Date
2024-02-29

SCA's reporting of its climate impact

Peter Holmgren, Katarina Kolar, Susanne Rutqvist
Version 2024-02-29

Contents

Summary

- This document provides background to SCAs annual climate reporting. The positive climate benefit from managed forests and wood-based products have been reported in SCAs Annual Reports since 2018.
- Starting from the Annual Report for 2023, the methodology is updated and refined, calibrating also to national reporting principles. Carbon storage in wood-based products, low-productive forests and forest soils have been included. The assessment of prevented greenhouse gas emissions when using SCAs wood-based products has been further developed.
- For 2023, SCA reported a climate benefit of 12.8 Mt CO_2e which corresponds to more than one quarter of Sweden's fossil emissions.
- Compared with the previous methodology applied 2018-2022, the updated methodology gives a result that is 3.7 Mt CO_2e higher for the year 2023.
- Continued development of data related to the climate performance of wood-based products may further enhance the quality of corporate climate reporting.

Background

SCA is Europe's largest private forest owner with 2.7 million hectares of land. It is also a leading forest industry corporation, delivering 1.8 million tonnes of pulp and paper and 1.9 million m^3 of solid wood products (2023), as well as bioenergy products, biochemicals and electricity. Given the size of SCAs operations, the corporate impact on the climate is significant. Most of this impact is positive, with growing forests removing carbon and wood-based products preventing greenhouse gas emissions from alternative products, including fossil-based energy.

Starting from year 2018, SCA has presented its overall climate impact expressed as climate benefit in each Annual and Sustainability Report. For the 2018 report, SCA pioneered a climate reporting model that included forest carbon balance, value chain emissions and prevented emissions from alternative products (Holmgren and Kolar, 2019; SCA, 2019a). In the following years, several Swedish forest industry corporations adopted this approach, including Södra, Holmen, Billerud, Stora Enso and Norra Skog. The methodology has also been applied for national and EU-level analyses (CEPI, 2020; Swedish Forest Industries, 2022, 2019).

Since 2018, the methodology has been gradually refined. Improved background data, e.g., on displacement factors have been developed. Calibrations with Swedish National Forest Inventory data have been introduced, including data on forest soils and low-productive forests. Approaches on how to handle recycled or recovered material in the calculations have been enhanced. Methodology for including carbon storage in Harvested Wood Products (HWP) has been developed and included.

Updated methodology guidance has been developed by the Swedish Forest Industries and the Forest Research Institute of Sweden, Skogforsk (Forest research Institute of Sweden, 2024). Furthermore, an ISO standard for the methodology is under development with publication expected in 2025 (International Organization for Standardization, 2023). The ongoing work with the ISO standard may result in changes in the terminology and/or methodology described in this document.

After five years of climate reporting with the original approach, SCA is updating its reporting, following the methodology developments, starting with the fiscal year 2023. The purpose of this brief is to describe SCAs climate reporting so far, introduce the updates that are applied from 2023, and present results.

SCAs climate reporting 2018-2022

On 27 February 2019, SCA presented its new approach to reporting its overall climate impact at the Royal Academy of Forestry and Agriculture in Stockholm (Holmgren and Kolar, 2019; SCA, 2019b). The event was organized by SCA and included a roundtable discussion where the new model was

debated, including areas for improvement – the roundtable report is publicly available (SCA, 2019c). Shortly after, the Annual Report for 2018 was released (SCA, 2019a), with the calculated climate benefit and presented graphically (Figure 1).

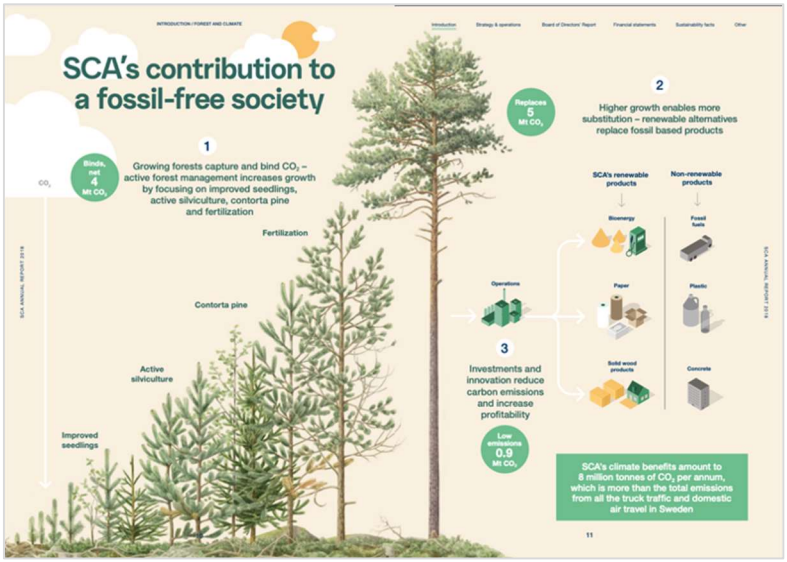

Figure 1. SCAs climate impact as reported in the Annual Report for 2018. The net positive impact was reported at 8 million tons of CO_2e for the year.

SCAs reporting in 2018-2022 included three components, (a) net uptake in own forest, (b), prevented emissions from alternative products, and (c) fossil emissions in the value chain, see figure 2.

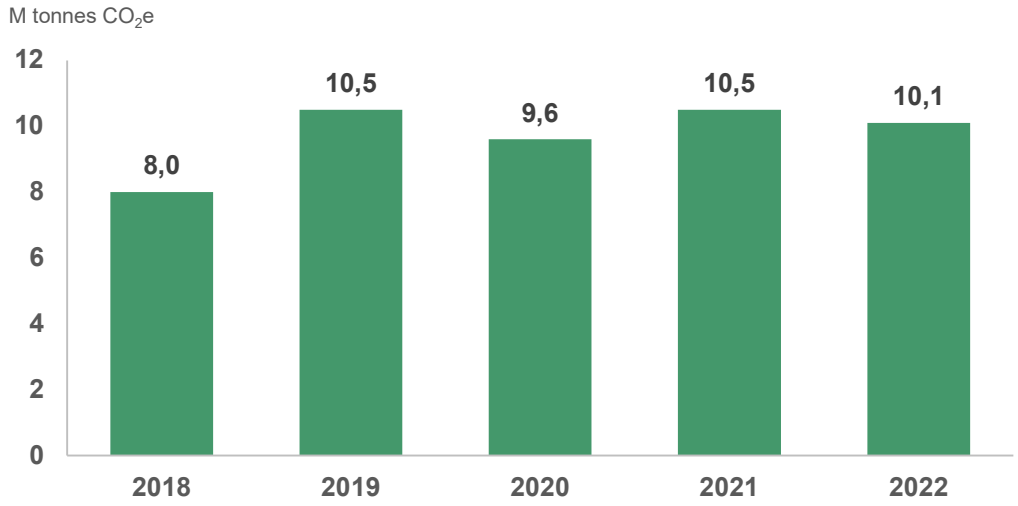

Figure 2. Reported net positive climate impact by SCA for years 2018-2022.

Model and methodology - general

The model and methodology for reporting the overall climate impact of a forest-based corporation has been developed to respond to both climate change mitigation goals set up by the climate convention, see Annex 1. In short, this means that both the carbon storage in the forest, and the positive effects of wood-based products are included. Further background to this approach and why it is a more appropriate method is found in Annex 1 to this brief.

The model has four components (Figure 3). The climate impact is calculated separately for each of these, as described further below. The methodology has been developed to build on existing and agreed standards for each of the four components as described in Table 1. Note that negative numbers indicate a positive climate effect meaning that greenhouse gases in the atmosphere are reduced.

One key update in the methodology is the inclusion of the component Wood-based carbon. In previous reports, the contributions to the increasing carbon storage in products were not considered, taking a more conservative approach in these previous assessments.

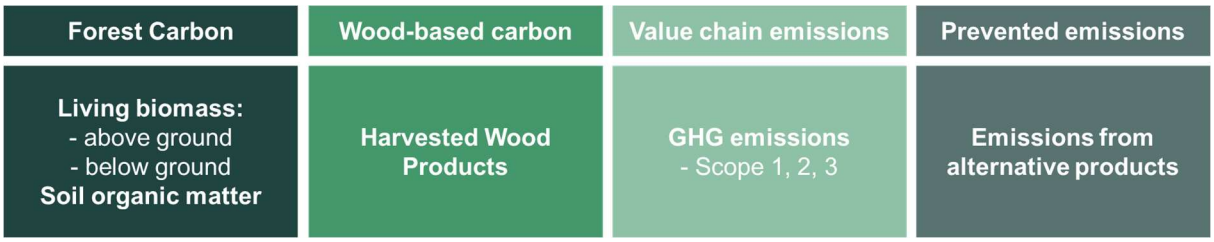

Figure 3. The four climate impact components included in the model. The two left-hand components relate to the biogenic carbon cycle. The two right-hand components refer to greenhouse gas emissions, mainly from fossil sources.

	Climate change mitigation goal (UNFCCC Article 4.1)			
	Conservation and enhancement of sinks and reservoirs		Control, reduce or prevent emissions	
Component in the assessment	Forest carbon	Wood-based carbon	Value chain emissions	Prevented emissions
Main driver	Management of forests where wood is sourced	Types and volumes of wood-based products delivered	Use of fossil fuels in wood-based value chain	Types, volumes and uses of wood-based products delivered
Key methodology supporting calculations	IPCC Guidelines for National Greenhouse Gas inventories	IPCC Guidelines for National Greenhouse Gas inventories	Greenhouse Gas Protocol	Comparative Life Cycle Assessments (LCAs)
Reference to methodology	IPPC (2019a)	IPCC (2019a)	World Resources Institute (2021)	International Organization for Standardization, (2014)

Table 1. The four components used in the assessment of a corporation's climate effect from wood and wood-based products.

SCA climate reporting from 2023

In the following sections, the approach to SCAs climate reporting is described by component. Further details on the updated methodology can be found in the Forest Research Institute of Sweden, Skogforsk (Forest research Institute of Sweden, 2024).

Forest carbon

The forest carbon component refers to the change of carbon in the forest during the reporting period. This includes changes in the living biomass (trees), dead wood, litter and soil carbon. "Forest" includes all land classified as forest according to the applicable national/international definition. This means that the reporting of forest carbon change is similar to annual reporting at the national level, see e.g. the Swedish report for 2022 (UNFCCC, 2022).

For SCA the change in forest carbon is calculated as follows (see also Table 2):

- Living biomass (trees) on productive forest land is based on regular corporate timber inventories combined with harvesting statistics. Conversion from stem volumes to total living biomass uses the factor 1,375 tCO_2e/m^3fo (Petersson et al., 2012). The total net sink for the Swedish and Baltic holdings was -5.7 Mt CO_2e in 2023.
- Living biomass (trees) on low-productive forest land (a new category in 2023 reporting) is based on data from the National Forest Inventory. SLU (2022) reports the net sink in living biomass at -1.231 $tCO_2e/ha/yr$ on SCAs low-productive forest land, which covers 300,000 ha in Sweden, for a total net sink of -0.37 $MtCO_2e$. For SCA's Baltic forest estate there is no significant area of low-productive forest, and no net sink is reported for this category.
- Dead wood, litter and soil carbon (a new category in 2023 reporting) is based on the National Forest Soil Survey, which is linked to the National Forest Inventory. SLU (2022) reports the net sink in dead wood, litter and soil at -0.83 Mt CO_2e, or 0.36 $tCO_2e/ha/yr$, for all of SCAs forest land in Sweden. For the Baltic forest estate, no net sink is reported for this category, corresponding to data in the National Inventory Reports of Estonia and Latvia (Ministry of Climate and Energy of the Republic of Latvia, 2023; Republic of Estonia, Ministry of Environment, 2023).

SCA purchases large quantities of wood from other landowners, primarily in Northern Sweden. The forest carbon balance in these forests is not part of SCAs climate reporting, although data exists that show a similar positive carbon development as in SCAs forest. For the purpose of SCAs climate reporting, however, the change in carbon storage in these forests is assumed to be 0, which represents a conservative approach to SCAs climate impact.

Category	Area, 000 ha	Carbon stock change, $MtCO_2e$
SCA land in Sweden		
Living biomass on productive forest land	2,000	-4.4
Living biomass on low-productive forest land	300	-0.37
Dead wood, litter and soil carbon (for both of above)	2,300	-0.83
SCA land in the Baltic States		
Living biomass	62	-0.1
Dead wood, litter and soil carbon	62	0
Non-SCA land where wood is purchased		
Sweden	n.a.	0
Total		**-5.7**

Table 2. Change in forest carbon by category for the year 2023.

Wood-based carbon
Wood-based carbon refers to the change of carbon storage in wood-based products that are in use. In national climate reporting, this is referred to as Harvested Wood Products (HWP) pool. For example, Sweden reported that nationally produced products led to an increase in the HWP pool of 9 $MtCO_2e$ in 2021 (UNFCCC, 2022) The methodology provided by IPCC Guidelines for national-level reporting has been modified for corporate reporting.

Note that this component has not been included in previous climate impact reports by SCA.

Calculating the change in HWP storage requires that HWP Coefficients are established for key product categories, based on half-life assumptions (IPCC, 2019a). The HWP Coefficient expresses how much of the delivered quantity that represent an increase of the carbon stock in products in use. The following HWP coefficients have been applied for SCA for 2023:

Product category	HWP Coefficient	Note
Solid wood products	0.25	
Pulp	0.05	Assuming 30% recycling
Containerboard	0.15	Assuming 80% recycling
All other categories	0	

Table 3. Assumptions for calculating wood-based carbon per product category.

Value chain emissions
SCA's reported value chain emissions are currently covering emissions from the forest to the customer gate using the Greenhouse Gas Protocol and covering Scopes 1-3. An annual internal report is compiled for this purpose and results are presented in the Annual Report. There is no separate calculation of value-chain emissions for the overall climate impact described in this document.

Prevented emissions
Prevented emissions refer to the greenhouse gas emissions that would potentially be generated if SCAs products were not supplied to the market. If so, these products would have to be replaced with counterfactual non-wood alternatives with the same functionality.

Prevention of emissions by using wood-based products is part of the overarching UNFCCC framework (see Annex 1), but, contrary to the other three components above, does not have a place in official climate reporting as stipulated by IPCC guidance. One reason is that these effects mainly occur in other economic sectors (for example using wood prevents emissions in the construction sector; biofuels prevent emissions in the transport sector).

Prevented emissions must instead be calculated based on comparative Life-Cycle Assessments and published research. In doing that, a displacement factor (DF) is established for each product category to reflect the quantity of greenhouse gas emissions (tCO_2e) that are prevented per quantity of wood-based product delivered (tCO_2e). This is expressed in tCO_2e/tCO_2e. It is calculated for:

- the first use of the wood material.
- the quantity of recovered material for energy use in the time period (final use).

Future recycled uses are not included as they fall outside of the time period in question, however, the first use calculation may include material that has been recycled.

Note that DFs are calculated as prevented emissions only. Sometimes, in the literature, the DF includes consideration of the wood-based value chain emissions. However, as SCAs value-chain emissions are calculated and reported as a separate component, this would mean a double-counting of SCAs emissions.
The following summarizes the assessment of current displacement factors (DF), based on assumed applications, recycling rates and energy recovery rates for each category:

Product category	DF first uses (rounded) tCO_2e/tCO_2e	DF final use (energy) (rounded) tCO_2e/tCO_2e	DF overall (rounded) tCO_2e/tCO_2e
Solid wood products	1.0	0.5	1.6
Wood-fiber-based products (pulp & paper)	0.4 - 0.9	0.6	1.0 - 1.5
Fossil-free electricity[1]	0.8	-	0.8
Liquid biofuels	0.9	-	0.9
Other bioenergy products	0.8	-	0.8

[1)] From 2023, fossil-free electricity includes bioelectricity and wind power marketed by SCA.

Table 4. Displacement factors used for calculating prevented emissions.

Results
Results are presented below for 2023 and 2022. Comparisons of results are made between the updated methodology as described in this document, and the previous methodology named Model 2019, used in Annual Reports for 2018-2022. Note that negative numbers indicate a positive climate effect meaning that greenhouse gases in the atmosphere are reduced.

Component	2023		2022	
	Updated Mt CO_2e	Model 2019 Mt CO_2e	Updated Mt CO_2e	Model 2019 Mt CO_2e
Forest carbon	-5.7	-4.5	-6.6	-5.4
Wood-based carbon	-0.7	not included	-0.7	not included
Value chain emissions	0.8	0.8	0.7	0.7
Prevented emissions [1)]	-7.2	-5.4	-7.1	-5.4
Total climate effect	**-12.8**	**-9.1**	**-13.7**	**-10.1**

[1)] Fossil-free electricity delivered to the grid from SCA's own wind farm is included in prevented emissions from 2023.

Table 5. Comparison of the updated methodology versus the model from 2019.

Observations

Comparison with earlier results
Compared with earlier reports, SCAs positive climate impact is higher with the updated methodology. For 2023 the difference is 3.7 Mt CO_2e. The following are the main factors impacting the positive shift in SCAs climate impact.

Factor	Rationale	Effect on SCA calculation for 2023
Low-productive forest	Low-productive forests are now included. This means that the forest carbon scope is harmonized with the reporting standard at the national level.	-0.4 Mt CO_2e
Dead wood, Litter and Forest soil pools	These carbon pools are now included. This means that the forest carbon scope is harmonized with the reporting standard at the national level.	-0.8 Mt CO_2e
Wood-based carbon – the HWP pool	This component was not included in earlier SCA reports. It is a well established concept, included in IPCC Guidelines and national reporting.	-0.7 Mt CO_2e
New analyses of displacement factors	Earlier SCA reports had conservative DFs for only 3 product categories. In the current calculations, the analysis has been diversified. In particular, the prevented emissions as a result of paper-based products have been included (previously only the energy recovery from these products were considered)	-1.8 Mt CO_2e
Total		-3.7 Mt CO_2e

Table 6. Main factors impacting the climate impact with the updated methodology for 2023.

Sensitivity in assumptions
Assumptions are required for several parts of the above calculations. Present assumptions have been based on the best available information and knowledge, and with an effort to make them robust, conservative, and valid over time. Some considerations include:

- Displacement factors must be based on LCAs and published research. While data is not always rich, the DFs used have been based on several hundred published studies. While differences between regions are likely, the available literature currently does not allow for distinguishing these.
- The fractions of product quantities actually leading to displacement can be difficult to estimate. This refers, e.g., to spill and losses, recycling rates, and to the rate of recovered material for use as energy. These factors can also vary between regions where the products are put to use. Assumptions rely on published reports and analyses at a general level, as data for SCAs specific product quantities are not available.

- The net contribution to the HWP pool requires assumptions and modelling. While the inflow to the pool is straightforward to calculate based on delivered product quantities, the outflow from the pool must be estimated based on product category half-lives and long-term statistics of

market developments. IPCC Guidelines provide useful methodologies for these calculations and have been applied.

Annex 1. The forest-based sector and the UNFCCC mitigation goals

The forest-based sector contributes strongly to both principal climate change mitigation objectives stipulated by the UNFCCC.

Forests and wood-based products have considerable potential for helping in addressing the climate change challenge and for providing fossil-free solutions to society. This is widely acknowledged in climate change assessments (IPCC, 2022) as well as climate-related policy at global, regional and national levels (European Commission, 2023, 2020; IPCC, 2019b; Swedish Environmental Protection Agency, 2023; United Nations, 2015)

The United Nations Framework Convention on Climate Change (UNFCCC) defines two principal objectives for climate change mitigation (United Nations, 1992, Article 4.1):

1. "[...] control, reduce or prevent anthropogenic emissions and of greenhouse gases in all relevant sectors […]"; and

2. "[…] conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems".

These dual objectives – reducing emissions and enhancing sinks – have since 1992 formed a basic structure for climate negotiations, agreements and policy. At the global level, they feature in the Kyoto Protocol (UNFCCC, 1998, Article 3.3), and the Paris Agreement (United Nations, 2015, Articles 4.1 and 5). They provide a fundament for the European Green Deal through its Climate Law (European Union, 2021, Article 30) as well as for national climate law (e.g. Swedish Code of Statutes, 2017, Article 2.3). It is fair to say that this dichotomy has shaped climate action on all levels, often by approaching either of the two objectives in isolation.

Many policies take the dichotomy one step further by declaring that, in the future, emissions should be balanced by sinks, thereby achieving "net-zero" emissions. This appealing thought is formalized by the Paris Agreement, the EU Green Deal and national climate laws, such as in Sweden. As an example, the EU Green Deal includes that by 2030 "..increase the EU net removal target to -310 Mt of CO_2 equivalent, which will put the Union on track towards climate neutrality in 2050." (European Commission, 2022a). This means that emissions not eliminated under the first climate change mitigation objective are to be compensated by increased reservoirs, mostly in EU forests, under the second objective.

As a consequence, it is common that climate policies involving forests address only the second climate change mitigation objective – conserving and enhancing forest sinks and reservoirs of carbon. One example related to the EU Green Deal is the European Union regulation on Land Use, Land Use Change and Forestry (LULUCF) that aims at increasing the forest carbon stock in the European Union (European Commission, 2022b).

However, the forest-based sector also contributes strongly to the first goal by providing fossil-free and renewable material, products and energy to all other sectors in the economy. With current reporting and policy structures, these contributions often fall between the chairs. It is essential to establish a reporting model that addresses contributions to both mitigation goals – otherwise we will miss out on opportunities in mitigating climate change.

Figure 1. Managed forests can contribute to both principal goals for climate change mitigation as stipulated by the UN Framework Convention on Climate Change (UNFCCC).

References

CEPI, 2020. Climate effects of the forest-based sector in the European Union.
European Commission, 2023. European Bauhaus: major catalyst of the European Green Deal [WWW Document]. Eur. Comm. - Eur. Comm. URL https://ec.europa.eu/commission/presscorner/detail/en/ip_23_203 (accessed 6.28.23).
European Commission, 2022a. Climate action - Land Use, Forestry and Agriculture [WWW Document]. URL https://ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal/land-use-forestry-and-agriculture_en (accessed 2.16.22).
European Commission, 2022b. Land use and forestry regulation for 2021-2030 [WWW Document]. URL https://ec.europa.eu/clima/eu-action/forests-and-agriculture/land-use-and-forestry-regulation-2021-2030_en (accessed 1.10.22).
European Commission, 2020. A European Green Deal [WWW Document]. Eur. Comm. - Eur. Comm. URL https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en (accessed 11.15.20).
European Union, 2021. Regulation 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality [WWW Document]. https://doi.org/10.5040/9781782258674
Forest Research Institute of Sweden, 2024. Manual for reporting corporate impact of wood-based products on the global climate - Overview of the Climate effect assessment and reporting (CLEAR) model, Arbetsrapport 1187-2024.
Holmgren, P., Kolar, K., 2019. Reporting the overall climate impact of a forestry corporation - the case of SCA [WWW Document]. URL https://www.sca.com/siteassets/hallbarhet/fossilfri-varld/klimatnytta/report-en.pdf
International Organization for Standardization, 2023. Standards by ISO/TC 287 - Sustainable processes for wood and wood-based products [WWW Document]. URL https://www.iso.org/committee/4952370/x/catalogue/p/0/u/1/w/0/d/0 (accessed 10.2.23).
International Organization for Standardization, 2014. ISO 14040 [WWW Document]. ISO. URL https://www.iso.org/standard/37456.html (accessed 6.30.23).
IPCC, 2022. Climate Change 2022: Mitigation of Climate Change [WWW Document]. URL https://www.ipcc.ch/report/ar6/wg3/ (accessed 8.13.22).
IPCC, 2019a. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Volume 4 Agriculture, Forestry and Other Land Use - Chapter 12 Harvested Wood Products.
IPCC, 2019b. Climate Change and Land [WWW Document]. URL https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf (accessed 8.8.19).
Ministry of Climate and Energy of the Republic of Latvia, 2023. Latvia 2023 National Inventory Report [WWW Document]. URL https://unfccc.int/documents/627724 (accessed 12.12.23).
Petersson, H., Holm, S., Ståhl, G., Alger, D., Fridman, J., Lehtonen, A., Lundström, A., Mäkipää, R., 2012. Individual tree biomass equations or biomass expansion factors for assessment of carbon stock changes in living biomass – A comparative study. For. Ecol. Manag. 270, 78–84. https://doi.org/10.1016/j.foreco.2012.01.004
Republic of Estonia, Ministry of Environment, 2023. Estonia 2023 National Inventory Report [WWW Document]. URL https://unfccc.int/documents/627754 (accessed 12.12.23).
SCA, 2019a. Annual report 2018 [WWW Document]. URL https://www.sca.com/globalassets/sca-engelska/investors/annual-reports/sca_annual-report-2018_eng2.pdf
SCA, 2019b. SCA reports climate impact [WWW Document]. URL https://www.sca.com/siteassets/hallbarhet/fossilfri-varld/klimatnytta/sca-reports-climate-impact.pdf (accessed 11.13.23).
SCA, 2019c. Climate benefits from forests, forestry and forest industry – how can we clarify, calculate and communicate them? Report from a roundtable discussion. [WWW Document]. URL https://www.sca.com/siteassets/hallbarhet/fossilfri-varld/klimatnytta/roundtable-discussion-on-climate-benefits-from-forests-forestry-and-forest-industry-march-2019.pdf
SLU, 2022. Klimatredovisning SCA.

Swedish Code of Statutes, 2017. Klimatlag (2017:720) [WWW Document]. URL https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/klimatlag-2017720_sfs-2017-720 (accessed 2.2.22).
Swedish Environmental Protection Agency, 2023. Sweden's Climate Act and Climate Policy Framework [WWW Document]. URL https://www.naturvardsverket.se/en/topics/climate-transition/sveriges-klimatarbete/swedens-climate-act-and-climate-policy-framework/ (accessed 6.28.23).
Swedish Forest Industries, 2022. Climate impact by the Swedish forest-based sector 1990-2020 [WWW Document]. URL https://www.forestindustries.se/siteassets/dokument/rapporter/climate-impact-by-the-swedish-forest-based-sector-1990-2020-komprimerad-1.pdf (accessed 11.23.22).
Swedish Forest Industries, 2019. Contribution of the Swedish forestry sector to global climate efforts. Swedish Forest Industries.
UNFCCC, 2022. National Inventory Report, Sweden 2022 [WWW Document]. URL https://unfccc.int/documents/461776 (accessed 2.15.23).
UNFCCC, 1998. The Kyoto Protocol [WWW Document]. URL https://unfccc.int/resource/docs/convkp/kpeng.pdf (accessed 2.2.22).
United Nations, 2015. Paris agreement [WWW Document]. URL https://unfccc.int/sites/default/files/english_paris_agreement.pdf (accessed 4.16.19).
United Nations, 1992. United Nations Framework Convention on Climate Change [WWW Document]. URL https://unfccc.int/resource/docs/convkp/conveng.pdf (accessed 6.14.19).
World Resources Institute, 2021. Greenhouse Gas Protocol [WWW Document]. URL https://ghgprotocol.org/ (accessed 11.4.21).