedish National Inventory Report, grasslands are defined as unfertilized pasture land³. Such grasslands in Sweden are on average net sinks of carbon dioxide. The major part of the carbon storage is in trees growing on pasture land, and the soils only constitute a small sink. The management of pasture land is supported by agri-environmental and climate measures in the Swedish Rural Development Program. Through national legislation and the requirements for the agri-environmental support and greening payment, actions such as plowing and fertilization are normally not permitted.

Since 2015 pastures with more than 60 stems per hectare are eligible for payment under the Basic Payment Scheme within pillar 1, thus giving increased incentives for keeping trees on pasture land. This change is an effect of changes of the EU-regulations for the Basic Payment Scheme.

3. Forest land

Non-exhaustive list of appropriate measures that effect the mitigation potential

The following policy measures can have other main purposes, but can also contribute to reduce emissions and maintain or increase removals:

1. Replacing greenhouse gas intensive materials with forest raw materials.
2. Replacing fossil energy with bioenergy, including from harvesting residues.
3. Increasing sustainable biomass growth through forestry methods, such as improved propagating material, intensified reforestation practices, continued afforestation and fertilization, used with precaution, as well as enhancing the carbon stock in forest soils by methods such as changes in silvi-cultural systems and protection and restoration of ecosystems, for example peatlands.

³ Swedish Environmental Agency (2014) National Inventory Report Sweden

4. Avoiding forestry methods which increase greenhouse gas emissions from forest soils, such as drainage, and in other respects adapting forestry to reduce the risk of future emissions as the climate changes.
5. Increasing the amount of carbon stored in harvested wood products.

The last three measures are LULUCF actions that will primarily influence carbon sequestration in the LULUCF sector, while the first two measures are LULUCF actions that will reduce emissions in other sectors.

Policies and measures to implement that effect mitigation potential

Policies to reduce fossil fuels by bio energy

The general carbon tax that was introduced already in 1991 (cf below) has effectively helped to reduce fossil fuel use, especially in the heat sector. Electricity produced with biomass (biopower) has also increased considerably in recent years. From 2003, the green certificate system (see below) made it favorable to switch fuels, from fossil fuels to biomass, in existing combined heat and power plants (CHP:s) and in forest industries producing their own power. In the transport sector, the conversion to bioenergy has been slower, due to higher costs for liquid and gaseous biofuels than for solid fuels. The technical barriers are also higher.

At present, bioenergy represents almost a third of the Swedish energy consumption. In total, 130 TWh of bioenergy was used in 2014, a small increase from 2013 but more than double the amount in 1990 (61 TWh). Approximately 85 % consist of by-products from the forest and forest industry sector. The use of harvesting residuals and wood pellets in the district heating and electricity production has increased dramatically since 1990. The last few years the use has stabilized around 60 TWh annually due to mild winter temperature and increased completion from other sources of energy such as waste. In 2014 bioenergy represented 62 % of the energy produced for district heating. The production of biodiesel for use in the transport sector has increased from 2 TWh in 2010 to 8 TWh in 2014 and is the most widely used biofuel in Sweden at present. The use of biofuels accounted for just over 12 % of the total use of fuels in the transport sector in 2014.

Forest policy and the forest act

The Swedish Forest Act (as of 1993) has two overarching, equal objectives: production and the environment.

The production objective means that forests and forest lands should be used effectively and responsibly so they produce sustainable yields. The direction of forest production should be giving flexibility in the use of what the forests produce.

The environmental objective means that 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 naturally occurring plant and animal species to survive in natural conditions and in viable populations. Threatened species and habitats should be protected. Cultural heritage assets of forests and their aesthetic and social values should be safeguarded.

Under the current Forestry Act, production subsidies have been abolished and forest owners have considerable freedom and responsibility to independently conduct long-term sustainable forest management. The regulations concerning timber production cover the notification of felling, the lowest age for felling, requirements for reforestation, guidelines for thinning and measures to limit damage. Special regulations apply to certain types of forests, such as subalpine forests and deciduous forests. Examples of regulations concerning nature conservation and cultural heritage include leaving important biotopes and buffer zones and arable land, and leaving older trees, high stumps and dead wood.

Sustainable forest management influence carbon dioxide removals and emissions in various ways: production of renewable raw materials that can replace fossil fuels and materials that generate emissions of greenhouse gases while maintaining or increasing carbon stocks in biomass, soils and harvested wood products. A long term increased forest growth will be needed to raise the harvesting levels in order to meet demand for renewable bio-based products. At the same time it is important that negative environmental effects are avoided. Forest biodiversity is also important for the adaptation to climate change.

Environmental policy and the environmental code

Swedish environmental policy also affects existing provisions which influence carbon dioxide removals and emissions in various ways. Since 1998, Sweden has had 16 national environmental quality objectives, of which several involve LULUCF.

The Swedish Environmental Code is a coordinated, broad and stringent piece of environmental legislation aimed at promoting sustainable development that will enable present and future generations to live in a good and healthy environment. The Code contains regulations on for example provisions on land drainage. In central parts of the southern Swedish highlands and north of the limes norrlandicus (the biogeographical boundary of northern Sweden), drainage – defined as drainage intending to permanently improve 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. Protection and restoration of peatlands with high carbon stocks can reduce emissions of carbon dioxide to the atmosphere.

Provisions on nature reserves and habitat protection in the environmental code and nature conservation agreements

Conservation efforts (site protection, nature conservation agreements, and voluntary set-aside of land) not only preserve biodiversity, but also have an impact on carbon stocks in forest biomass, and soil carbon are maintained or continue to increase. Protected forest ecosystems in areas where natural disturbances like forest fires are rare have a large capacity to sequester carbon, even long after a conservation measure has been implemented. 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 productive forests.

Swedish Environmental Quality Objectives

A Governmental Bill on Biological Diversity and Ecosystem Service was presented in March 2014. The bill established five additional environmental interim targets for already established environmental quality objectives in the area of protection of biodiversity. These five additional environmental interim targets include environmental consideration in forest management and conservation work.

They include a goal that at least 20 percent of land, fresh water and 10 percent of marine areas should contribute to attain objectives for biological diversity. Protected areas should increase by at least 1 142 000 hectares between the years 2012 and 2020, including the additional protection of 150 000 hectares of forest land through set aside from any form of management, or managed with the primary purpose of promoting biodiversity. It also includes an expected additional 200 000 hectares of forest land to be set aside voluntarily by the forestry sector without compensation from the state.

To reach the objectives of the environmental and forest policy voluntary efforts by the landowners are crucial. Advice to the forestry sector from the central government to promote effective and functional consideration for the environment and improved forest management play a fundamental role.

Government initiatives

Since 2014, the Government is developing a long term strategy within the framework of the Swedish National Forest Programme. The work is carried out in comprehensive consultation with stakeholders and expert agencies. The process is guided by the vision of the programme: *Forests – the green gold – shall contribute to jobs and sustainable development in the whole country and the development of a growing bioeconomy* and is based on the three dimensions of sustainable development. A key issue is the need for measures for increased biomass production through a sustainable and diverse forest management to meet the needs of a circular and bio-based economy.

The Swedish Forest Agency provides information to forest owners on how climate change will affect their forests and offer guidance adapted to the owners' specific holdings on how to best manage their forests with the owners' specific goals in mind.

The Swedish Forest Agency also issued a report in 2016 on the effects of climate change on forests and the need for climate change adaptation in forest management.

Since the long-term synergies between climate change mitigation and adaptation in forestry are substantial, the Swedish Forest Agency is currently developing an action plan on climate change adaptation in forestry. With the assistance of forestry stakeholders, the plan is being developed to identify

- quantifiable and measurable targets where appropriate or qualitative indicators,
- the need for continued development of categorising erosion prone forest land,
- the need for demonstration areas to showcase climate change adaptation.

Indicative timetables for policy measures

The appropriate measures in order to pursue the mitigation potential will be implemented through interconnected strategies for different ecosystem services and a diverse set of policy instruments. Strategies and policy instruments have various focuses but may also influence how the forestry sector can contribute to mitigating climate change. Below is the indicative timetable for existing or planned policies, initiatives and proposals:

The Government's Bill on Biological Diversity and Ecosystem Services includes increasing the protected area by at least 1 142 000 hectares between the years 2012 and 2020, including 350 000 hectares of forest land.

The action plan on climate change adaptation in forestry is currently in development and will be finalised during the year 2017.

In 2017, the Government will report to the Swedish Parliament the results of the process within the Swedish National Forest Programme, including the long term strategy, and develop a plan for implementation.