BIOGENIC CARBON FOOTPRINT CALCULATOR FOR HARVESTED WOOD PRODUCTS

USER MANUAL (VERSION 1)

Prepared by:

Simon Gmünder, Michele Zollinger, Jon Dettling |Quantis

July 2020

For:

Marty Spitzer | WWF

Marta Stevenson | WWF

Simon Gmünder

Senior Consultant

Contact: biogenic-carbon-calculator@quantis-intl.com

Table of Contents

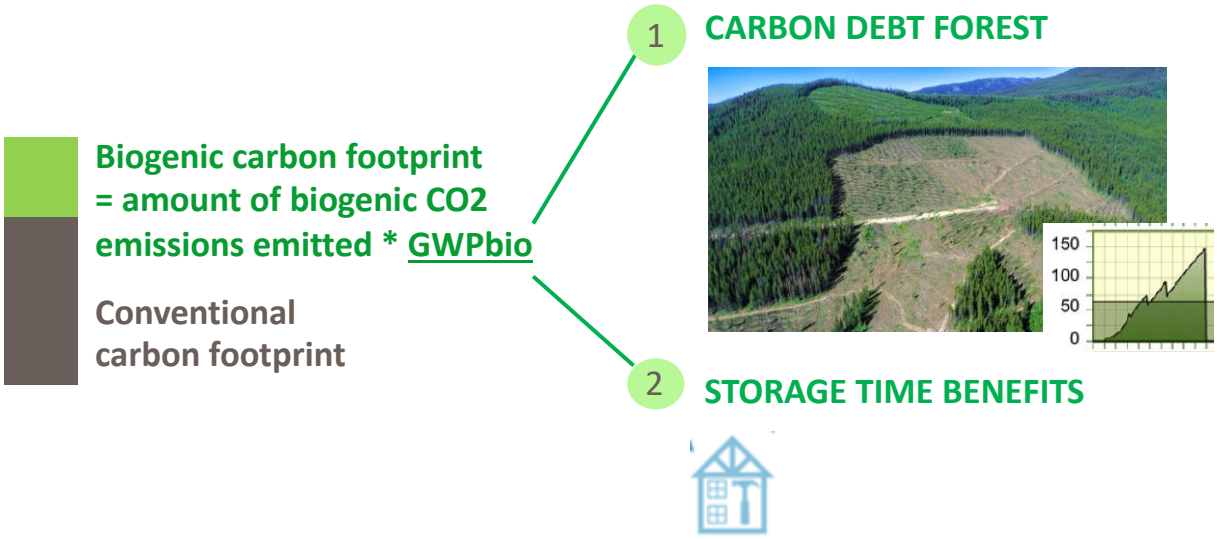
1. Introduction

Welcome to the biogenic carbon footprint calculator. This screening calculator allows you to dynamically account for biogenic carbon emissions and removals of wood-based products. The calculator is applicable to a variety of products (e.g., bioenergy pellets, paper, timber, etc.) with a diverse set of end uses (e.g., renewable energy, furniture, pulp & paper, etc.).

What this calculator allows you to do:

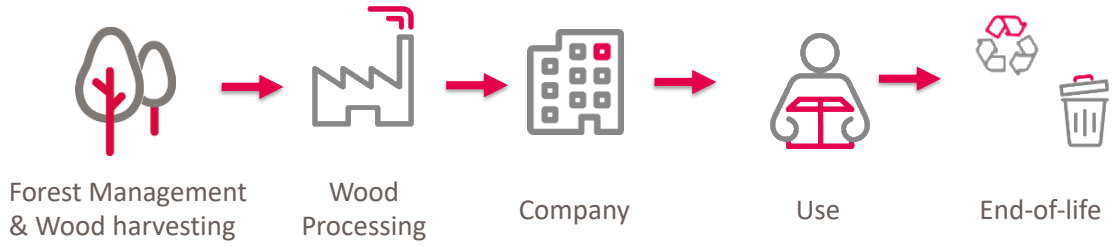
The calculator's aim is to support companies in making decisions around the sustainable sourcing, design, and use of wood-based products.

The main output of this calculator is the biogenic carbon footprint. The biogenic carbon footprint is measured in kg CO_2eq, which is then added to the conventional carbon footprint to reflect a product's carbon footprint originating from biogenic sources.



What does the calculator account for:

The biogenic carbon footprint calculator is based on dynamic methods that account for a potential forest carbon gap after harvesting (decreased carbon stock in forests until regrowth — carbon debt forest) and the benefit of storing carbon in a product (delayed emissions — storage time benefits).



Product storage: The calculator allows you to quantify the benefit of removing CO_2 from the atmosphere and storing it for a number of years, with an underlying assumption that temporarily storing biogenic carbon is equivalent to delaying CO_2 emissions by the same number of years.

Forest carbon gap at the stand level: The basic principle represented by this approach is that if you cut down a tree, it no longer sequesters carbon; it also takes time for another tree to grow and "replace" it. Dynamic forest models are used to assess carbon stock from the time a tree or stand is harvested until those specific emissions are matched by regrowth. Carbon pools accounted for include carbon stored in above-ground biomass (AGB), below-ground biomass (BGB), dead organic matter (DOM), and soil organic carbon (SOC).

Some key characteristics include:

- **Focus on forest biomass in various products and applications:** This calculator considers a broad set of forest biomass used for energy generation or as materials (paper, packaging, construction, textile, furniture, etc.).
- **Forest biomass from managed natural forests or forest plantations:** This calculator does not account for any land use changes, afforestation, or deforestation scenarios — see the NCS guidance.
- **Nature as the reference:** All emissions and uptakes are accounted for relative to a natural reference scenario. In the case of forest biomass used for any product or service, the reference used is that trees are not harvested and remain in the forest.
- **Climate change metric:** This calculator's outputs are kg CO_2 equivalents related to biogenic carbon emissions and uptakes. The calculator does not account for any other environmental aspects of forest biomass use such as biodiversity or water, or socio-economic aspects.
- **Reference values used:** This calculator provides reference values for different forest types, along with values for different species and product use phases (e.g., <1 year for pellets, 15 years for furniture). Additionally, a user can customize the calculator (i.e., overwrite the reference values) with location or company-specific data as appropriate.

The aim of this Excel-based calculator is to make GWP_{bio} practical by providing a user-friendly tool packed with the latest science. This document is a step-by-step manual to guide you through using the calculator.

For more information about methodology, please refer to the methodological report and the FAQ section in the calculator.

Disclaimer: *Your use of the biogenic carbon footprint calculator is at your own risk and provided "as is" without warranties of any kind. WWF and Quantis do not represent or warrant that the tool and the results it provides are accurate, complete, reliable, current, or error-free nor that the tool is free of viruses or other harmful components.*

2. Structure of the calculator

The biogenic carbon footprint calculator can be used on two levels. Use the “BASIC” level if you want a quick calculation of a specific product’s biogenic carbon footprint, or the “ADVANCED” level if you want to dive deeper and compare up to 10 products:

BASIC

This tab is ideal for a quick check of your biogenic carbon footprint, as you can calculate results with just a handful of input parameters. See chapter 3 for a step-by-step guide.

ADVANCED (“Interface,” “Data Details,” and “Forest Model” tabs)

The “ADVANCED-Interface” tab is ideal if you want to dive deeper and compare up to 10 products (see chapter 4).

Some assumptions and default data are used in the background when calculating the biogenic carbon footprint. If you want to dig deeper into the results, this calculator allows you to change modeling and data assumptions according to your specific needs and data availability. Additional details can be defined for each of the life cycle stages in the "ADVANCED-Data Details" tab (see chapter 5).

If you have access to specific data on forest carbon stocks and/or harvesting, this can be used to regionalize the parameters of the “forest model” (see chapter 6).

All cells marked in blue can be edited; all other cells and sheets are protected.

Documentation (“Quick start guide,” “Q&A,” and Supporting Documents tabs)

Calculations rely on pre-defined parameters populated using data from different secondary sources. Supporting details on how calculations are done, as well as any application questions, can be found in the following documentation:

- User Manual (this document)
- GWP_{bio} methodology
- FAQ (in the Excel calculator)

For any comments or questions, reach out to biogenic-carbon-calculator@quantis-intl.com

3. BASIC

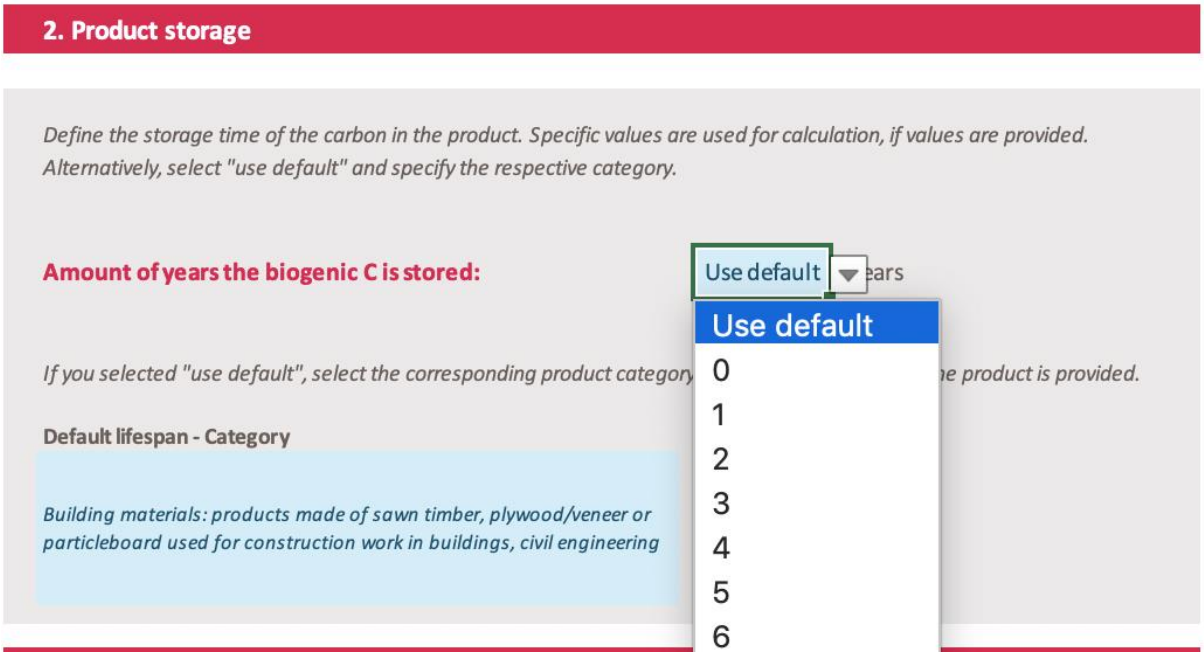
3.1. Step 1: Carbon in product

Provide the amount of biogenic carbon in the product under study in kg C. Pre-calculate the value in kg C outside of this calculator.

Example pulp fiber: The aim is to calculate the biogenic carbon footprint of 10 metric tons (dry mass) of sulfate pulp. The generic carbon content of wood is around 50% (0.5 kg C per kg dry mass) and consequently the carbon contained is 5000 kg C (input value).

3.2. Step 2: Define the storage time

Define specific storage time of carbon in the product in years.



For cases where no specific values are available, select “use default” and choose the most appropriate category. Here is an overview of the categories and corresponding lifetimes (in years)[1]:

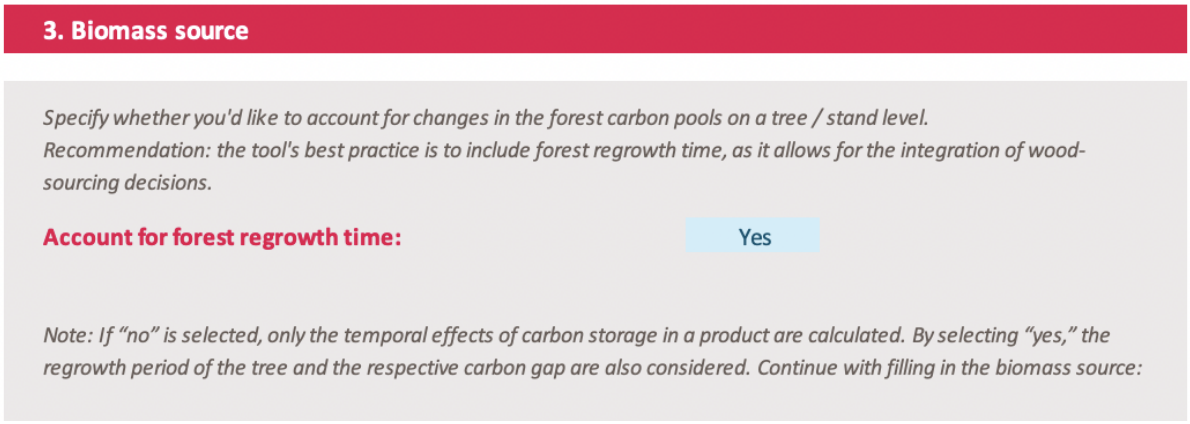
[1] Thies Eggers. 2002. The Impacts of Manufacturing and Utilisation of Wood Products on the European Carbon Budget. Internal Report 9. European Forest Institute

Product category	Lifetime (in years)
Energy — combustion/incineration	0
Building materials: products made of sawn timber, plywood/veneer, or particleboard used for construction work in buildings, civil engineering	50
Other building material: products made of sawn timber, plywood/veneer, or particleboard used for maintenance in houses or civil engineering. Includes commodities such as fences, windows, frames, panels, wooden floors, and doors	16
Structural support materials: products made of sawn timber, plywood/veneer, or particleboard used for form works, scaffolds, and other wood-based products needed on building sites	1
Furnishing: products made of sawn timber, plywood/veneer, or particleboard used for furnishing houses and offices	16
Packing materials: products made of sawn timber, plywood/veneer, or particleboard; or paper and paperboard products used for packing other commodities such as shipping boxes, wrapping, and boxing	1
Long-life paper products: products made of pulp used for longer periods such as books, maps, and posters	4
Short-life paper products: products made of pulp used for short periods such as newsprint and sanitary papers	1
Others	

Select the category and paste the default lifespan into the blue cell on the left (see previous screenshot).

3.3. Step 3: Define the biomass source

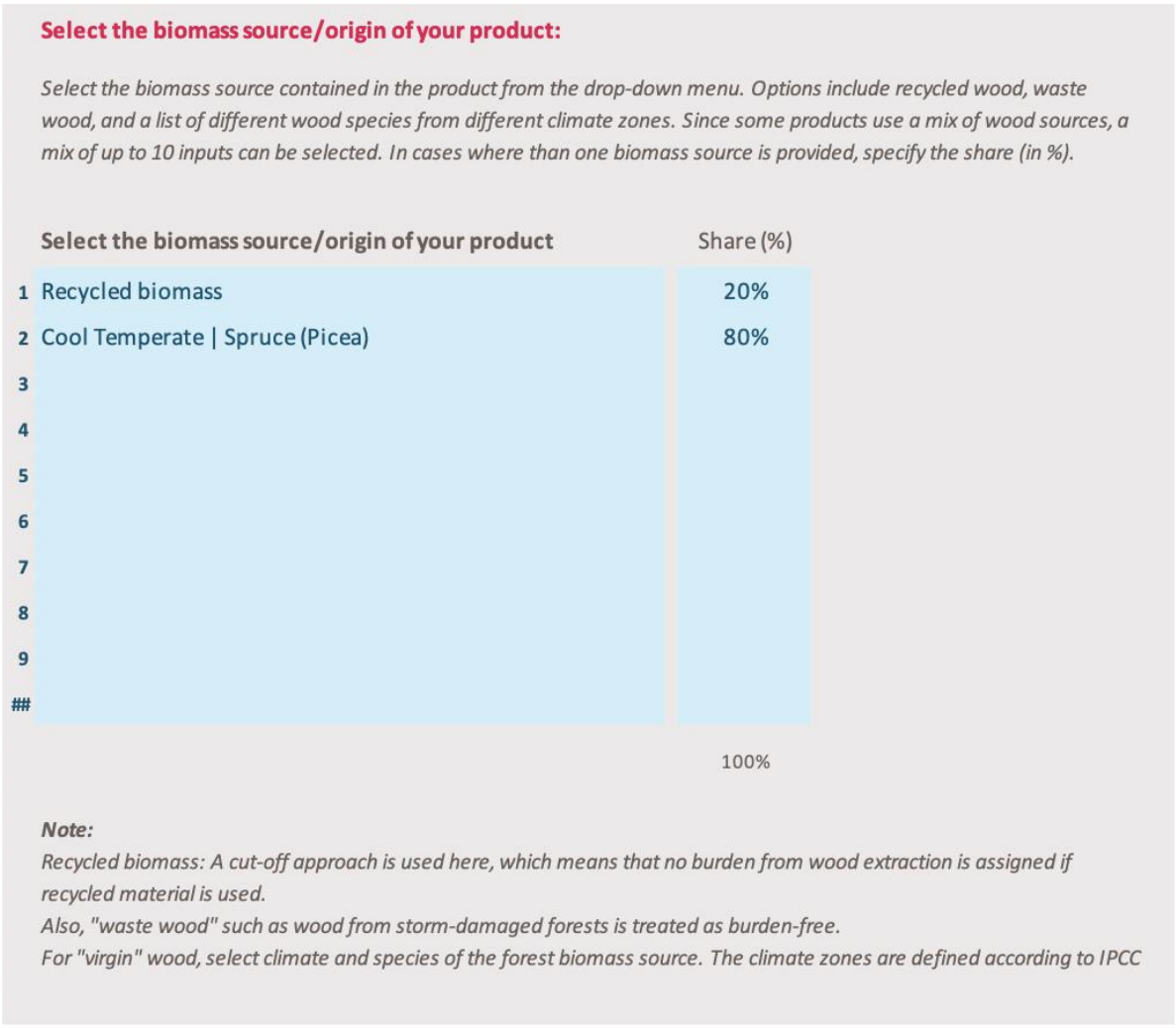
Specify whether you'd like to account for changes in forest carbon pools on a tree/stand level.



If "no" is selected, only the temporal effects of carbon storage in the product are calculated. By selecting "yes," the regrowth period of the tree is also considered.

We recommend considering both carbon storage in the product, as well as the regrowth period. This allows users to gain additional insights in decision-making from a wood sourcing perspective.

Specify the source of biomass and the share.



Select the biomass source/origin of your product:

Select the biomass source contained in the product from the drop-down menu. Options include recycled wood, waste wood, and a list of different wood species from different climate zones. Since some products use a mix of wood sources, a mix of up to 10 inputs can be selected. In cases where than one biomass source is provided, specify the share (in %).

	Select the biomass source/origin of your product	Share (%)
1	Recycled biomass	20%
2	Cool Temperate | Spruce (Picea)	80%
3		
4		
5		
6		
7		
8		
9		
##		
		100%

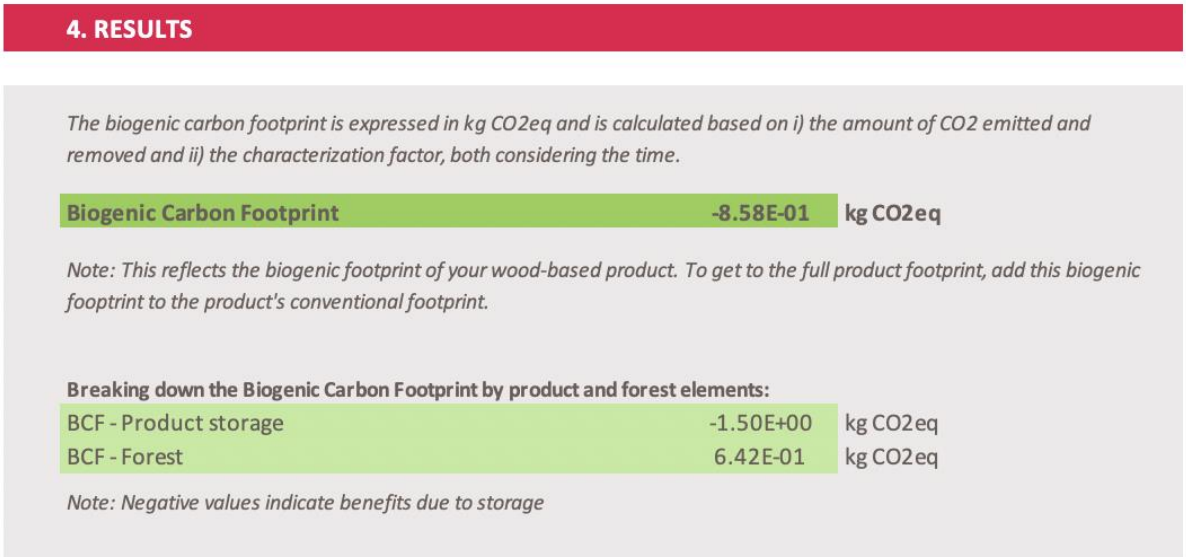
Note:
Recycled biomass: A cut-off approach is used here, which means that no burden from wood extraction is assigned if recycled material is used.
Also, "waste wood" such as wood from storm-damaged forests is treated as burden-free.
For "virgin" wood, select climate and species of the forest biomass source. The climate zones are defined according to IPCC

- Recycled biomass/waste wood: means forest biomass sourced from recycled wood. A cut-off approach is used here, meaning no burden from wood extraction is assigned if recycled material is used. "Waste wood," such as wood from storm-damaged forests, is also treated as burden-free.
- Harvested forest biomass: select from the available forest species list. Climate zones are defined in accordance with IPCC 2006 (a map is provided in this user manual). See chapter 6 to customize these values.
- Share: make sure the sum adds to 100%

3.4. Step 4: Results

The impact metric is calculated based on i) the amount of CO_2 emitted and removed and ii) the characterization factor. Both factors also consider time. The total biogenic carbon footprint is expressed in kg CO_2eq, and factors in the effects of storage and any forest carbon gap (if selected).

In addition, the amount of biogenic CO_2 emitted and removed is provided in kg CO_2, calculated using carbon input and the molecular weight ration 44/12.



4. RESULTS

The biogenic carbon footprint is expressed in kg CO2eq and is calculated based on i) the amount of CO2 emitted and removed and ii) the characterization factor, both considering the time.

Biogenic Carbon Footprint	**-8.58E-01**	**kg CO2eq**

Note: This reflects the biogenic footprint of your wood-based product. To get to the full product footprint, add this biogenic footprint to the product's conventional footprint.

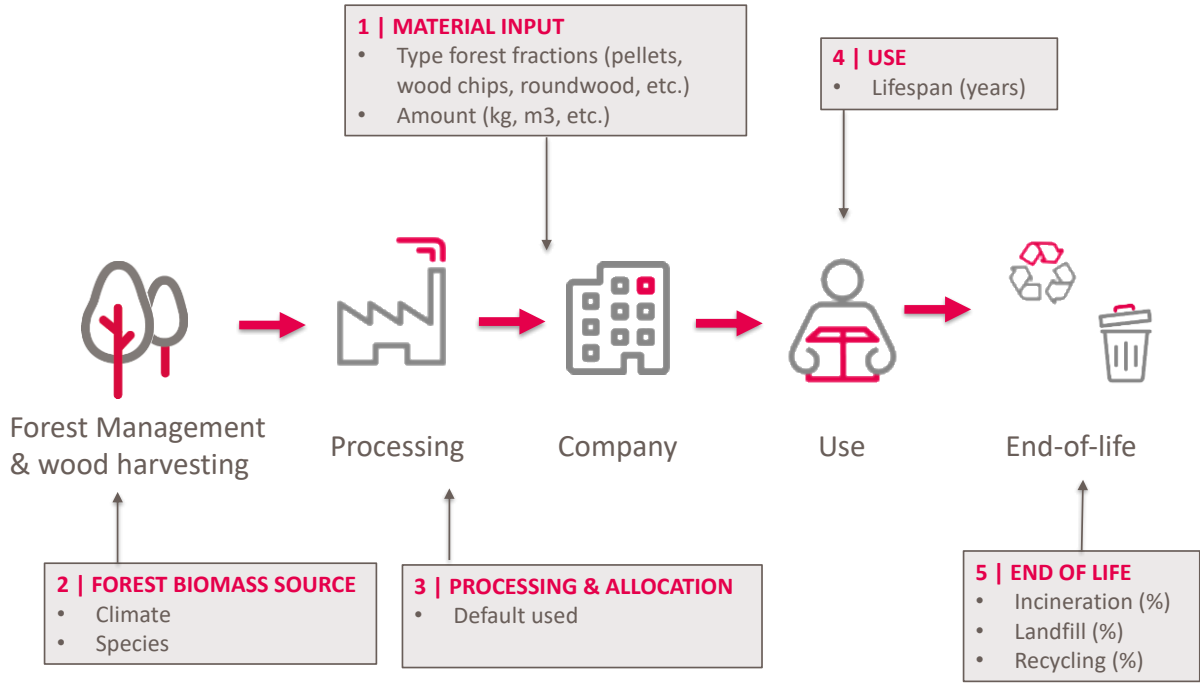
Breaking down the Biogenic Carbon Footprint by product and forest elements:

BCF - Product storage	-1.50E+00	kg CO2eq
BCF - Forest	6.42E-01	kg CO2eq

Note: Negative values indicate benefits due to storage

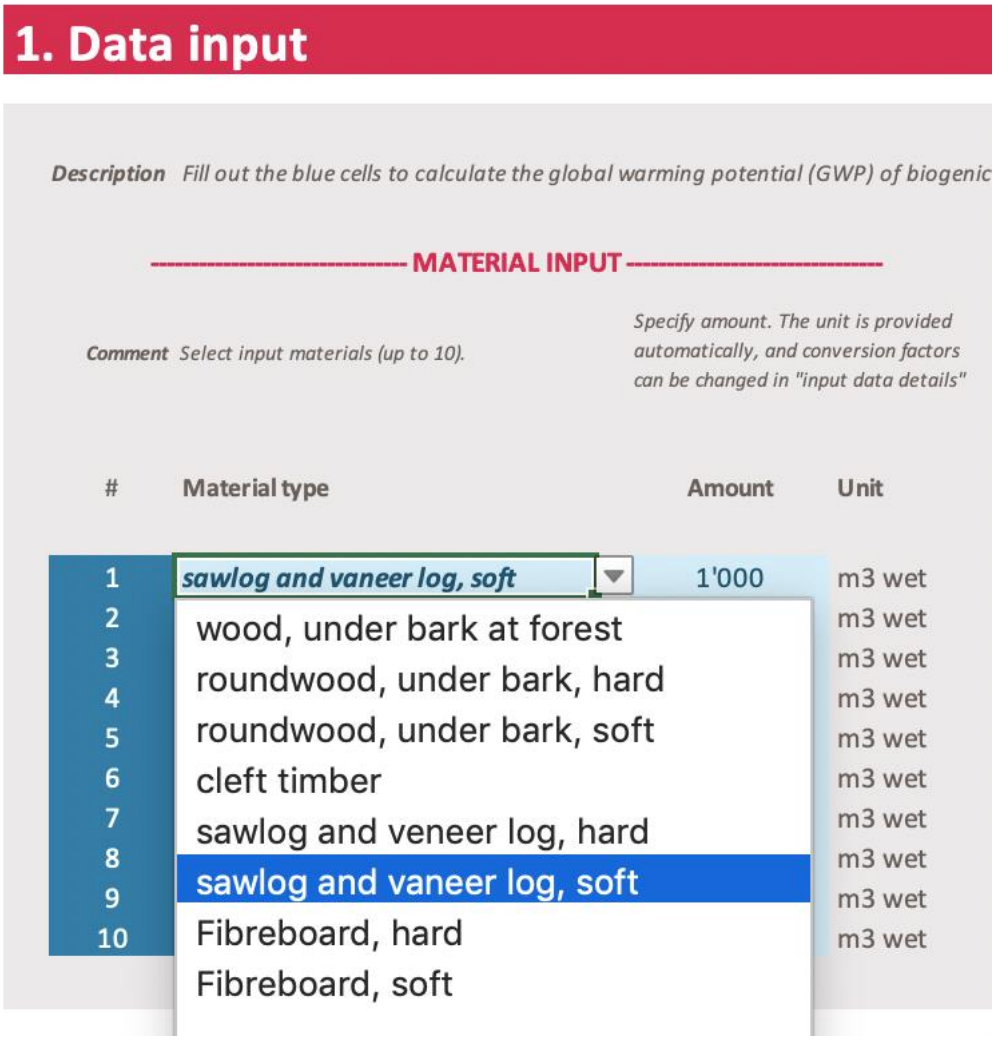
4. ADVANCED — Interface

Biogenic carbon footprint calculation is based on five input parameters along the value chain.



4.1. Step 1: List input materials

The first step is to select the type of wood-based material used. The list of input materials ranges from raw wood freshly extracted from the forest to processed wood materials such as pulp and paper, pellets, or sawn logs.

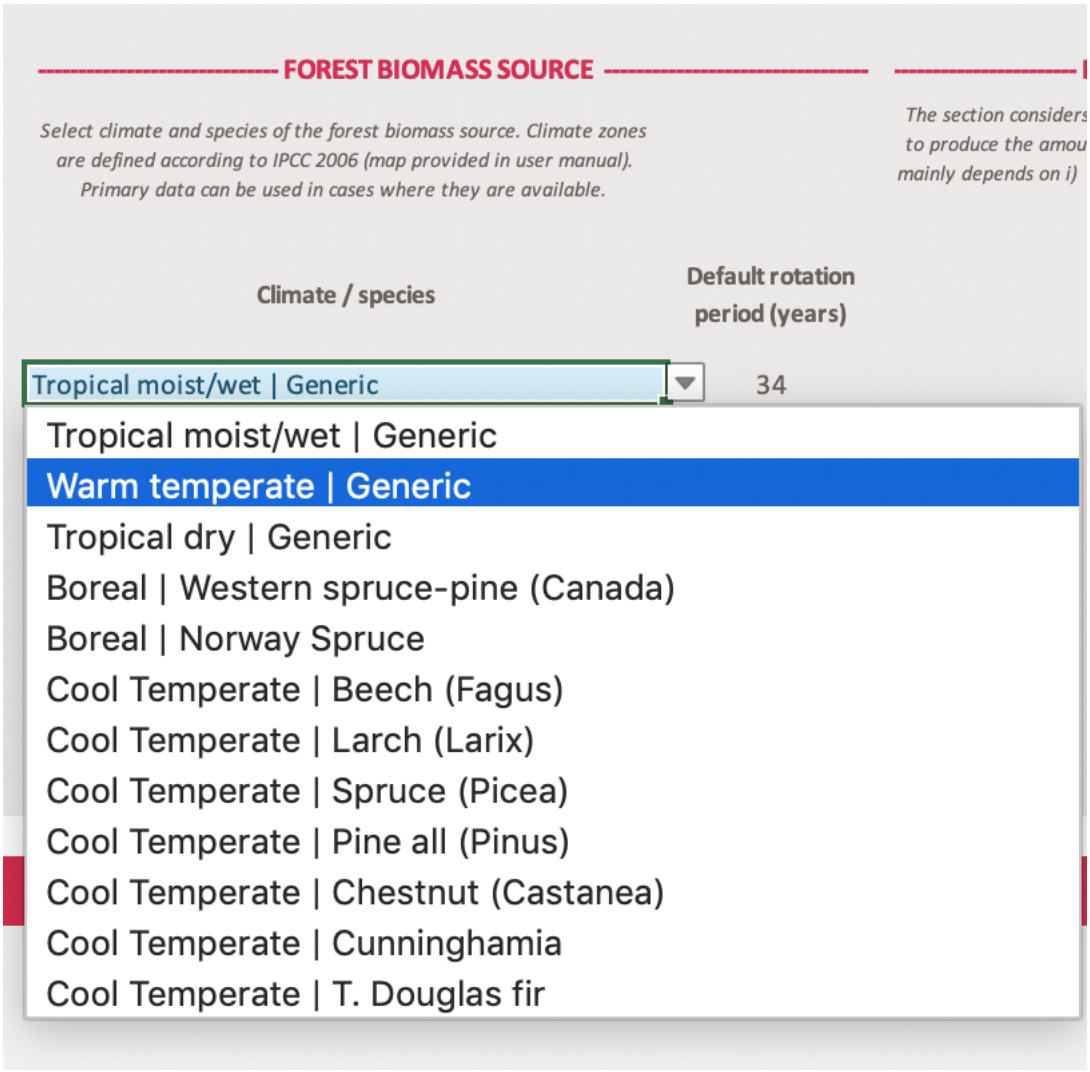


Besides the type of input material, the amount also needs to be provided. The unit (kg dry matter, m3 fresh wood, MJ) is pre-defined depending on the material input and cannot be changed in the calculator.

The calculator allows users to include up to 10 input materials to facilitate product footprinting where typically, multiple input materials are used. The calculator also allows users to run different scenarios and compare results.

4.2. Step 2: Select Forest Biomass Source

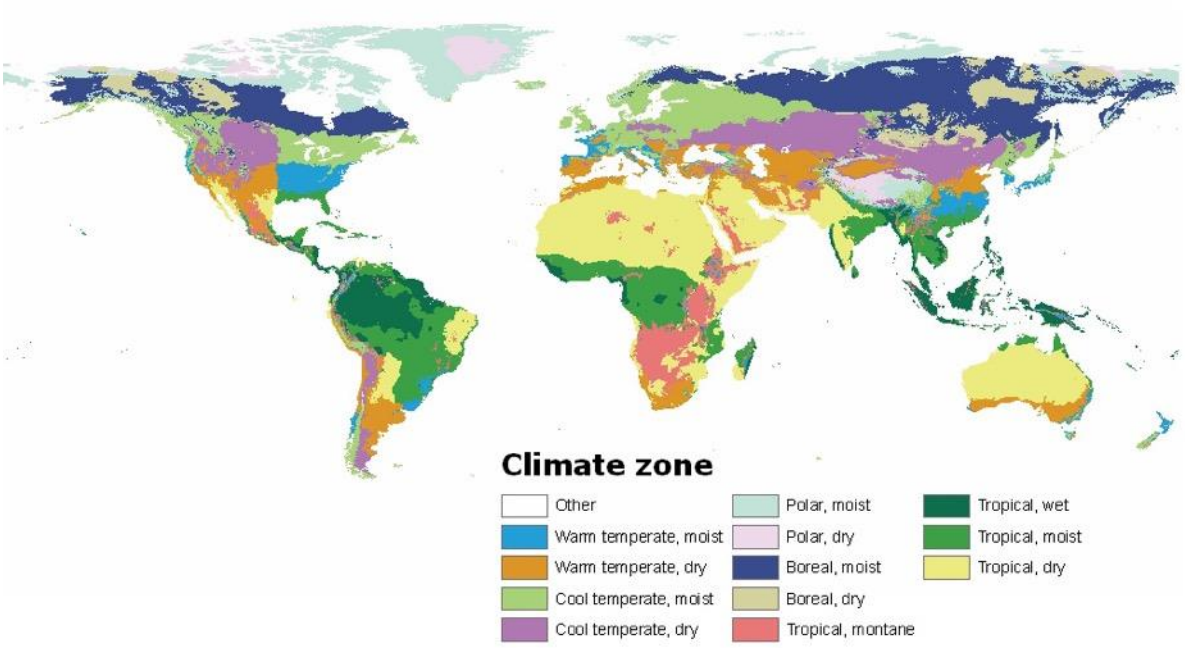
The two main parameters for the forest carbon model are climate and forest species.



4.2.1. Select the climate

Climatic Zone layer definitions are based on IPCC classifications (IPCC, 2006), taking into account temperature, precipitation, potential evapo-transpiration (PET), and elevation.

Climate Zones



4.2.2. Forest species

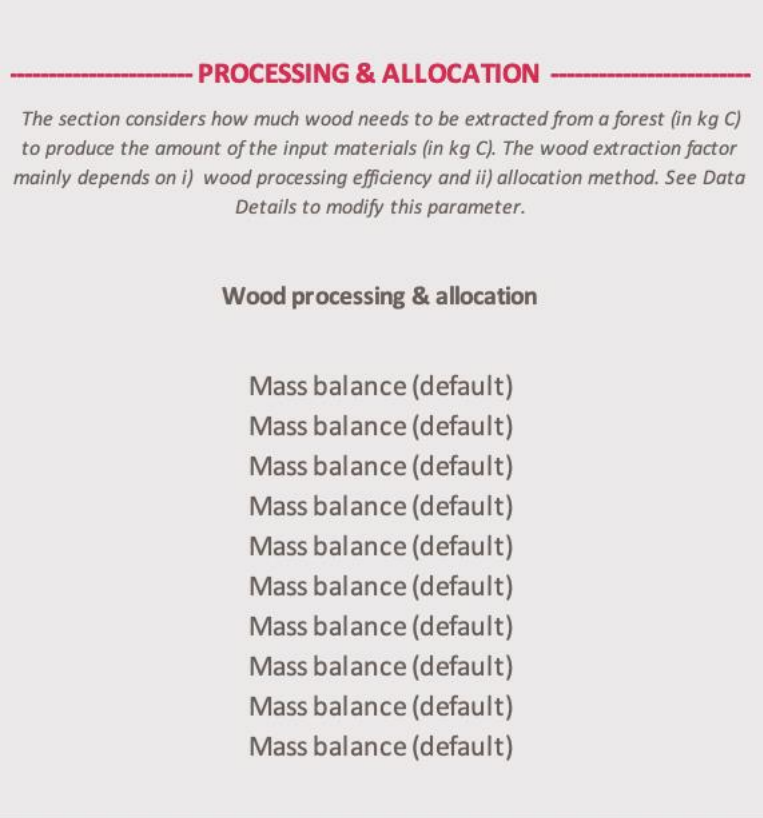
The following forest species are currently available in the calculator:

No	Climate / species
1	Tropical moist/wet | Generic
2	Warm temperate | Generic
3	Tropical dry | Generic
4	Boreal | Western spruce-pine (Canada)
5	Boreal | Norway Spruce
6	Cool Temperate | Beech (Fagus)
7	Cool Temperate | Larch (Larix)
8	Cool Temperate | Spruce (Picea)
9	Cool Temperate | Pine all (Pinus)
10	Cool Temperate | Chestnut (Castanea)
11	Cool Temperate | Cunninghamia
35	Cool Temperate | T. Douglas fir
12	Warm temperate | Pine all (Pinus)
13	Warm temperate | Slash pine (Pinus elliotti)
14	Warm temperate | Loblolly pine (Pinus taeda)
15	Warm temperate | Pinus radiata
16	Tropical dry | Acacia all
17	Tropical dry | Acacia nilotica
18	Tropical dry | Acacia senegal
19	Tropical dry | Acacia seyal
20	Tropical dry | Ailantus excels
21	Tropical dry | Cypress (Cupressus)
22	Tropical dry | African mahogany (Khaya sp.)
23	Tropical dry | Teak (Tectona grandis)
24	Tropical dry | Slash pine (Pinus elliotti)
25	Tropical dry | Pinus patula
26	Tropical dry | Pinus radiata
27	Tropical moist/wet | T.W Agathis sp.
28	Tropical moist/wet | T.W Araucaria angustifolia
29	Tropical moist/wet | T.W Gmelina sp
30	Tropical moist/wet | T.W Rubber (Hevea brasiliensis)
31	Tropical moist/wet | T.W Pine all (Pinus)
32	Tropical moist/wet | T.W Mahogany (Swietenia macrophylla)
33	Tropical moist/wet | T.W Teak (Tectona grandis)
34	Tropical moist/wet | T.W Eucalyptus all
36	Tropical moist/wet | Bamboo (Phyllostachy pubescens)

4.3 Step 3: Define allocation procedure and wood processing efficiency

This section considers how much wood needs to be extracted from a forest (in kg C) to produce the amount of input materials (in kg C). It also considers the wood extraction factor, which mainly depends on i) wood processing efficiency, and ii) allocation method.

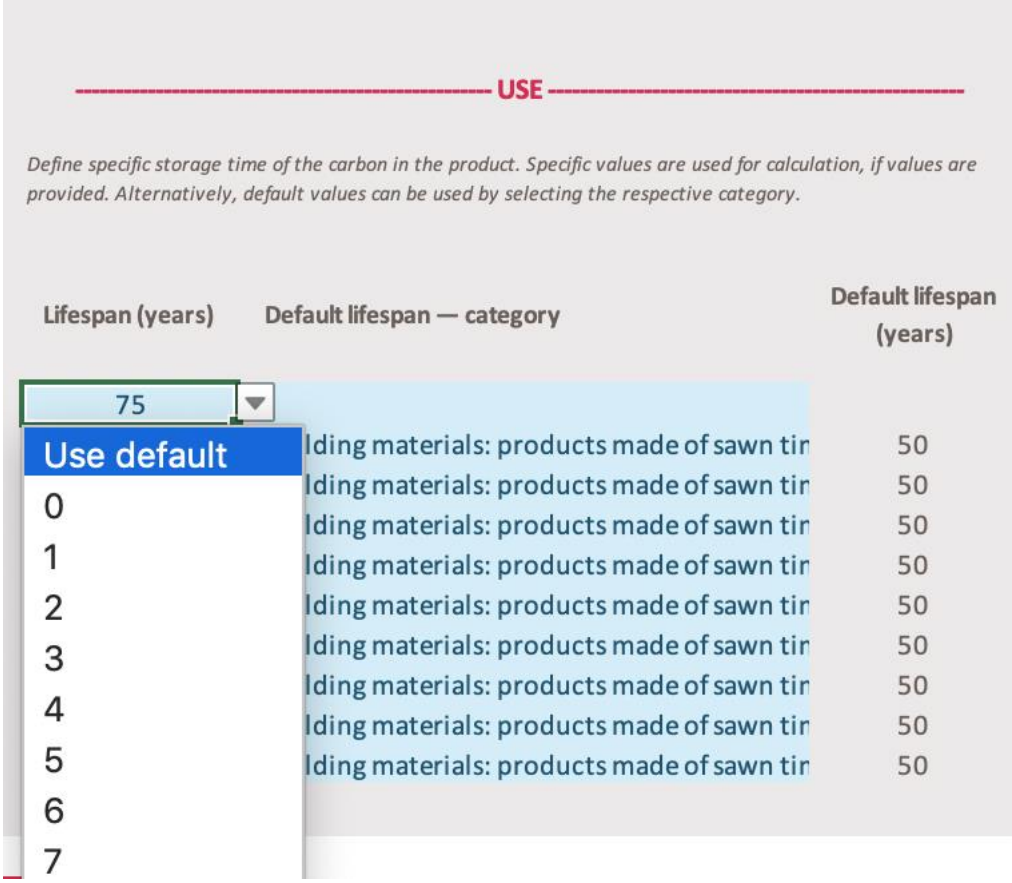
A default method is selected



See the "ADVANCED-Data Details" tab to modify this parameter (section 4.3).

4.4 Step 4: Define product lifespan

Define the specific storage time of carbon in the product. If specific lifespan values are available, these can be selected from the drop-down menu.



In cases where no specific values are available, select "use default" and choose the most appropriate category. Here is an overview of categories and corresponding lifetimes (in years)[2]:

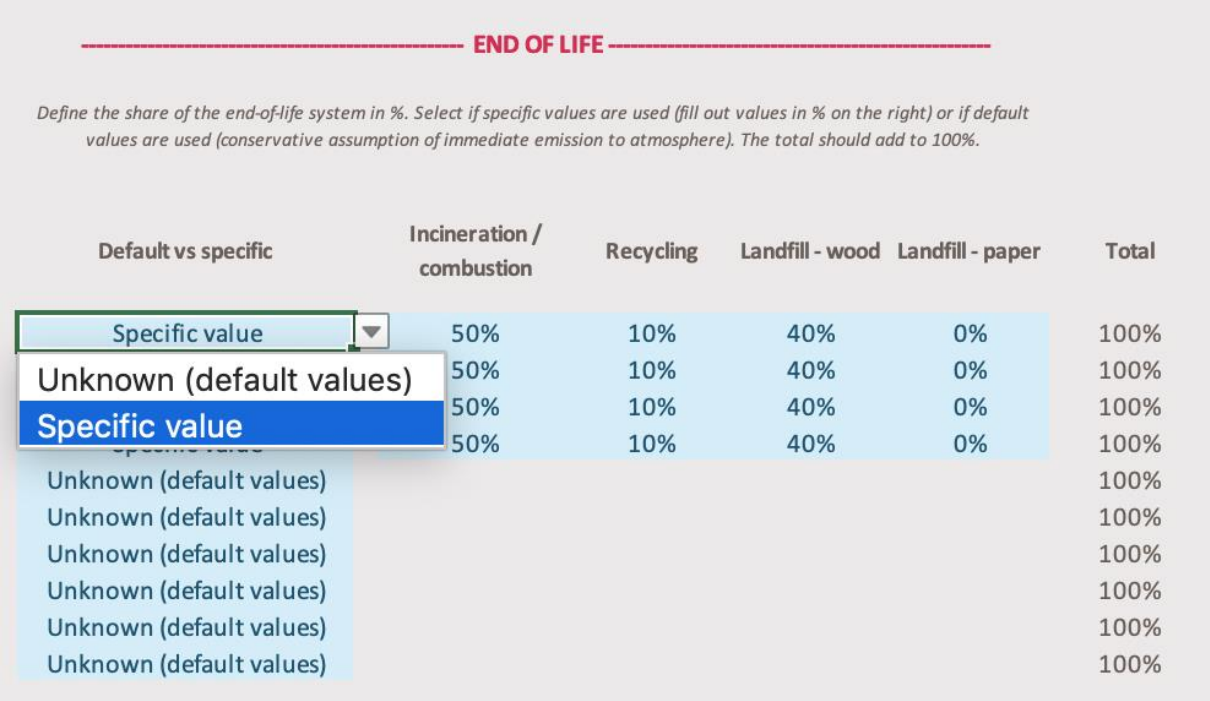
Product category	Lifetime (in years)
Energy — combustion/incineration	0
Building materials: products made of sawn timber, plywood/veneer, or particleboard used for construction work in buildings, civil engineering	50
Other building material: products made of sawn timber, plywood/veneer, or particleboard used for maintenance in houses or civil engineering. Includes commodities such as fences, windows, frames, panels, wooden floors, and doors	16
Structural support materials: products made of sawn timber, plywood/veneer, or particleboard used for form works, scaffolds, and other wood-based products needed on building sites	1
Furnishing: products made of sawn timber, plywood/veneer, or particleboard used for furnishing houses and offices	16
Packing materials: products made of sawn timber, plywood/veneer, or particleboard; or paper and paperboard-products used for packing other commodities such as shipping boxes, wrapping, and boxing	1
Long-life paper products: products made of pulp used for longer periods such as books, maps, and posters	4
Short-life paper products: products made of pulp used for short periods such as newsprint and sanitary papers	1

[2] Thies Eggers. 2002. The Impacts of Manufacturing and Utilisation of Wood Products on the European Carbon Budget. Internal Report 9. European Forest Institute

Others

4.5 Step 5: Select end-of-life treatment

Define the specific end-of-life treatment systems in cases where specific values are available, and include them as a percentage in the category, “incineration/combustion, recycling, or landfill (wood or paper).” In cases where no specific values are available, select “unknown (default values).”



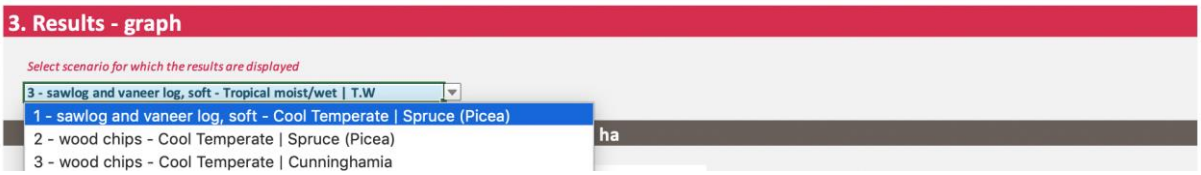
The following table describes the implications of each end-of-life treatment scenario:

End-of-life treatment system	Assumption/effect
Incineration/combustion	For incineration and combustion, no storage is assumed (immediate release)
Recycling	For recycling, no benefits beyond the product lifespan are assumed (benefits are instead assigned to the product using the recycled material again).
Landfill — wood	Decay of wood biomass over time (extended storage time). The fraction going to landfills is further divided into non-degradable and degradable pools for paper and wood products. The non-degradable pool is permanently sequestered. The fraction of the degradable pool remaining in subsequent years is determined

	by first-order decay; that is, fraction remaining=exp(-years×ln(2)/half-life).
Landfill — paper	Same as wood, but with a different degradable/ non-degradable ratio.
Unknown (default)	Immediate release (no additional storage) — conservative assumption

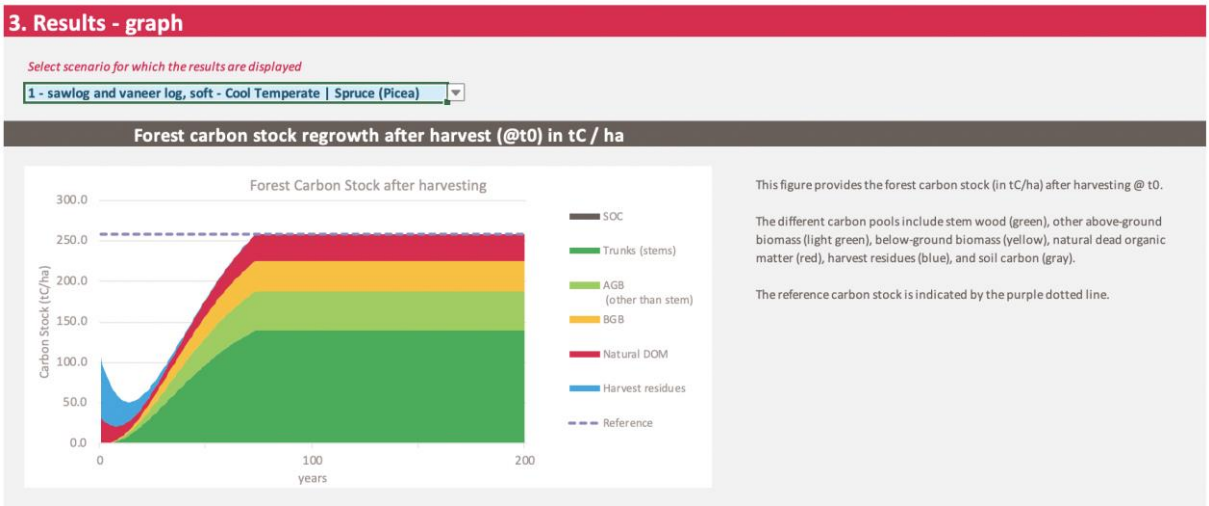
4.6 Step 6: Interpret results

Select which scenario the figures of the carbon stock, the storage time and the overall biogenic carbon should be plotted against.



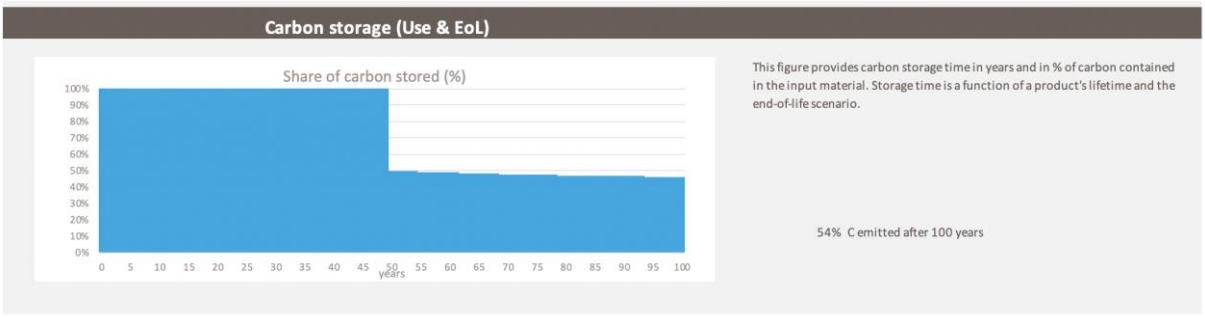
4.6.1 Forest carbon gap

Different carbon pools include stem wood (green), other above-ground biomass (light green), below-ground biomass (yellow), natural dead organic matter (red), harvest residues (blue), and soil carbon (gray). The purple dotted line indicates the reference carbon stock. A gap in carbon stock between the reference and the harvested forest scenario can be interpreted as the "forest carbon gap."



4.6.2 Carbon stored in the product

Storage time is a function of a product's lifetime (50 years in the figure below) and the end-of-life scenario (landfill 50% and incineration 50%, in the figure below). The percentage of carbon emitted during a time period of 100 years is also indicated (in this case, as 54%).



4.6.3 GWP_{bio}

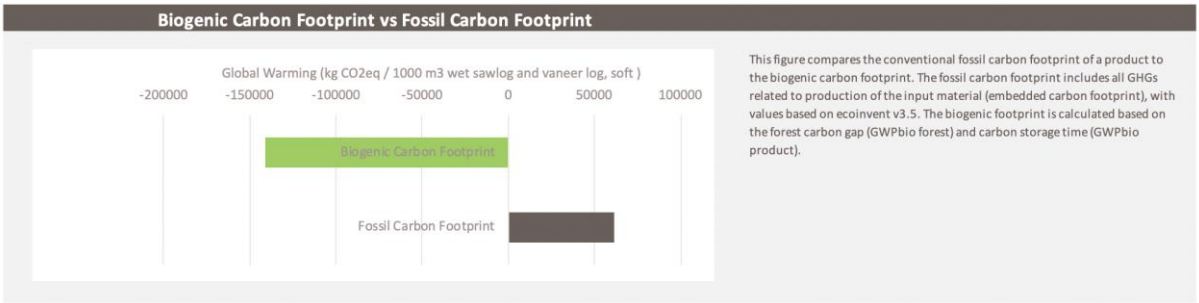
The biogenic carbon footprint is expressed in kg Co_2eq and can be compared to the "fossil carbon footprint". The biogenic carbon footprint is calculated based on the amount of carbon emitted (kg C), with conversion to CO_2 based on molecular weight (44/12) and global warming potential bio (GWP_{bio}). GWP_{bio} consists of the forest GWP_{bio} (typically a value above 0) and the product GWP_{bio} product (typically 0 or negative). GWP_{bio} is relative to the GWP of fossil CO_2, and can be interpreted as follows:

- GWP_{bio} of 1 = GWP of fossil CO_2
- GWP_{bio} of 0 = carbon neutrality for biogenic carbon emissions/uptake
- GWP_{bio} of -1 = carbon capture and storage over >100 years

Depending on the wood processing efficiency and allocation method, carbon stored in a product is different than the amount of carbon extracted from a forest. GWP_{bio}, forest is multiplied with the amount of C extracted from a forest (converted to CO_2) and the GWP_{bio}, product with the amount of C contained in the product (converted to CO_2).

4.6.4 Biogenic and fossil carbon footprint

The biogenic carbon footprint is expressed in kg CO_2eq per amount of input material (absolute value) and can be compared to the conventional fossil carbon footprint using the same units. The fossil carbon footprint includes all GHGs related to the production of the input material (embedded carbon footprint), with values based on ecoinvent v3.5.



4.6.5 Limitations

As described earlier, results can be used as a first screening to identify how the biogenic carbon footprint relates to the fossil carbon footprint.

The highest uncertainties are related to forest carbon modeling. Consequently, primary data from your supply chain should be used to i) improve the quality of results overall, and ii) make decisions about forest biomass sourcing (comparing different feedstocks).

Also keep the calculator's main assumptions in mind (focus on global warming, no LUC, etc.).

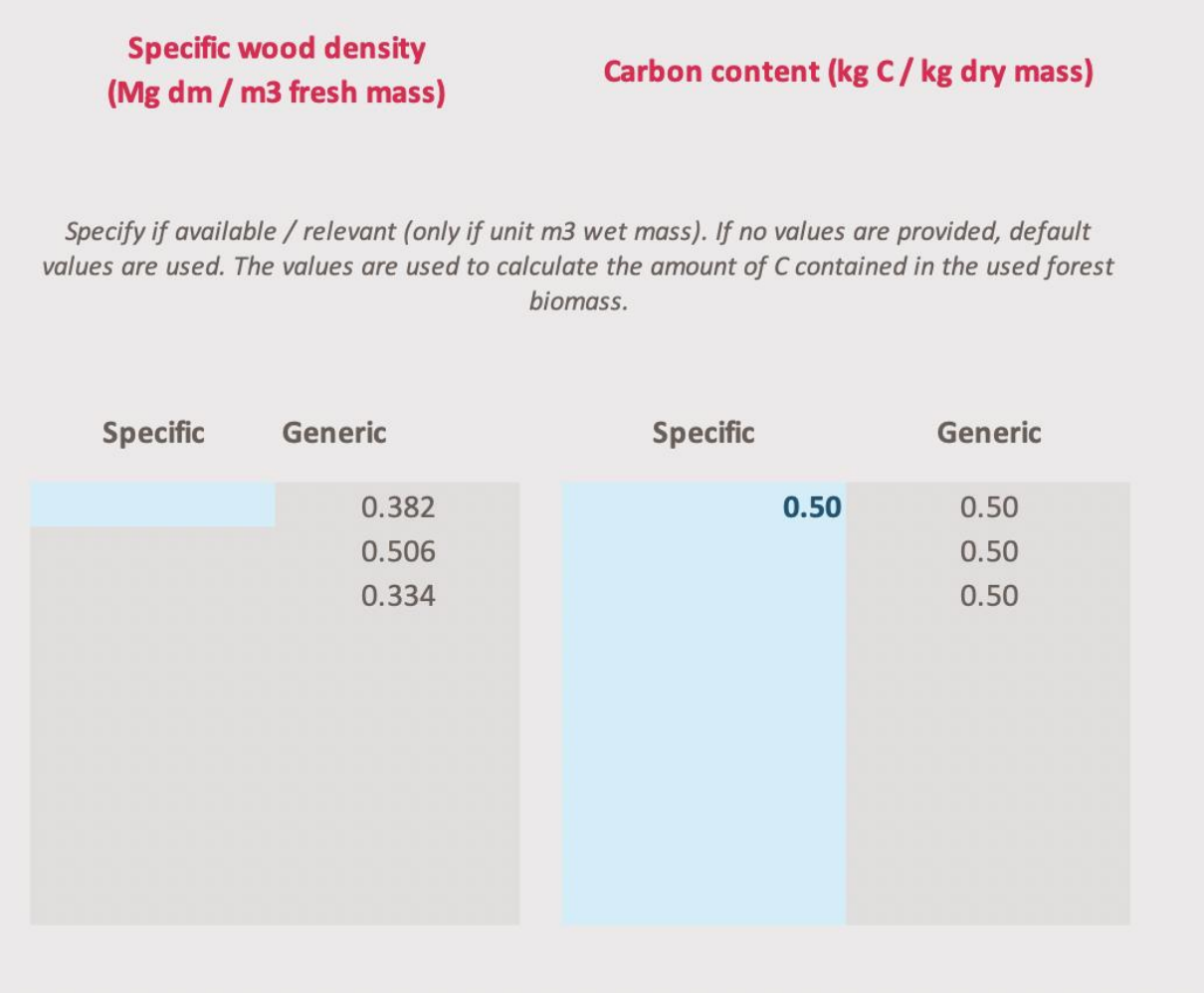
5 ADVANCED — Data details

5.4 Input material parameters

5.4.1 Specific wood density and carbon content

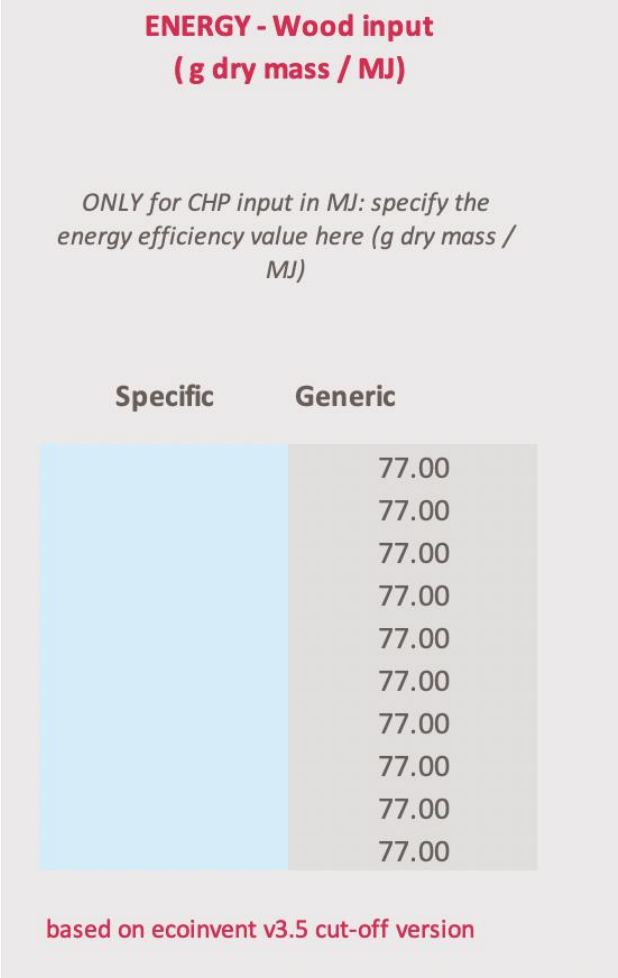
For some material inputs, the unit is m3 fresh mass. To determine carbon content, density (kg dry mass / m3 fresh mass) and carbon content (kg C / kg dry mass) are required. Default values are provided for both (see the “Forest Model” tab for default values, in columns G and column I). Provide specific values for the blue fields in cases where these values are available.

Specific wood density			Carbon content (kg C / kg dry mass)	
Specify if available / relevant. If no values are provided, default values are used. *The values are used to calculate the amount of C contained in the used forest biomass.*				
Amount	**Unit**		**Specific**	**Generic**
0.41	Mg dm / m3		**0.50**	0.50
0.41	Mg dm / m3			0.50
0.41	Mg dm / m3			0.50
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00
	Mg dm / m3			0.00



5.4.2 Energy value

These values are only required if the input is “heat, CHP plant,” which is measured in MJ heat provided and is used to relate MJ with the amount of dry mass used (kg dry mass / MJ). A default value of 77g dry mass per MJ is used (ecoinvent v3.5).



5.5 Forest biomass source

The key parameter here is climate/species type, which defines the growth curve. Default parameters are provided in the Forest Model tab, and calculations are described in the methodology report.

A few key parameters that can be changed directly in the calculator (depending on needs) include:

- Reference scenario: the reference is set as "net-zero reference," which means that forest carbon stock remains unchanged and the forest carbon gap is analyzed until the same carbon stock as at harvesting time is reached. Alternatively, the foregone sequestration of forests can also be considered (continuous growth), leading to higher $GWP_{bio,\ forest}$.
- Carbon stocks considered: by default, all carbon pools except soil carbon stock change are considered (stem wood, other above-ground biomass, and below-ground biomass). Natural deadwood is also an important carbon pool in the forest, and is considered by default in the forest carbon model. The influence of different forest harvesting and management

practices on soil carbon stock might be significant. However, the default calculations do not consider potential SOC emissions given the relatively large uncertainty.

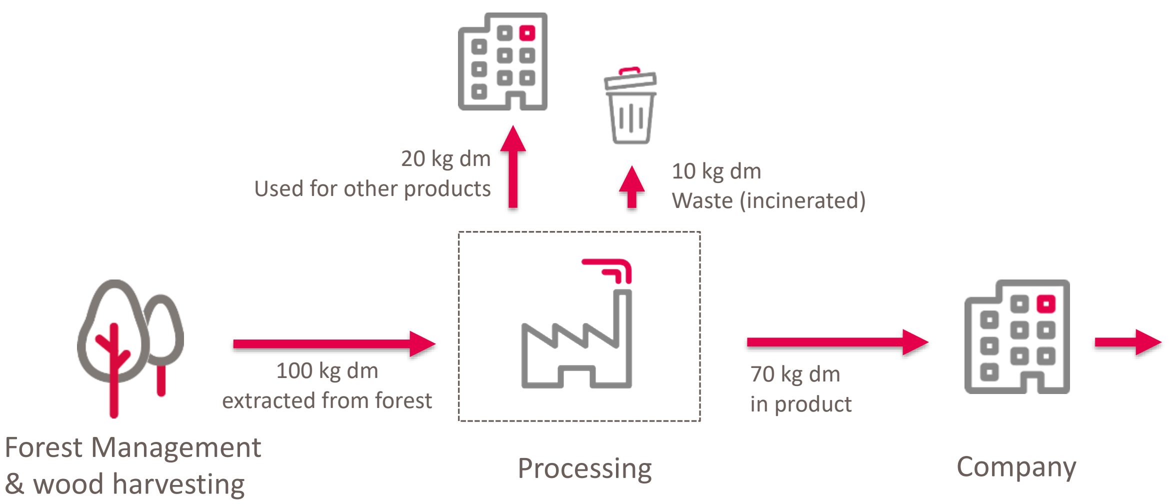
- **Biomass extracted:** 100% of stem wood and 25% of other AGB is assumed to be extracted. BGB and DOM are left in the forest (decay).

Reference scenario	Carbon stocks considered			Biomass extracted (%)			
Baseline scenario	*Other AGB considered?*	*nDOM & harvest residues considered?*	*Soil carbon considered*	Stem	AGB (other than stem)	BGB	DOM
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%
Net-Zero Reference	Yes	Yes	No	100%	25%	0%	0%

5.6 Wood processing and allocation

This section considers how much wood needs to be extracted from a forest (in kg C) to produce the amount of input materials (in kg C). The wood extraction factor mainly depends on two parameters:

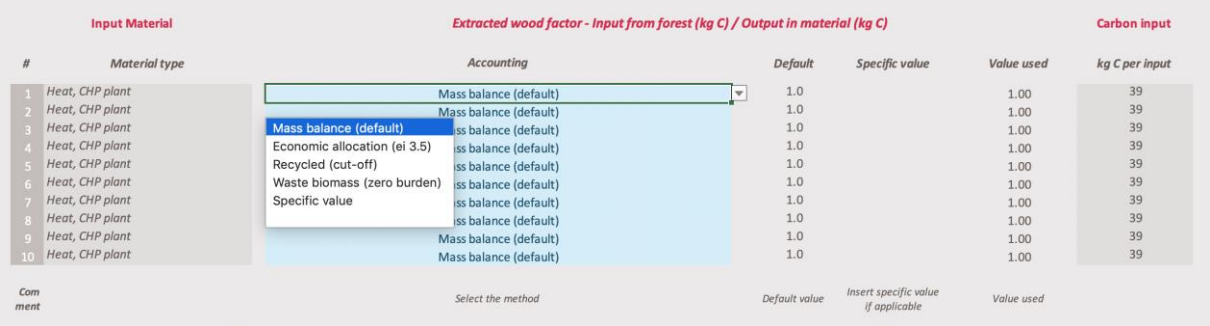
- **Wood processing:** the amount of wood that needs to be extracted from the forest (in kg C) to produce the amount of input materials (in kg C). Some of the wood biomass extracted from a forest may be used for other products (e.g. 20% as in the fictive mass balance below) or as waste (10%).
- **Allocation:** the ways the biogenic carbon footprint is assigned to different forest products and co-products (e.g., sawdust, shavings, etc.).



Different approaches

Category	Wood extraction factor	Description
Mass balance (default)	1	Amount of carbon contained in material = amount of carbon extracted from forest (default)
Economic allocation (ei 3.5)	≥0	Amount of standing wood (kg C) for each input material is based on ecoinvent v3.5, cut-off version and is expressed as carbon extracted from forest (kg C) per carbon contained in material (kg C). Values greater than one indicate that either a high value biomass is used, or that processing losses occur. Values lower than one indicate that low value biomass is used, and that more burden is assigned to the high value product (e.g. timber vs.. saw dust)
Recycled (cut-off)	0	The forest biomass is sourced from recycled wood. A cut-off approach is used here, meaning that no burden from wood extraction is assigned if recycled material is used.
Waste biomass (zero burden)	0	Waste biomass is used, meaning no burden from wood extraction is assigned if "waste" material is used.
Specific value	≥0	Specify your own value

A “wood extraction factor” can be selected for each input material:



Note: if the value is greater than one, remaining carbon not contained in the product is assumed to be emitted at year one (no storage benefits).

5.7 Use & end-of-life

Main parameters in this stage are defined in the “ADANCED-interface” tab (see chapter 3.4 and 3.5). No additional values can be modified.

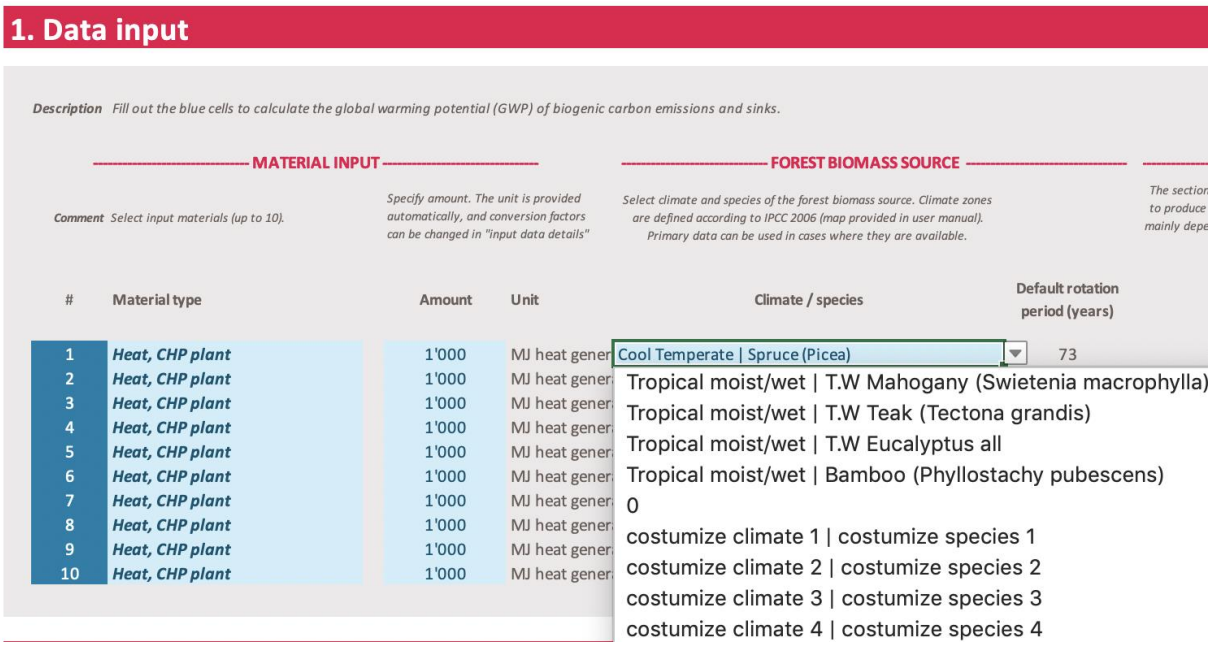
6 Forest model

In this tab, the forest carbon model parameters are described for 36 climate/species combinations. Starting in row 42, there is space to “customize” the forest carbon model by filling out the blue cells for each parameter.

Forest Model

No	Climate / species	Climate type	Specie	Wood type	Carbon content		Sepecific wood density		Rotation period	
					t C / t dm	Source	Mg dry matte	Source	Year	Source
38	costumize climate 1 | costumize species 1	costumize climate 1	costumize species 1							
39	costumize climate 2 | costumize species 2	costumize climate 2	costumize species 2							
40	costumize climate 3 | costumize species 3	costumize climate 3	costumize species 3							
41	costumize climate 4 | costumize species 4	costumize climate 4	costumize species 4							
42	costumize climate 5 | costumize species 5	costumize climate 5	costumize species 5							
43	costumize climate 6 | costumize species 6	costumize climate 6	costumize species 6							
44	costumize climate 7 | costumize species 7	costumize climate 7	costumize species 7							

The customized datasets are then available in the “ADVANCED-Interface” tab for further calculations.



1. Data input

Description *Fill out the blue cells to calculate the global warming potential (GWP) of biogenic carbon emissions and sinks.*

MATERIAL INPUT — FOREST BIOMASS SOURCE

Comment *Select input materials (up to 10).*

Specify amount. The unit is provided automatically, and conversion factors can be changed in "input data details"

Select climate and species of the forest biomass source. Climate zones are defined according to IPCC 2006 (map provided in user manual). Primary data can be used in cases where they are available.

The section to produce mainly depe

#	Material type	Amount	Unit	Climate / species	Default rotation period (years)
1	*Heat, CHP plant*	1'000	MJ heat gener	Cool Temperate | Spruce (Picea)	73
2	*Heat, CHP plant*	1'000	MJ heat gener		
3	*Heat, CHP plant*	1'000	MJ heat gener		
4	*Heat, CHP plant*	1'000	MJ heat gener		
5	*Heat, CHP plant*	1'000	MJ heat gener		
6	*Heat, CHP plant*	1'000	MJ heat gener		
7	*Heat, CHP plant*	1'000	MJ heat gener		
8	*Heat, CHP plant*	1'000	MJ heat gener		
9	*Heat, CHP plant*	1'000	MJ heat gener		
10	*Heat, CHP plant*	1'000	MJ heat gener		

Tropical moist/wet | T.W Mahogany (Swietenia macrophylla)
Tropical moist/wet | T.W Teak (Tectona grandis)
Tropical moist/wet | T.W Eucalyptus all
Tropical moist/wet | Bamboo (Phyllostachy pubescens)
0
costumize climate 1 | costumize species 1
costumize climate 2 | costumize species 2
costumize climate 3 | costumize species 3
costumize climate 4 | costumize species 4