

Carbon Impact Accounting 2021

EXAMPLE FOREST COMPANY (EFC)

Key figures

16

MtCO₂

Carbon storage at the end of 2021

in EFC forests covering 15 000 ha of forest land

0.89

tCO₂/ha/year

Average annual carbon sink

by Client's forests after annual harvest removals including sinks to tree biomass and organic soil carbon.

1.11

tCO₂/ha/year

Average annual carbon impact

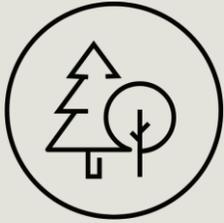
by Client's forests including carbon stored in harvested wood products. This figure is inclusive of emissions from harvest, transportation, and wood processing operations.*



Results are based on scientifically proven approaches and models and the analysis follows scientific best-practices.

*Harvesting, transporting, and wood processing assumptions are based on average operating model in Finland.

Executive summary



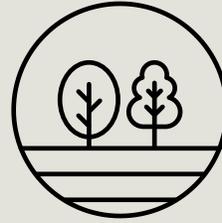
CARBON STORED IN LIVING BIOMASS

As of 31.12.2021, the total carbon stored in client's forests is around **16 million tCO₂**. Out of this, approximately 16% is stored in the woody biomass and the rest in the soil.



CARBON STORED IN WOOD PRODUCTS

In 2021, the estimated additional carbon stored in wood products originating from the EFC forests is around **27 000 tCO₂**.



FOREST CARBON BALANCE

In 2021, the analysed forests are a carbon sink. Considering the annual forest growth and the harvested volume (some 55 000 m³), the total annual forest carbon balance is more than **13 000 tCO₂** positive.

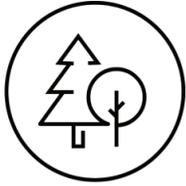


TOTAL CARBON IMPACT

Considering the carbon balance of the forests and the carbon stored in the wood products, the total annual carbon impact is **17 000 tCO₂** positive. This considers the emissions from harvest, transportation, and wood processing operations.

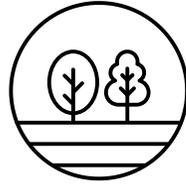
This corresponds to annual emissions by almost 1 700 Finnish citizens, whose average annual carbon footprint was around 10.3 tCO₂ (Sitra 2019).

Executive summary



CARBON STORED IN LIVING BIOMASS

As of 31.12.2021, the total carbon stored in client's forests is around **7 million tCO₂**. Out of this, approximately 14% is stored in the woody biomass and the rest in the soil.



FOREST CARBON BALANCE

In 2021, the analysed forests are a carbon sink. Considering the annual forest growth and the harvested volume (some 55 000 m³), the total annual forest carbon balance is more than **13 000 tCO₂** positive.



CARBON STORED IN WOOD PRODUCTS

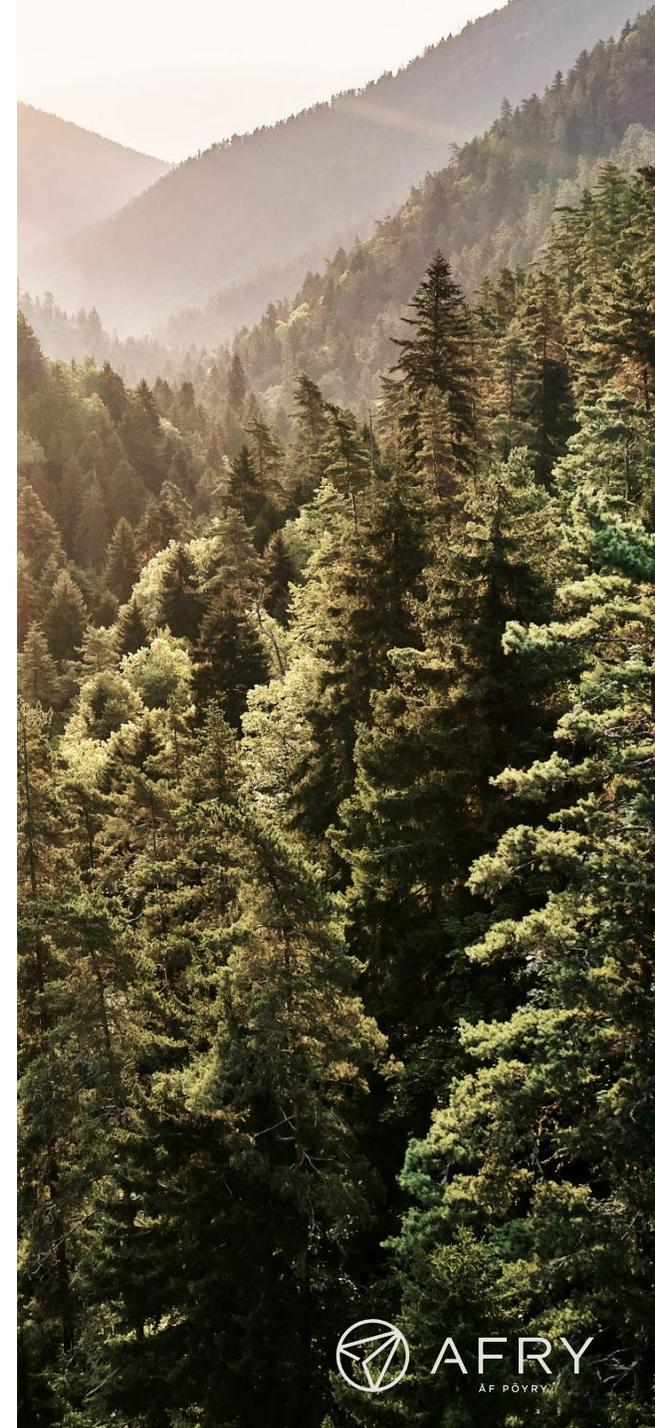
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TOTAL CARBON IMPACT

Considering the carbon balance of the forests and the carbon stored in the wood products, the total annual carbon impact is **17 000 tCO₂** positive. This considers the emissions from harvest, transportation, and wood processing operations.

This corresponds to annual emissions caused by more than 21 000 passenger cars in EU, which emit around 1.8 tCO₂ per year (AISBL 2018).

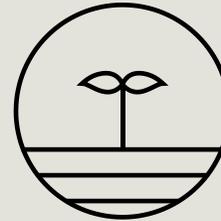


Summary of inputs



FOREST DATA

Forest data included all of the client's forest estates in Finland. The data used for 2020 forecast is dated at the end of 2019. The data follows Finnish standard forest data formats and is assumed to be sufficiently accurate and up to date.



SILVICULTURAL OPERATIONS

Annual silvicultural operations, including soil preparation and regeneration, tending of seedling stands, ditching and fertilization were based on planned activity data received from the Client.



HARVEST REMOVALS

Annual harvest removals, i.e., how much and what assortments were assumed to be harvested over a year, was based on planned activity data received from the Client.



WOOD TRANSPORTATION

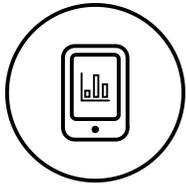
Average transportation distances on road, rail and water were based on planned activity data received from the Client.

Summary of the results

	Carbon storage	Change in carbon storage	
	31.12.2021	1.1.2021 – 31.12.2021	
	t CO ₂	t CO ₂ / a	t CO ₂ / ha / a
Carbon storage in woody biomass	1 071 000	2 618	0.38
Carbon sequestration by tree growth		38 436	5.52
Carbon losses by natural mortality		- 2 759	- 0.40
Carbon losses by harvesting		- 33 059	- 4.75
Carbon storage in soil	6 346 764	4 285	0.62
Total forest carbon storage	7 417 764	6 904	0.99
Fossil emissions from harvesting, transportation and wood processing		- 1 818	0.26
Fossil emissions from silvicultural activities		- 12	- 0.00
Carbon storage in harvested wood products		17 825	2.56
Total carbon impact		22 899	- 3.29
Substitution impact from produced bioenergy		0	0.00
Substitution impact from produced wood-based materials		30 800	4.43

— Forest carbon accounting is about estimating changes in forest carbon pools. The pool perspective is applied in reporting carbon gains as positive values and carbon losses as negative.

Summary of inputs



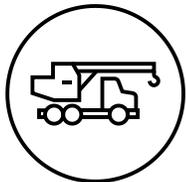
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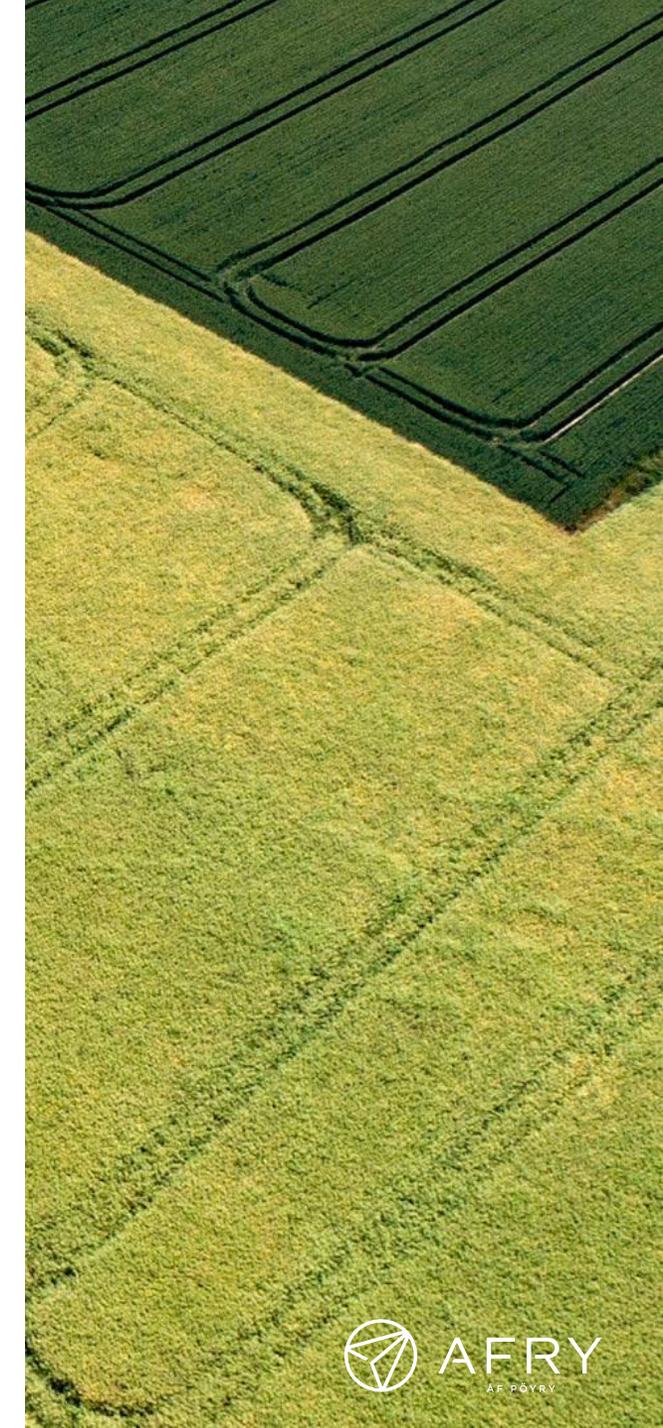
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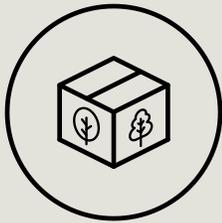


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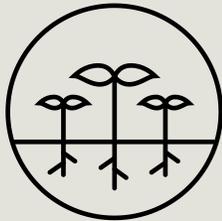


Summary of the methodology



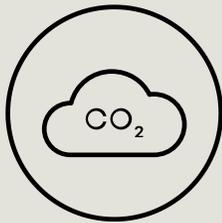
STANDING STOCK CARBON STORAGE

Carbon balance of trees, including branches, leaves and roots was estimated using Motti forest growth model from the Natural Resources Institute.



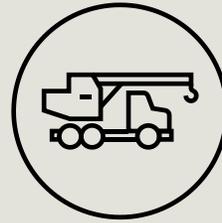
SOIL CARBON STORAGE

Carbon balance of soils was estimated using Yasso15 soil carbon model from Finnish Meteorological Institute.



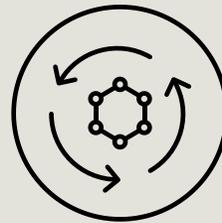
CARBON EMISSIONS

Carbon released in harvest, silviculture and transport operations was estimated using average figures compiled from recent, relevant research.



CARBON STORED IN WOOD-BASED PRODUCTS

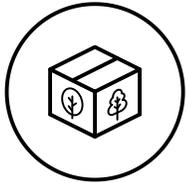
Carbon half-life in the different product classes, as well as the product class division was compiled from recent, relevant research.



SUBSTITUTION IMPACT

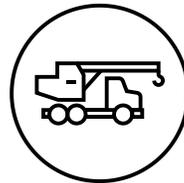
Substitution impact of bioenergy and wood-based products was calculated by applying substitution factors values from existing scientific literature. The substitution impact arising from wood products is estimated for harvested logs and pulp wood, whereas the harvested energy wood volume contributes to the bioenergy substitution impact.

Summary of inputs



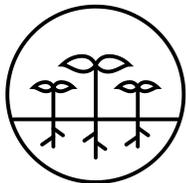
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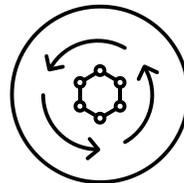
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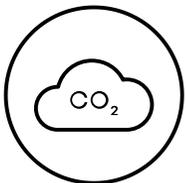
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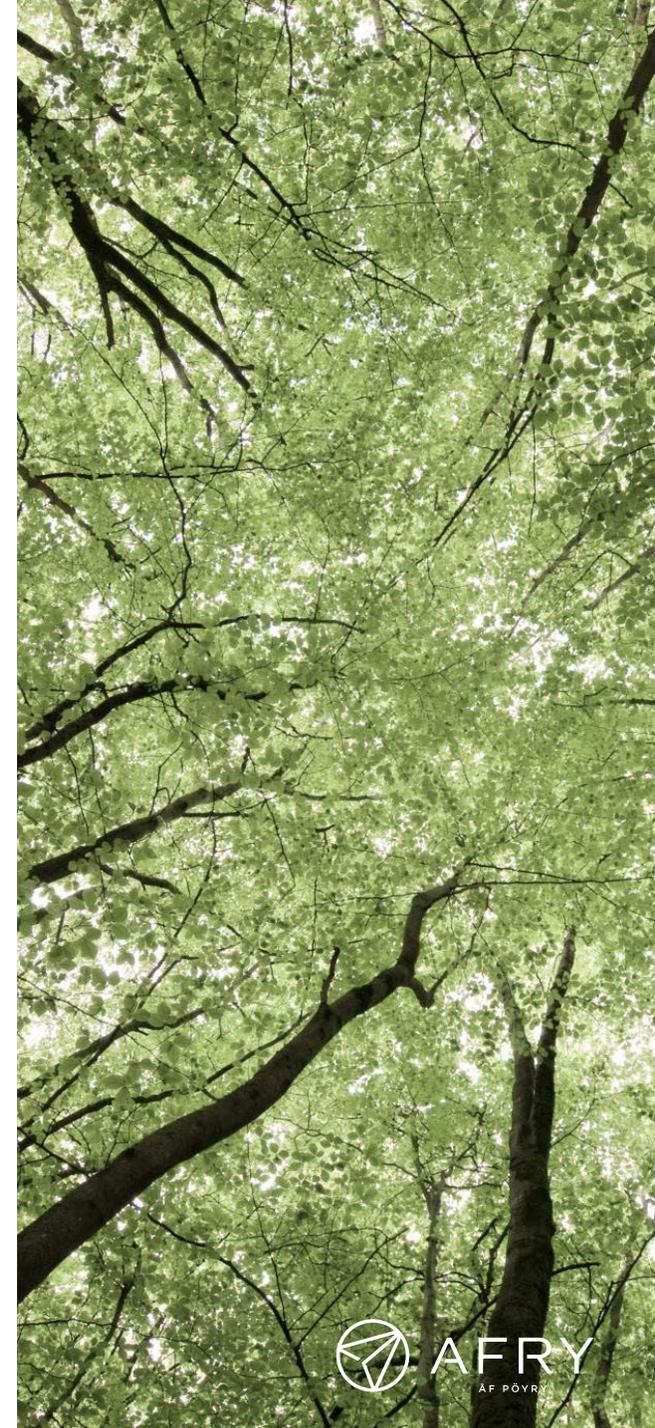
SUBSTITUTION IMPACT

Substitution impact of bioenergy and wood products was calculated based on aggregated substitution factors for different wood product categories and biofuel was obtained from scientific literature.



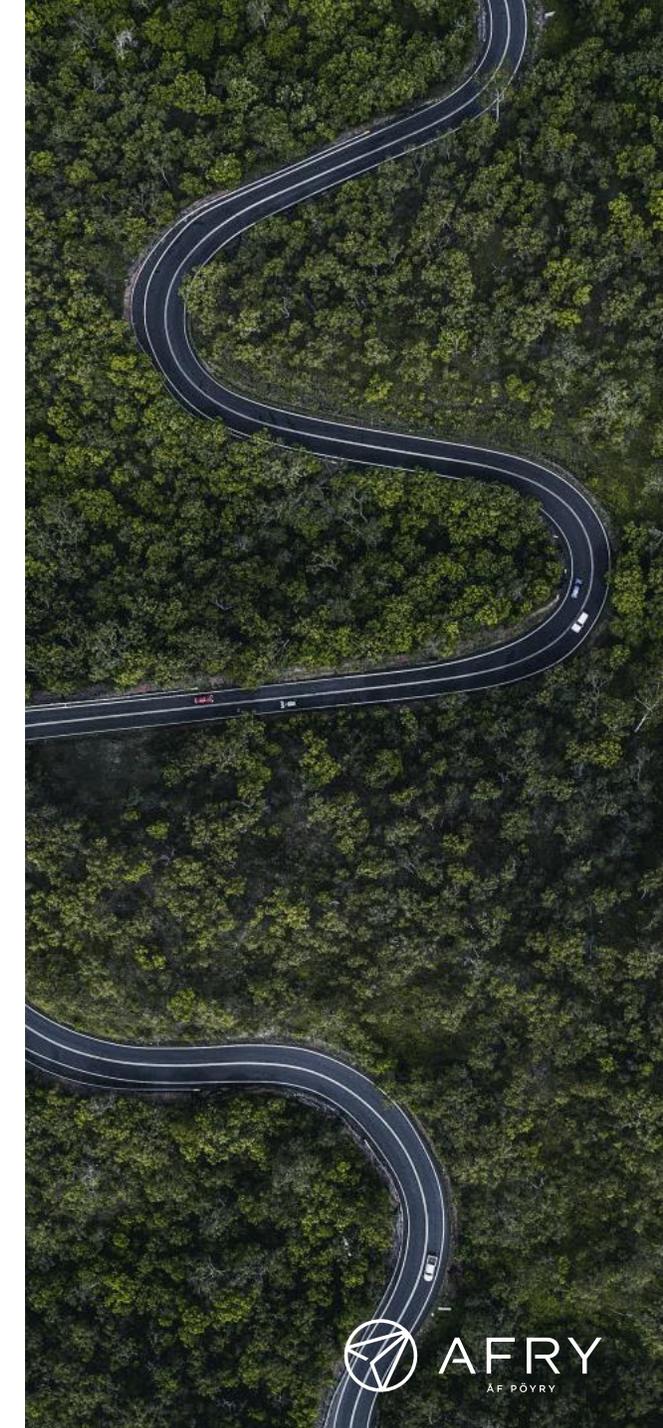
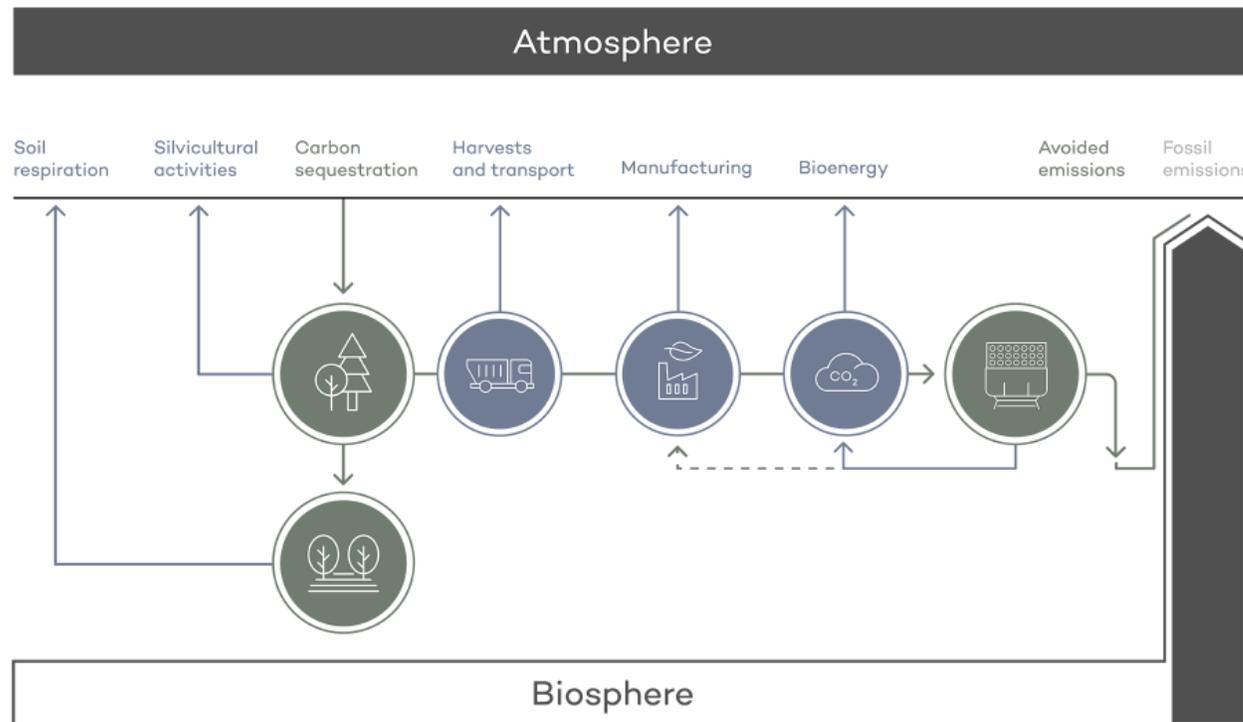
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AFRY's carbon model

- In the analysis AFRY applied a fully dynamic model integrating forest dynamics, soil carbon, forest and transportation operations, manufacturing and wood products and bioenergy production.
- The applied model has been used for analyzing the carbon footprint of multiple major forest owners in Finland, Baltic countries and Southern Europe.



CONTACT

NICO ÖSTERBERG

Forest Carbon Service Manager

+358 50 3372 291

nico.osterberg@afry.com

Making Future