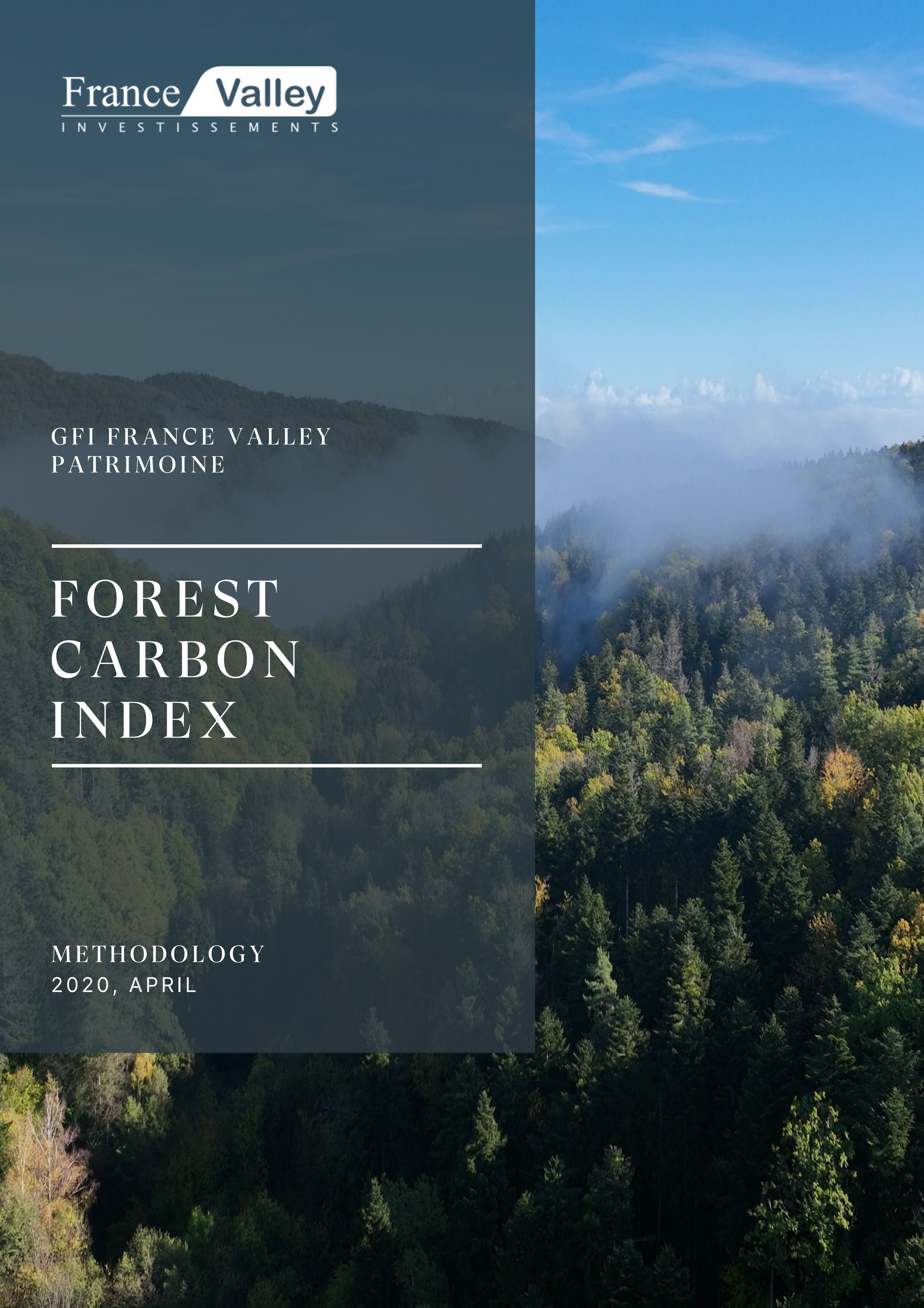


France Valley
INVESTISSEMENTS

GFI FRANCE VALLEY
PATRIMOINE

FOREST CARBON INDEX

METHODOLOGY
2020, APRIL

INDEX

INTRODUCTION

This document is based on scientific data as of the date of production, which may change considering more recent scientific publications. The technical data for each of the forests on which it is based are produced by expert foresters, who allow for a certain margin of error. They may also be updated according to our knowledge of the forest areas in question, for example when an inventory is carried out or updated.

The various elements of carbon quantification come mainly from the "Label Bas Carbone" methodology proposed by the CNPF, which aims to evaluate the potential carbon gain of an alternative silvicultural itinerary compared with a so-called reference scenario. As the GFI's forest carbon assessment is annual and based on real data, some calculations and data have had to be adapted, but they are still based on reliable scientific references.

1. Summary of carbon compartments assessed by the methodology

Compartment type	
Forest ecoystem	Above-ground biomass
	Root biomass
	Soil
	Litter
	Underfoor
Wood Products	Storage in wood products
	Wood product substitution effect
Emissions	Forestry operations
	Forest management activities

2. Quantifying carbon stock in forest ecosystems

2.1 Datas

Before each new acquisition, the fund has a qualitative and quantitative assessment of the asset carried out by a forestry expert member of the Conseil National de l'Expertise Foncière Agricole et Forestière (CNEFAF). He adopts the methodology recommended by the Compagnie Nationale des Ingénieurs et Experts Forestiers et des Experts Bois (CNIEFEB).

This assessment makes it possible to determine :

- Forest species making up the stands;
- Volumes by type of product (timber, firewood, pulpwood, etc.);
- The nature of the land (forest, moorland, farmland, bare land);
- An estimate of the biological growth of stands.

Each year, the GFI's lead appraiser carries out a revaluation of all the assets in the portfolio, applying a growth rate to the stand and deducting any harvesting carried out during the year.

The data used in this methodology will be taken from the valuation at portfolio entry for the first year, and from annual revaluations thereafter.

2.1.1. Mature Forest stands

Data characterizing mature stands can be collected using a full-scale inventory (counting and measuring all trees), statistically using representative plots, or visually for low-value plots.

The volumes indicated in tons and steres are converted into cubic meters, the reference unit for our calculations, by the standards of the Institut Technologique Forêt Cellulose Bois-construction Ameublement (FCBA).

2.1.2 Growing forest stands

The assessment of wood volume in growing stands is based on the estimation of their biological growth and density. A theoretical silvicultural itinerary drawn up by the forester determines the volume according to the apparent age of the stands.

2.2 Above-ground biomass (B_A)

According to the Label Bas Carbone methodology, the volume of above-ground biomass, in tons of dry matter, should be calculated as follows:

$$B_A(n) = V_7(n) \times FEB \times d_i$$

Équation 11

B_A = biomasse aérienne (en tMS) ;
V_7 = volume bois fort tige (m^3) ;
FEB = facteur d'expansion « branches » ;
d_i = infrandensité de l'essence i (voir annexe 3).

However, as heavy timber volume is rarely used by forestry experts, we will use the "commercial" volume indicated in the expert's assessment for this calculation. This allows us to incorporate a margin of uncertainty at this stage, as the commercial volume is lower due to the larger diameter at which the measurement is stopped. In the case of young stands, the volume cannot be qualified as commercial, as the wood is not always harvestable due to its small diameter. We will therefore use the commercial volumes produced during the life of the stand, presented according to a theoretical silvicultural itinerary, to determine a smoothed volume, which could be marketed in the future, according to the apparent age of the stands. An example is shown in Appendix 1.

The equation for calculating above-ground biomass will therefore take this form:

$$\boldsymbol{B_A(n) = V_c \times FEB \times d_i}$$

$B_A(n) = Above - ground\ biomass\ in\ tMS$

$V_c = Commercial\ volume\ in\ m^3$

$FEB = "Branch"\ expansion\ factor$

$d_i = Species\ infradensity\ in\ tMS/m^3$

The "branch" expansion factors used will be 1.3 for softwoods and 1.56 for hardwoods, as indicated in the Label Bas Carbone methodology (see Appendix 2). These figures consider carbon storage in the smallest sections of wood.
The infra-densities of forest species per cubic meter are presented in appendix 3. These data come from an unpublished note by Dupouey and are used by the Institut National de l'Information Géographique et Forestière (IGN) during its forest resource inventory campaigns.

Note : In the absence of precision as to the forest species making up the forest stands, we will use the average values of infra-densities and branch expansion factors.

2.3 Root Biomass (B_R)

Root biomass, directly related to above-ground biomass, will be determined according to the equation indicated in the Label Bas Carbone methodology, namely:

$$B_R(n) = exp(-1.0587 + 0.8836 \times \ ln(B_A(n)) + 0.2840)$$

$B_A(n) = Above - ground\ Biomasse\ in\ tMS$

$B_R(n) = Root\ Biomasse\ in\ tMS$

2.4 Underfloor Biomass (B_{SE})

To quantify the carbon sequestered in the shrub, herb and foliage strata, we will refer to ADEME's recommended constants of 2.4 tC/ha for hardwood stands and 6.5 tC/ha for softwoods, using an average of 4.45 tC/ha of forest area, with the GFI composed equally of hardwood and softwood forests. We will not vary this compartment over time.

2.5 Soil (S)

To quantify carbon storage in soils, we will use the equilibrium states recommended by Arrouays et al. (2002) and presented below by type of soil:

Nature of land	Carbon Storage (tC/ha)
Vineyards and orchards	32
Agricultural crops	45
Permanent meadows	70
Forests	70

The equilibrium state corresponds to the point at which carbon inflows and outflows are equal, generally at 30 years. As the overwhelming majority of GFI's plots have been in a forest state for much longer, we consider that equilibrium has been reached for all the forested land in the GFI portfolio.
It should be noted that recent studies tend to demonstrate that carbon storage in forest soils is much higher than the figures presented above.

Note : In the absence of precise information on the nature of the land, no carbon stock will be retained.

2.6 Litter (L)

The equilibrium value of carbon stored in forest litter is set at 10 tC/ha, as recommended by Arrouays et al. (2002). As with the calculation of soil carbon stock, we consider that the equilibrium state of litter has been reached for all the forest land in the portfolio.

2.7. Deadwood

The carbon contained in dead wood in forests will be neglected due to a lack of scientific studies on the subject.

2.8. CO2 Total Stock total in forest ecosystem (Sef)

After calculating the carbon storage of the various compartments, the total quantification, in teqCO2, of the forest ecosystem studied will be evaluated as follows:

$$\boldsymbol{Sef(n) = ((B_A(n) + B_R(n)) \times \tau C + B_{SE}(n) + S(n) + L(n)) \times \frac{44}{12}}$$

$Sef(n) = teqCo2\ content\ of\ the\ forest\ ecosystem\ in\ year\ n$

$B_A(n) = Aboe - ground\ biomass\ in\ tC$

$B_R(n) = Root\ biomass\ in\ tC$

$B_{SE}(n) = Biomass\ of\ the\ understory\ tC$

$S(n) = Soil\ carbon\ content\ in\ tC$

$L(n) = Carbon\ content\ of\ litter\ in\ TC$

$\tau C = Carbon\ rate\ in\ dry\ matter, constant\ equal\ to\ 0.475\ tC/tMS$

The coefficient (44/12) allows the conversion of tonnes of carbon into teqCO2.

3. Quantifying carbon storage and the substitution effect of harvested products

3.1 Datas

As carbon storage in wood products and substitution effects are closely linked to the end use of harvested volumes, we will rely on invoices and contradictory receipts, which, when sold by product unit, provide information on the main categories of wood produced:

- Lumber or sawn timber: used in "solid" form, without chipping (carpentry, staveboard, cabinetwork, joinery, etc.).
- Industrial wood: wood chips used to make particleboard (chipboard, OSB, etc.). This category also includes paper processing. Where possible, we will distinguish between these two uses, which do not have the same carbon storage time or substitution effect
- Wood energy: used for heating, in the form of logs, chips or pellets.

In the case of "block" sales, we do not have the volume by product category. In such cases, France Valley, the forest manager, or the GFI's forestry expert will presume to use according to the purchaser of the lot, species, wood diameters, and conformation.

3.2. Carbon Storage in harvested products 〚(S〛_PB)

The carbon contained in forest products at the start of year n, corresponding to the marketing year, will be assessed as follows:

$$S_{PB}(n) = (V_v \times Rdt \times d_i \times \tau c) \times \frac{44}{12}$$

$S_{PB}(n) =$ *Carbon content of wood products in TeqCo2*

$V_v =$ *Volume sold in m3*

$Rdt =$ *Material yield depending on use*

$d_i =$ *Infradensity of gasoline in* tMS/m^3

$\tau C =$ *Carbon rate in dry matter, constant equal to 0,475* tC/tMS

The average material yield per type of use will be defined using the work of INRA, 2014:

Type of use	Rendement
Lumber	50%
Industrial Wood	85%
Wood energy	100%

As the lifespan of wood energy is less than 2 years, we will not take into account the carbon storage for this use.

Note : If the species marketed are not identified, we will use average infradensity values. Volumes indicated in other units (tonne, stere) will be converted to m3 according to the standards of the Institut Technologique Forêt Cellulose Bois-construction Ameublement (FCBA).

3.3. Substitution effect of wood products (SU)

The substitution effect generated by wood harvesting will be quantified at the time of marketing. It will be calculated using the equation below :

$$\boldsymbol{SU(n) = V_v \times CS}$$

$SU(n) =$ $tCo2$ $substitution$ at $harvest$

$V_v =$ $Volume$ $marketed$ in $m3$

$CS = Substitution$ $coefficient$ in $teqCo2/m^3$

The table below shows the substitution coefficients assessed by Valada et al., 2016, and used by the CNPF as part of the Label Bas Carbone methodology.

Type os use	Substitution Coefficient
Lumber	1.52
Paper Industry	0
Other industrial wod	0.77
Wood energy	0.25

We will not be quantifying the cascading use of wood materials throughout their life, which allows us to introduce a margin of uncertainty for both storage in wood products and substitution.

4. Quantifying carbone emissions generaterd by forest harvesting and management activities

4.1. Forest Management ($\boldsymbol{EF}$)

Neglected in the Low Carbon Label methodology, emissions from forest harvesting will be quantified.
A 2014 study (González-García et al.) carried out in dynamically and extensively managed forests assessed emissions generated by forestry work (felling, skidding, reforestation, plantation maintenance and others) at 10 kgCO2e/m3 and 25 kgCO2e/m3 of wood product. Considering that French forests are not very intensively exploited, we will retain, in accordance with the recommendations of the 2017 Ademe report "Faire un diagnostic carbone des forêts et des produits bois à l'échelle d'un territoire", 0.01 teqCO2/m3 under bark per wood product. We will not convert between volumes on and under bark, as the difference is negligible.
The calculation of emissions generated by forestry work will take this form:

$$\boldsymbol{EF(n) = V_v \times Ec}$$

$EF_n = \textit{ emissions generated by forestry operations in teqCO2}$

$V_v = \textit{ volume sold in m3 over the year}$

$EC = \textit{ emission constant } 0{,}01\ tCO2e/m3$

4.2. Management activities ($\boldsymbol{EG}$)

Technical management activities (hammering, monitoring, felling and work supervision, etc.) are delegated to local service providers (forestry experts, managers, cooperatives, independent contractors). According to our observations, a manager visits each forest on average 6 times a year. To estimate the emissions generated by their travel, we will define the distance between their premises and the forest concerned. In 2017, ADEME estimated average emissions per kilometer from the private car fleet at 111 geqC02/km, i.e., 0.000111 teqC02/km.

Quantifying emissions from management activities will take this form:

$$\boldsymbol{EG(n) = D \times Ekm \times 2 \times 6}$$

$\boldsymbol{EG_n = \text{emissions generated by forestry operations in } teqCO2/m3}$

$D = \text{Distance between the manager's premises and the forest concerned in km}$

$Ekm = \text{Average emissions from private car fleet in } teqC02/km$

5. Evolution and annual balance

5.1. Carbon stock evolution in the forest ecosystem

Two main factors will influence the evolution of the carbon stock in the ecosystem:

- Biological growth of stands
- Wood harvesting

The biological increase in stand volume will be assessed annually by the GFI's lead expert and used as a basis for calculating above-ground and root biomass at n+1. Removals carried out during the year will be deducted beforehand.
The calculation of aerial biomass at n+1 will therefore take this form:

$$\boldsymbol{B_A(n+1) = (B_A(n) - (V_v \times FEB \times d_i)) \times (1 + t)}$$

$B_A(n+1) = Above - ground\ biomass\ at\ n+1\ in\ tMS$

$V_v = Volume\ sold\ during\ the\ year\ in\ m^3$

$FEB = Branch\ expansion\ factor$

$d_i = Species\ infradensity\ in\ tMS/m^3$

$t = Stand\ growth\ rate\ in\ \%$

As there is very little literature on the decomposition of root biomass, we will assume that it disappears when the harvest is carried out. It is, however, undeniable that storage continues in this compartment for years. As we were unable to substantiate this scientifically, we will estimate above-ground biomass at n+1 as follows:

$$\boldsymbol{B_R(n+1) = exp\left(-1.0587 + 0.8836 \times\ ln\left(B_A(n+1)\right) + 0.2840\right)}$$

Carbon storage in the other compartments of the forest ecosystem will only change in the event of a plot being sold or acquired.
In conclusion, the storage in teqCO2 at n+1 in the forest ecosystem will be obtained by this equation:

$$Sef(n+1) = ((B_A(n+1) + B_R(n+1)) \times \tau C + B_{SE}(n+1) + S(n+1) + L(n+1)) \times \frac{44}{12}$$

$Sef(n+1) = content\ of\ the\ forest\ ecosystem\ at\ n+1$

$B_A(n+1) = Above - ground\ biomass\ in\ tC$

$B_R(n+1) = Root\ biomass\ in\ tC$

$B_{SE}(n+1) = understory\ biomass\ tC$

$S(n+1) = Soil\ carbon\ content\ in\ tC$

$L(n+1) = Litter\ carbon\ content\ in\ tC$

5.2. Evolution of carbon stock in wood products

The evolution of carbon stored in wood products, by type of use, will be evaluated following the methodology of the Label Bas Carbone, i.e. :

$$S_{PB}(n+1) = (e^{-k} \times S_{PB}(n) + \frac{1-e^{-k}}{k} \times Flux\ (n)) \times \frac{44}{12}$$

$S_{pb}(n+1) = Stock\ in\ teqCo2\ in\ wood\ products\ at\ n+1$

$k = ln(2)/t_{1/2}\ First - order\ decomposition\ constant$

$t_{\frac{1}{2}} = Half - life\ by\ type\ of\ use$

$Flux\ (n) = low\ of\ incoming\ carbon\ between\ n\ and\ n + 1, corresponds\ to\ the\ carbon\ stock\ of\ harvested\ products\ between\ n\ and\ n + 1$

Half-life times are defined by the European Commission:

Type os use	Half-life time
Timber (sawing)	35
Industrial wood – wood panels	25
Industrial wood - paper	2
Wood energy	0

The type of use will be determined based on contradictory invoices and receipts. In the absence of information concerning industrial wood, we will apply the lowest half-life, i.e. paper. An example is available in Appendix 4.

5.3. Annual balance

The evolution of the Forest Carbon Balance will take this form:

$$\boldsymbol{Balance\ (n+1) = S_{PB}(n+1) + Sef(n+1) - EF(n) - EG(n) + SU(n)}$$

$\boldsymbol{S_{pb}(n+1)} = Stock\ of\ teqCo2\ in\ wood\ products\ at\ n+1$

$\boldsymbol{Sef(n+1)} = teq\ Co2\ content\ of\ the\ forest\ ecosystem\ at\ n+1$

$\boldsymbol{EF(n)} = Emissions\ generated\ by\ forestry\ operations\ since\ the\ first\ year\ teqCO2$

$\boldsymbol{EG(n)} = Emissions\ generated\ by\ forest\ management\ since\ the\ first\ year\ in\ teqCO2$

$\boldsymbol{SU(n)} = Sum\ of\ substitution\ effects\ since\ the\ first\ year\ in\ teqCO2$

5.4. Discount

This methodology is not subject to discounts as presented in the Low Carbon methodology to protect against the risks of non-permanence of the forested state, fires, storms or phytosanitary because the reassessment of the stock will take place annually. In the event of a disaster, the compartments will be impacted according to the inventory drawn up by the manager of the forest concerned.
Furthermore, the GFI has taken out storm and fire insurance for all forests, which greatly limits the risk that stands will not be reforested, due to lack of financing, in the event of a disaster.
No discount for losses during operations will be calculated because the quantification of substitution and storage effects is based on the volumes sold.

APPENDICES

Appendix 1 : Example of determining the smoothed commercial volume of an immature stand

Scénario : Pin Taeda à 10,6 m3/ha/an

Dépenses et recettes variables (en €/ha)

	Années	Volume (en m3)	Prix Unitaire	Recettes	Dépenses
Début	0				1 700
	2				150
	4				100
	6				100
	15				680
	20	55	5 €	275	
	20				580
	28	60	8 €	480	
	36	70	10 €	700	
	44	80	20 €	1600	
	52	70	25 €	1750	
Annéefin	60	300	35 €	10500	

BNA	0
BASI	0
I	2 854
CA	617
Do	4 054
Rn	19 168

Recettes ou frais fixes (annuels) en €/ha

	Départ	Fin	Montant
Frais	0	60	-15

Fonds	1 200
Volume	300
PU	35

TIR 2,43%

Age 2

	Parcelle	**Peuplt**
Prix revient	3089	1889
Valeur d'avenir lissée	3227	2027

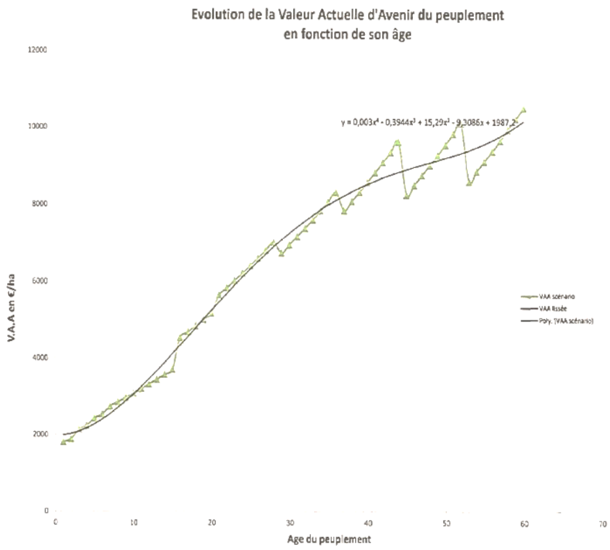
CONTROLE SCENARIO:

Productivité moyenne du scénario :	10,58 m³/ha/an
Volume totale des éclaircies / volume coupe	112%

$$Pr = (f+ca)(1,0t^{m} - 1) + c\,1,0t^{m} - Ea\,1,0t^{m-a} + Da\,1,0t^{m-a}$$

$$Va = \frac{Ru + Eq\,1,0t^{u-q} - (f+ca)(1,0t^{u-m} - 1) - Dq\,1,0t^{u-q}}{1,0t^{u-m}}$$

Age	VAA escompte	Prix de revient	Valeur lissée
1	1 801 €	1 801 €	1 993 €
2	1 889 €	1 889 €	2 027 €
3	2 132 €	2 132 €	2 086 €
4	2 228 €	2 228 €	2 170 €
5	2 429 €	2 429 €	2 275 €
6	2 532 €	2 532 €	2 400 €
7	2 740 €	2 740 €	2 543 €
8	2 851 €	2 851 €	2 702 €
9	2 965 €	2 965 €	2 874 €
10	3 081 €	3 081 €	3 059 €
11	3 200 €	3 200 €	3 254 €
12	3 322 €	3 322 €	3 458 €
13	3 447 €	3 447 €	3 669 €
14	3 574 €	3 574 €	3 887 €
15	3 705 €	3 705 €	4 109 €
16	4 536 €	4 536 €	4 334 €
17	4 691 €	4 691 €	4 561 €
18	4 849 €	4 849 €	4 788 €
19	5 011 €	5 011 €	5 016 €
20	5 177 €	5 177 €	5 242 €
21	5 659 €	5 659 €	5 466 €
22	5 841 €	5 841 €	5 686 €
23	6 027 €	6 027 €	5 902 €
24	6 217 €	6 217 €	6 114 €
25	6 412 €	6 412 €	6 320 €
26	6 612 €	6 612 €	6 520 €
27	6 817 €	6 817 €	6 714 €
28	7 027 €	7 027 €	6 900 €
29	6 750 €	6 750 €	7 079 €
30	6 958 €	6 958 €	7 250 €
31	7 172 €	7 172 €	7 413 €
32	7 390 €	7 390 €	7 568 €
33	7 614 €	7 614 €	7 715 €
34	7 843 €	7 843 €	7 853 €
35	8 078 €	8 078 €	7 984 €
36	8 318 €	8 318 €	8 106 €
37	7 847 €	7 847 €	8 220 €
38	8 082 €	8 082 €	8 326 €
39	8 323 €	8 323 €	8 425 €
40	8 569 €	8 569 €	8 517 €
41	8 821 €	8 821 €	8 603 €
42	9 080 €	9 080 €	8 683 €
43	9 345 €	9 345 €	8 757 €
44	9 616 €	9 616 €	8 827 €
45	8 255 €	8 255 €	8 893 €
46	8 499 €	8 499 €	8 956 €
47	8 750 €	8 750 €	9 017 €
48	9 007 €	9 007 €	9 076 €
49	9 270 €	9 270 €	9 136 €
50	9 539 €	9 539 €	9 197 €
51	9 815 €	9 815 €	9 260 €
52	10 098 €	10 098 €	9 326 €
53	8 595 €	8 595 €	9 398 €
54	8 848 €	8 848 €	9 476 €
55	9 107 €	9 107 €	9 561 €
56	9 372 €	9 372 €	9 656 €
57	9 644 €	9 644 €	9 762 €
58	9 923 €	9 923 €	9 880 €
59	10 208 €	10 208 €	10 013 €
60	10 500 €	10 500 €	10 162 €



According to this theoretical silvicultural scenario, the natural growth of these populations is estimated at 10.6 m³/ha/year. Over their 60-year lifespan, they will produce a total marketable volume of 635 m³. Excluding the cuts presented opposite, the woods produce annually a smoothed annual increase of 10.58 m³/ha.

The apparent age of this Taeda Pine plantation being two years, the volume used to calculate the aboveground biomass is 21.16 m³/ha.

Appendix 2 : “Branch” expansion factors

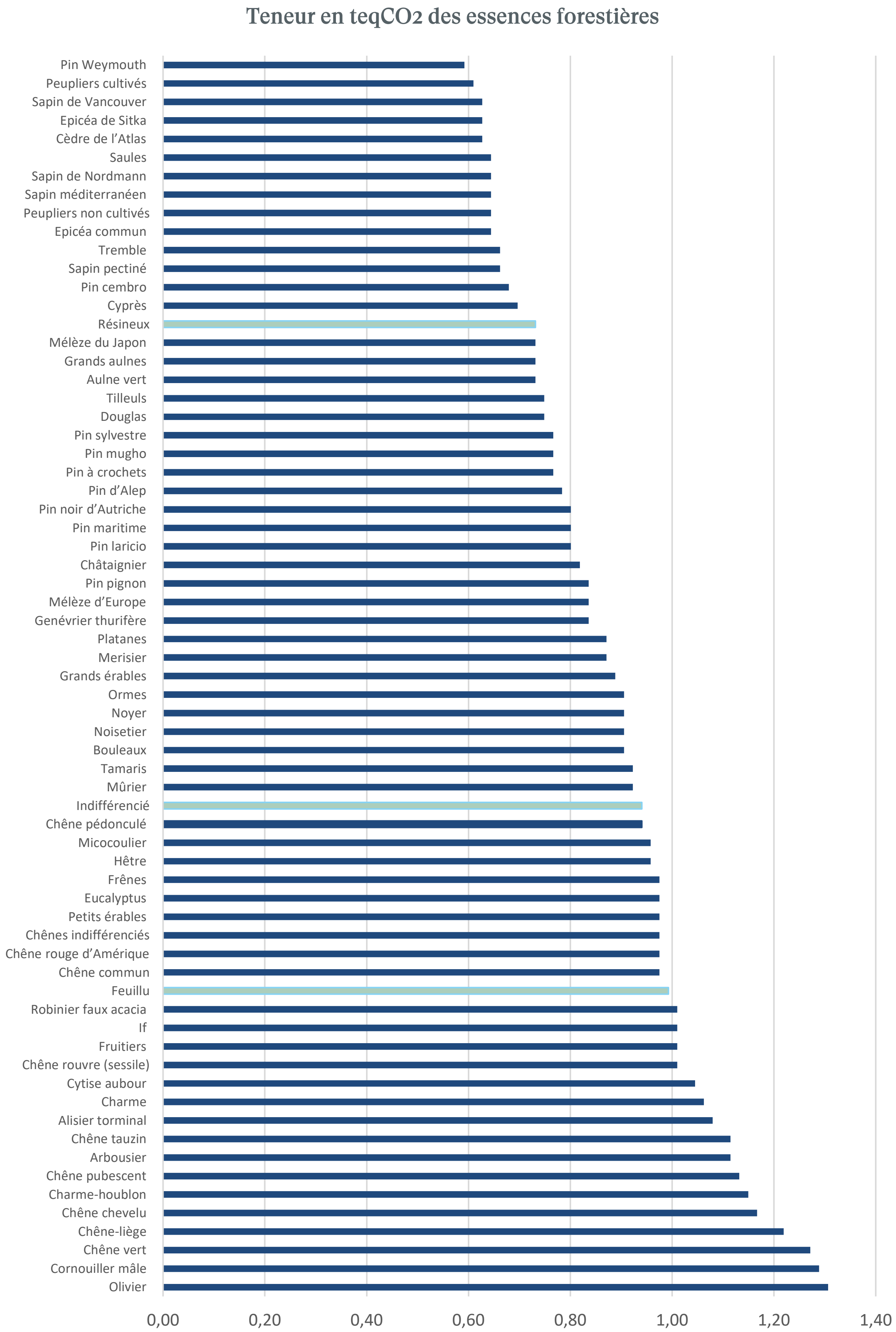
Type	Half-life time
Hardwoods	1,56
Softwoods	1,30
Undifferentiated	1,43

Appendix 3 : Infradensities of forest species in tMS, tC and TeqCO2

Species	Infradensity in tMS per m³	Content in tCarbon per m³	Content in TeqCO2
Torminal serviceberry	0,62	0,29	1,08
Arbutus	0,64	0,30	1,11
Green alder	0,42	0,20	0,73
Large alders	0,42	0,20	0,73
Birches	0,52	0,25	0,91
Atlas cedar	0,36	0,17	0,63
Charm	0,61	0,29	1,06
hop hornbeam	0,66	0,31	1,15
Chestnut	0,47	0,22	0,82
Hairy oak	0,67	0,32	1,17
Common oak	0,56	0,27	0,98
Oak cork	0,7	0,33	1,22
Pedunculate oak	0,54	0,26	0,94
Downy oak	0,65	0,31	1,13
American red oak	0,56	0,27	0,98
Sessile oak	0,58	0,28	1,01
Tauzin oak	0,64	0,30	1,11
Holm oak	0,73	0,35	1,27
Undifferentiated oaks	0,56	0,27	0,98
Male dogwood	0,74	0,35	1,29
Cypress	0,4	0,19	0,70
Laburnum aubour	0,6	0,29	1,05
Douglas	0,43	0,20	0,75
Common spruce	0,37	0,18	0,64
Sitka spruce	0,36	0,17	0,63
Large maples	0,51	0,24	0,89
Small maples	0,56	0,27	0,98
Eucalyptus	0,56	0,27	0,98
Thuriferous juniper	0,48	0,23	0,84
Beech	0,55	0,26	0,96
Ash trees	0,56	0,27	0,98
Fruit trees	0,58	0,28	1,01
Yew	0,58	0,28	1,01
European larch	0,48	0,23	0,84
Japanese larch	0,42	0,20	0,73
Cherry	0,5	0,24	0,87
Hackberry	0,55	0,26	0,96
Mulberry	0,53	0,25	0,92

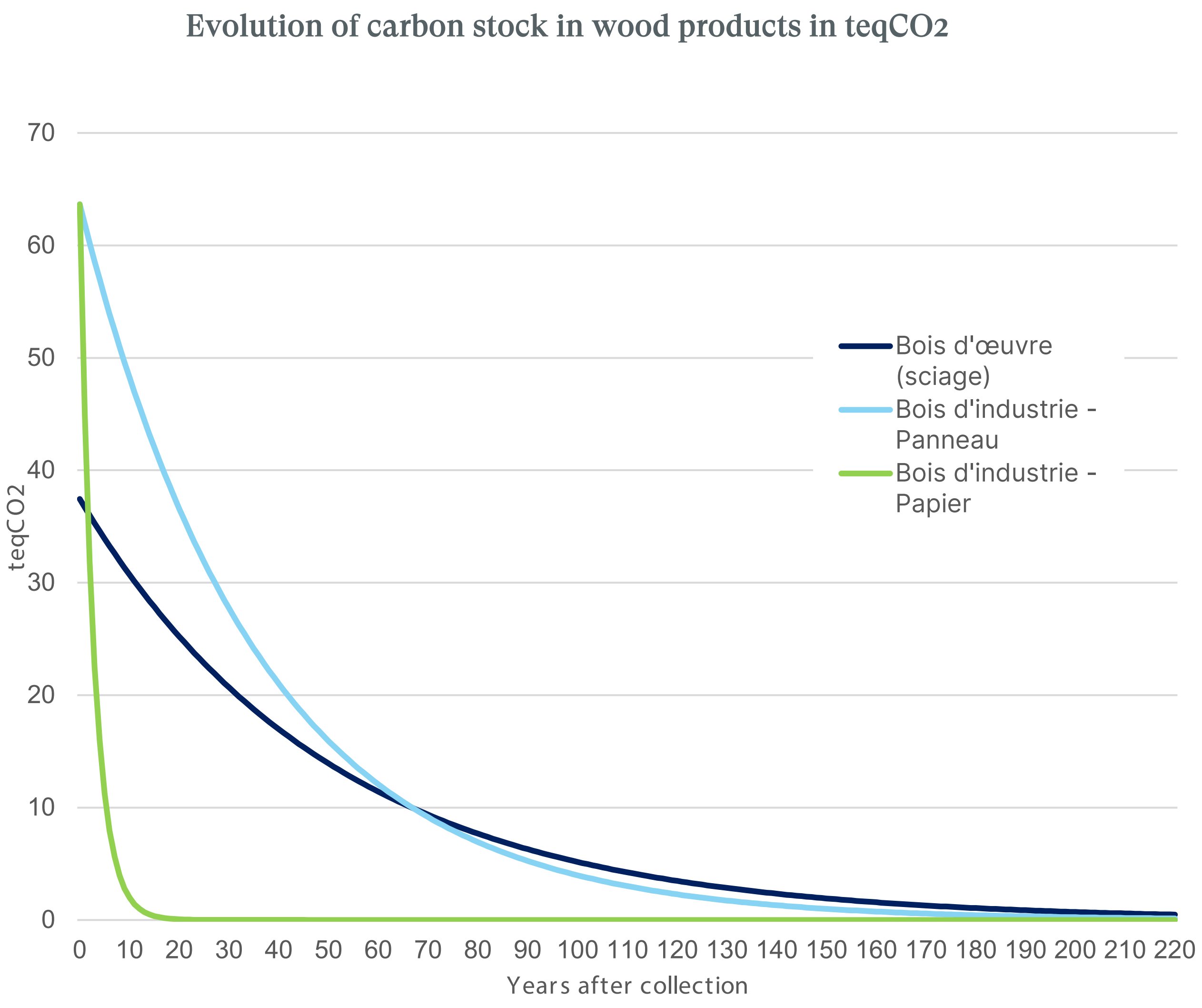
Hazel	0,52	0,25	0,91
Walnut	0,52	0,25	0,91
Olivier	0,75	0,36	1,31
Elms	0,52	0,25	0,91
Cultivated poplars	0,35	0,17	0,61
Uncultivated poplars	0,37	0,18	0,64
Aleppo pine	0,45	0,21	0,78
Swiss pine	0,39	0,19	0,68
Hook pine	0,44	0,21	0,77
Laricio pine	0,46	0,22	0,80
Maritime pine	0,46	0,22	0,80
Mugho pine	0,44	0,21	0,77
Austrian black pine	0,46	0,22	0,80
Gable pine	0,48	0,23	0,84
Scots pine	0,44	0,21	0,77
Weymouth Pine	0,34	0,16	0,59
Plane trees	0,5	0,24	0,87
Robinia false acacia	0,58	0,28	1,01
Mediterranean fir	0,37	0,18	0,64
Nordmann fir	0,37	0,18	0,64
Silver fir	0,38	0,18	0,66
Vancouver Fir	0,36	0,17	0,63
Willows	0,37	0,18	0,64
Tamarisk	0,53	0,25	0,92
Tilia	0,43	0,20	0,75
Aspen	0,38	0,18	0,66
Softwood	0,42	0,20	0,73
Hardwoods	0,57	0,27	0,99
Undifferentiated	0,54	0,26	0,94

Note : The infradensity of the "common oak" was obtained by averaging the infradensities of the sessile and pedunculate oak. We very rarely have the distinction between these two species within the expertise.



Teneur en teqCO2 des essences forestières
Pin Weymouth
Peupliers cultivés
Sapin de Vancouver
Epicéa de Sitka
Cèdre de l'Atlas
Saules
Sapin de Nordmann
Sapin méditerranéen
Peupliers non cultivés
Epicéa commun
Tremble
Sapin pectiné
Pin cembro
Cyprès
Résineux
Mélèze du Japon
Grands aulnes
Aulne vert
Tilleuls
Douglas
Pin sylvestre
Pin mugho
Pin à crochets
Pin d'Alep
Pin noir d'Autriche
Pin maritime
Pin laricio
Châtaignier
Pin pignon
Mélèze d'Europe
Genévrier thurifère
Platanes
Merisier
Grands érables
Ormes
Noyer
Noisetier
Bouleaux
Tamaris
Mûrier
Indifférencié
Chêne pédonculé
Micocoulier
Hêtre
Frênes
Eucalyptus
Petits érables
Chênes indifférenciés
Chêne rouge d'Amérique
Chêne commun
Feuillu
Robinier faux acacia
If
Fruitiers
Chêne rouvre (sessile)
Cytise aubour
Charme
Alisier torminal
Chêne tauzin
Arbousier
Chêne pubescent
Charme-houblon
Chêne chevelu
Chêne-liège
Chêne vert
Cornouiller mâle
Olivier
0,00
0,20
0,40
0,60
0,80
1,00
1,20
1,40

Appendix 4 : Example of the evolution of carbon storage in teqCO2 according to the types of use (100 m³ of Douglas roundwood)



Note : the difference visible in year 0 comes from sawing yields (50% for lumber; 85% for industrial wood.

Appendix 5 : Example of modeling the evolution of carbon flows in a theoretical silvicultural scenario: reforestation of one hectare of Douglas fir in regular high forest, with an increase of 16.18 m^3/ha/year

Forestry route :

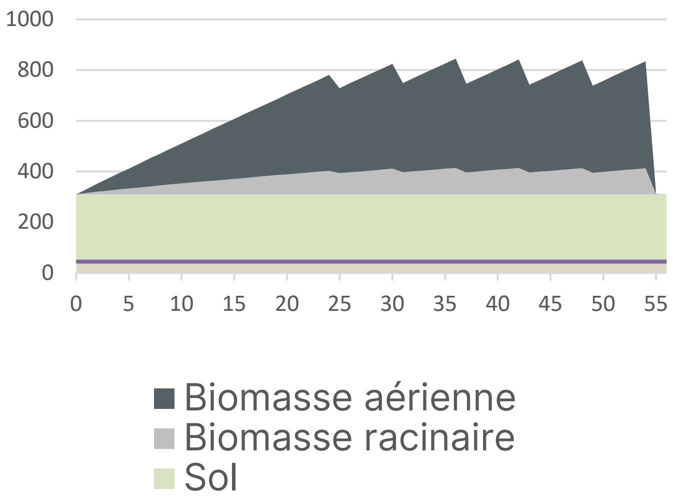
Years	25	31	37	43	49	55	Total
Type of cut	1st thinning	2nd thinning	3rd thinning	4th thinning	5th thinning	Clear cut	-
Total withdrawal (m^3)	60	80	100	100	100	450	890
-Including lumber (sawing)	-	16	40	40	70	315	481
-Including industrial wood (panel)	60	64	60	60	30	135	409

Evolution of the forest carbon footprint

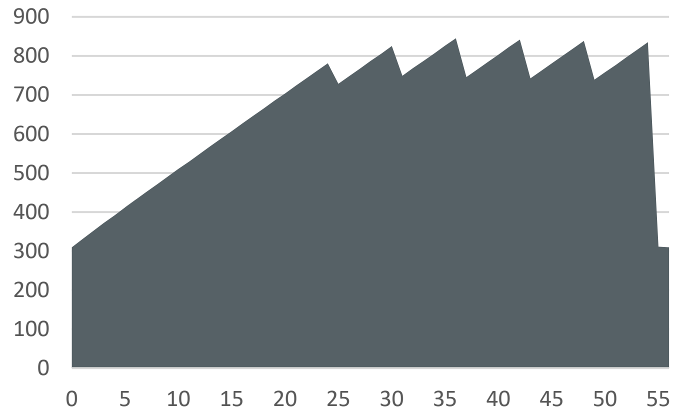
Compartments	0 to 10 years	0 to 20 years	0 to 30 years	0 to 40 years	0 to 50 years
Aboveground biomass	158	315	414	396	359
Root biomass	43	79	101	97	89
Ground	-	-	-	-	-
Litter	-	-	-	-	-
Under floor	-	-	-	-	-
Wood product storage	-	-	32	109	172
Substitution effect	-	-	39	206	432
Total evolution over the period	+ 201	+ 394	+ 587	+ 809	+ 1052

Note: this example does not take into account emissions generated by forest exploitation and management because they are negligible for a one-hectare project.

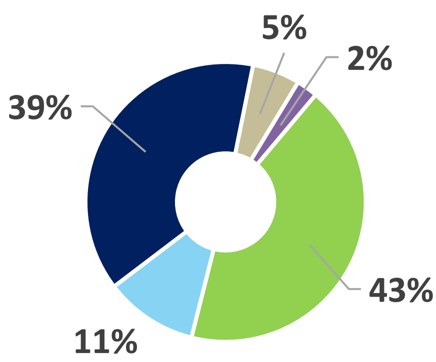
Evolution dof teqCO2 compartments of the forest ecosystem



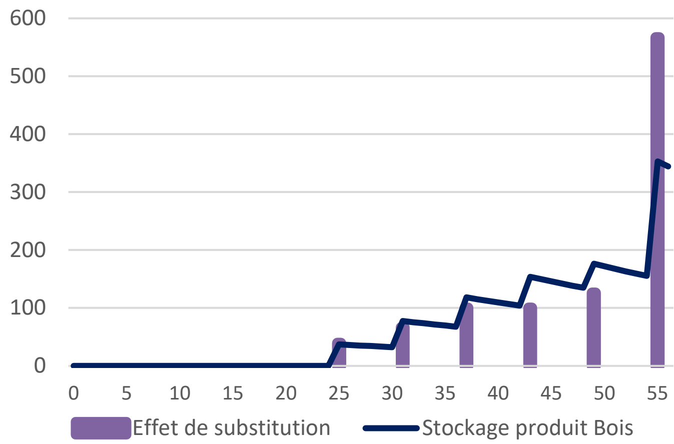
Global evolution in teqCO2 of carbon in the forest ecosystem



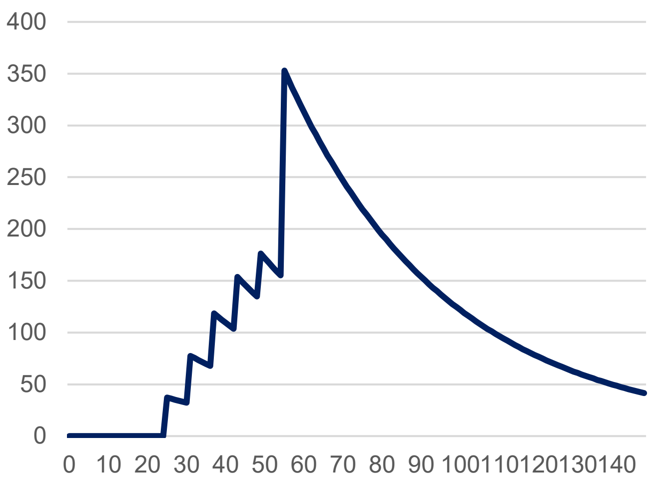
Average share of storage per compartment in the ecosystem



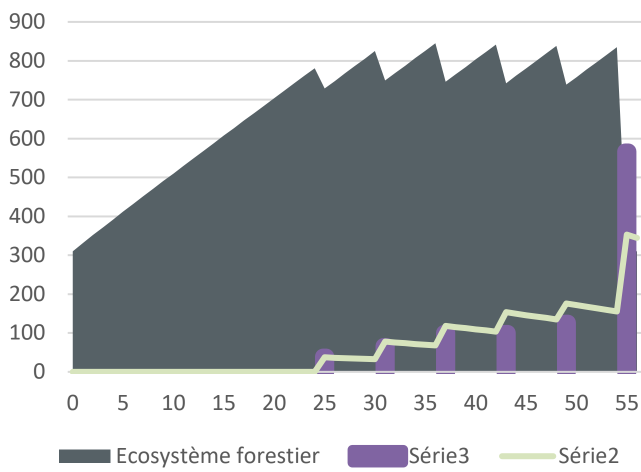
Evolution of substitution and storage in wood products during the route



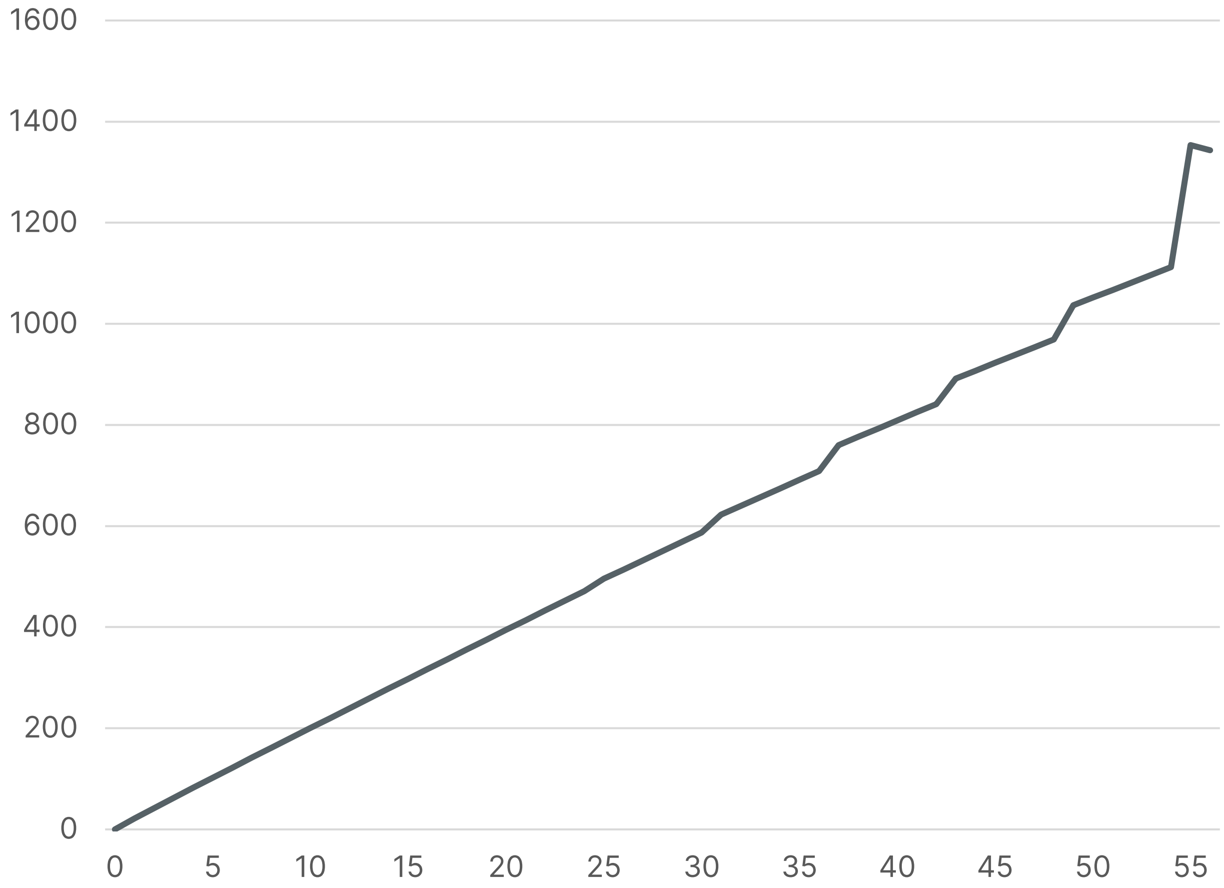
Evolution of teqCo2 storage in wood products (BO/BI)



Evolution of the compartments in teqCO2



Evolution of the gain in teqCo2



France Valley
INVESTISSEMENTS

Portfolio management company approved by the AMF under number GP-14000035SAS à Directoire à capital variable, with minimum capital of €250,000.

56, avenue Victor Hugo
75116 Paris
Tél : 01 82 83 33 85

RCS Paris 797 547 288

www.france-valley.com