

Forest Biomass within the energetic transition - a SWOT analysis

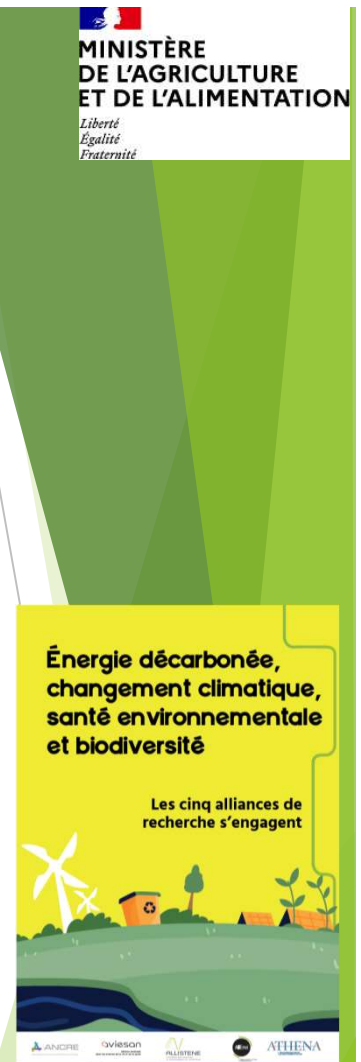
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Context

- French forests cover 31% of the territory, 2/3 private-owned, 2/3 are made of hardwood with a strong regional heterogeneity - 400 000 direct jobs
- 1st largest forest resource in Europe (incl overseas forests), On the metropolitan territory, surfaces and stocks have been increasing during the last 100 years
- Forests regulate biogeochemical cycles, capture atmospheric CO2, produce drinkable water, host high above- and-belowground biodiversity, provide wellness....
- highly impacted by climate change (storms, bio-aggressors, droughts, high temperatures)
- highly solicited for the decarbonization of the economy through an increased demand for products and services, especially for energy purposes

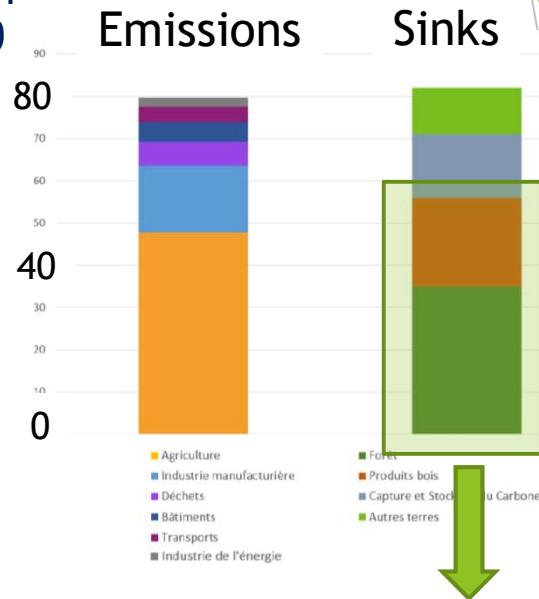
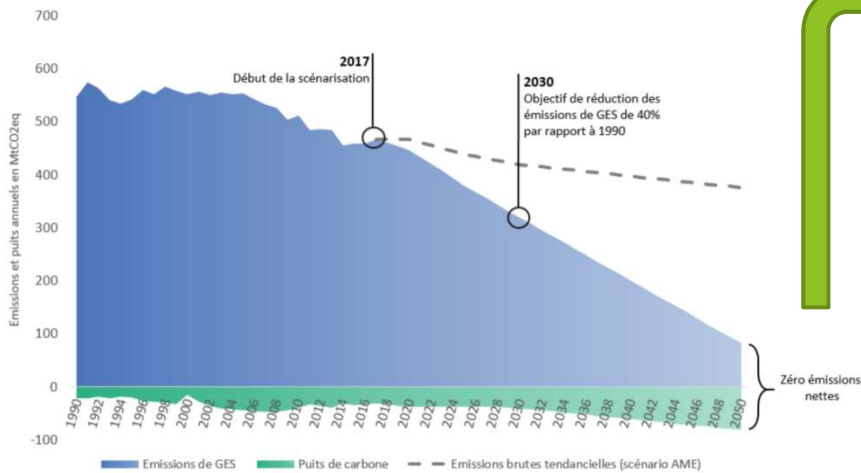
There are then concerns on forest sustainability ?



Context

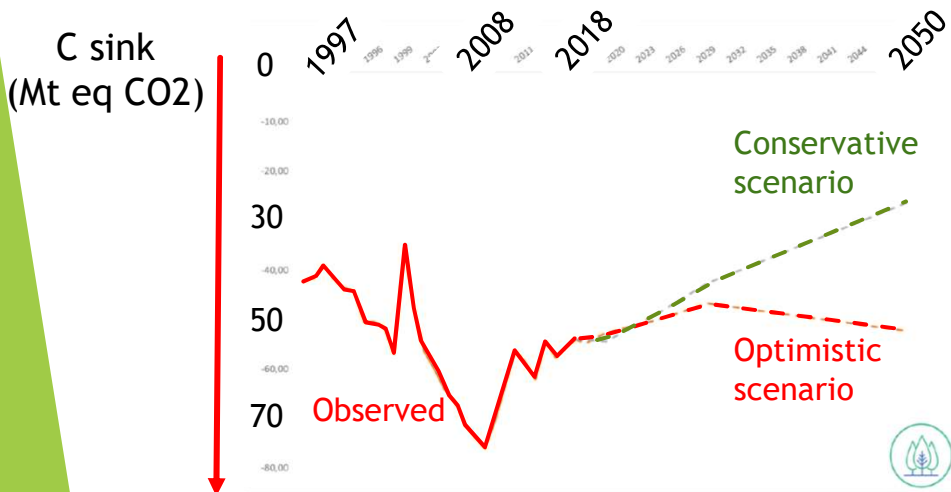
- National low-carbon strategy

- 2050: Carbon budget of 80 Mt eq CO₂



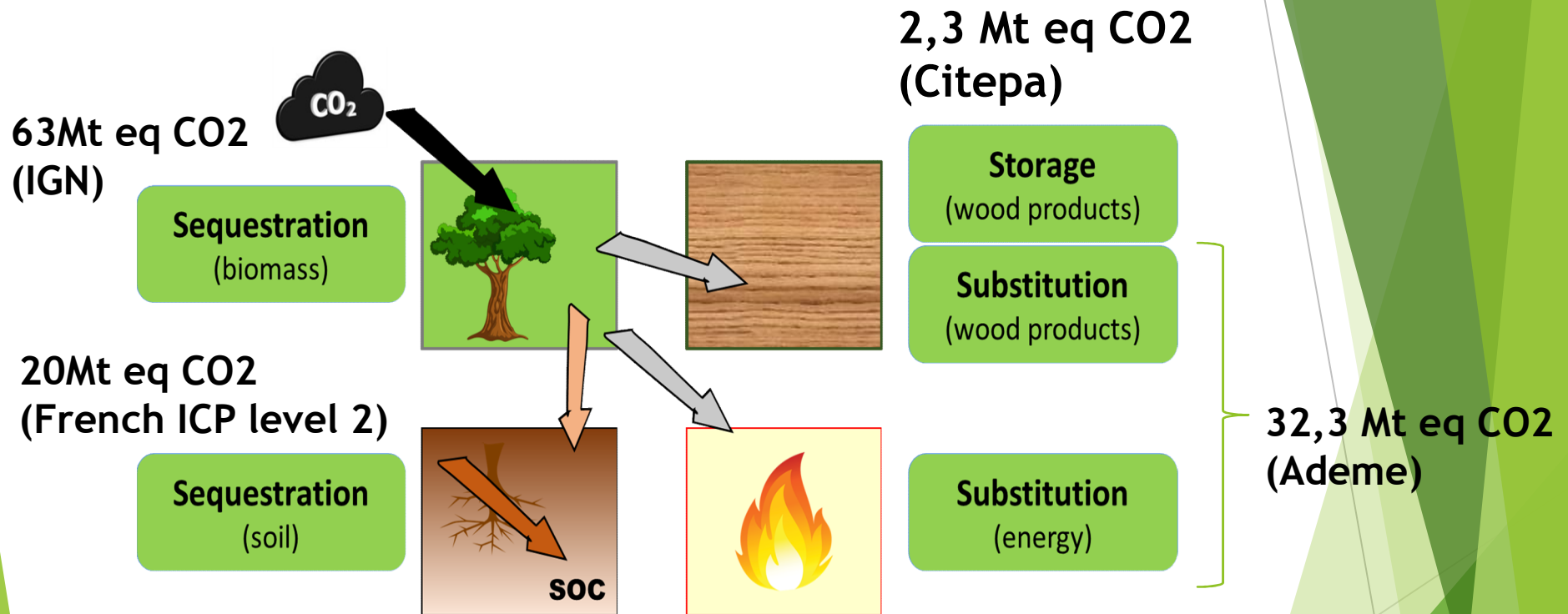
- Sequestration of 55 Mt eqCO₂ expected from the forest vegetation and wood products (incl. Substitution)

then all is well in the best of worlds ?



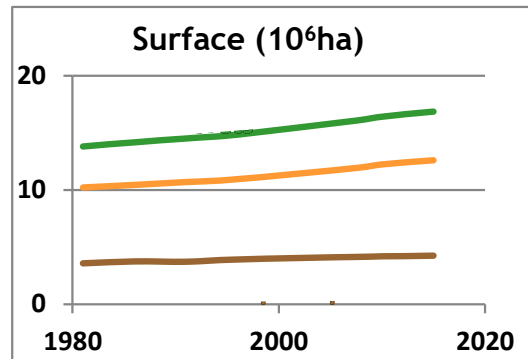
Deepsurf Conference, Nancy, 2021

Terms of the C sequestration in the forests and products

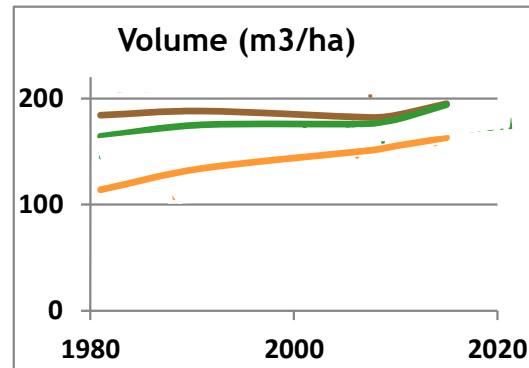


C sequestration in forests currently represent 20 to 25% of the French emissions

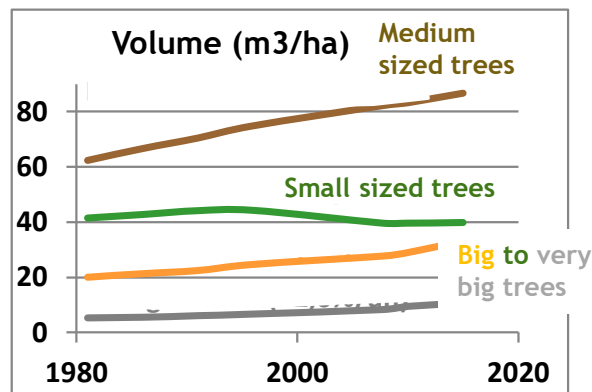
Forest, a renewable resource but in permanent evolution



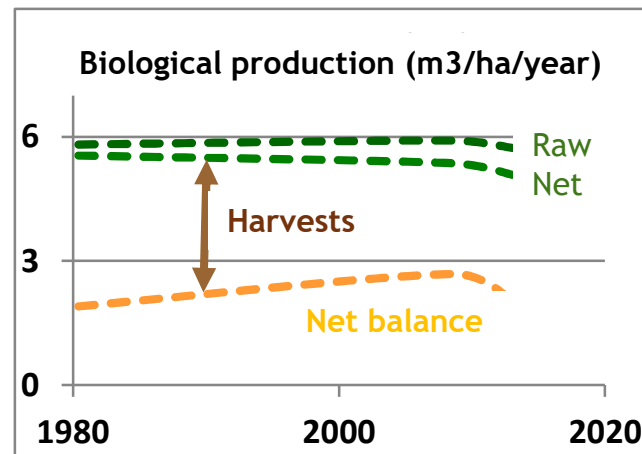
All forests
Private forests
Public forests



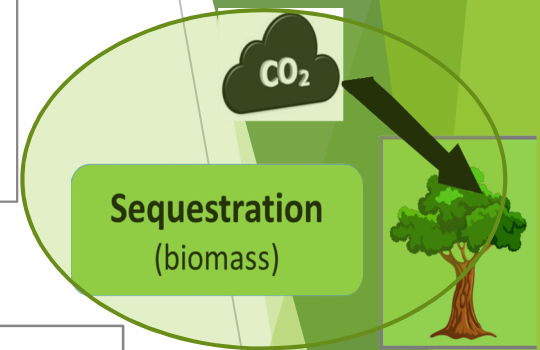
Both surfaces and volumes increased (mainly private forests)



But the resource is ageing ; vulnerability to global changes increases

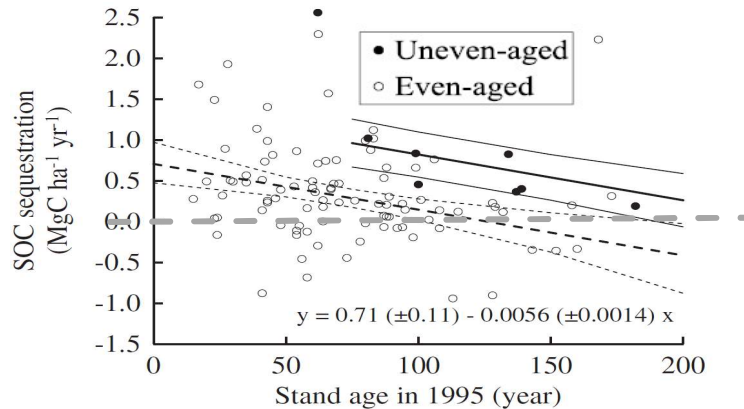


C sequestration into vegetation is expected to stabilize, even decrease

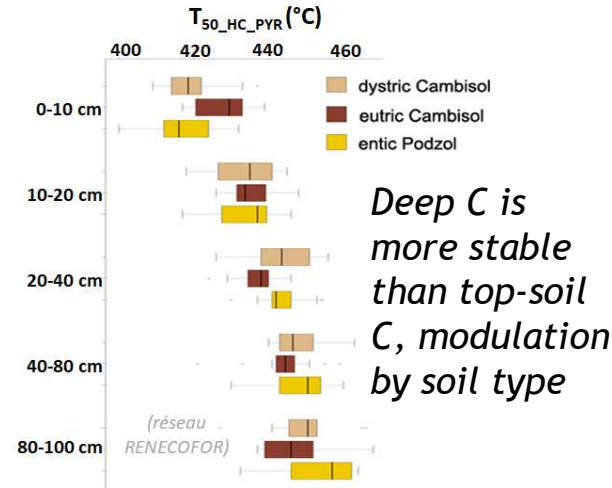


Forest soils - potential for long term C sequestration

RENECOFOR: ↗ SOC up to ~100 years



[Jonard et al. (2017) - Sci. Tot. Env.]



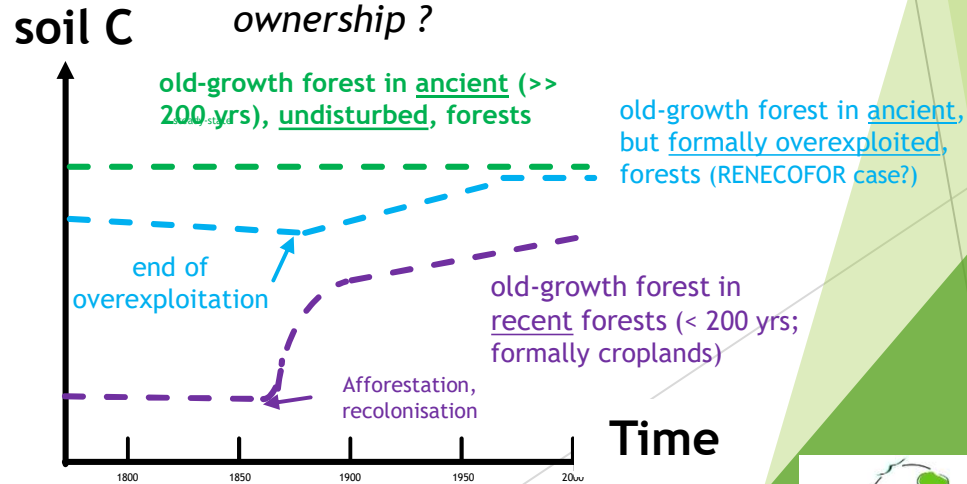
Deep C is more stable than top-soil C, modulation by soil type



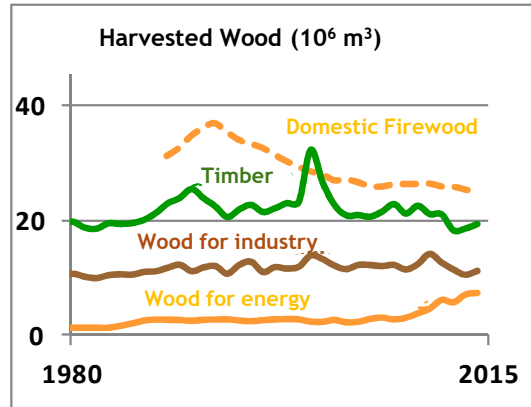
Increase of Soil Organic C in forest soils

C sequestration into forest soil need to be confirmed (RENECOFOR 3th campaign, RMQS 2nd campaign)

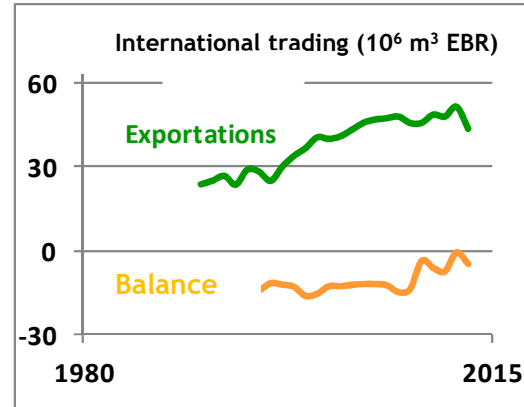
But impact of past history? Forest ownership?



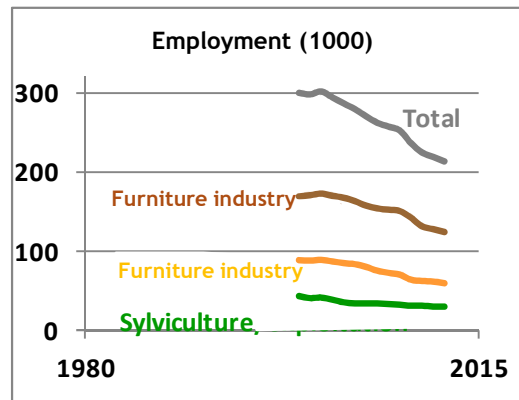
Storage in wood products and substitution - Changes in drivers ?



Wood for energy increases while other uses stayed stable

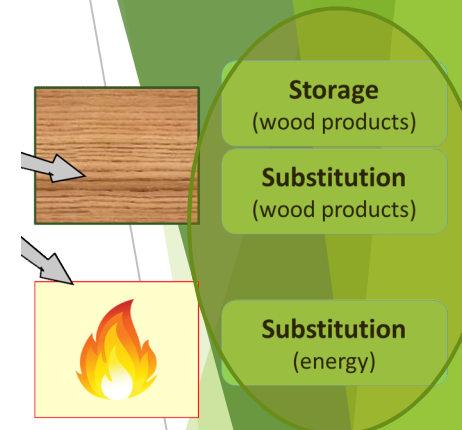


Balance between exportation and importation near equilibrium in volume but not in value



Employment decreased - Increase of mechanisation ? Long term impacts on forest soils ?

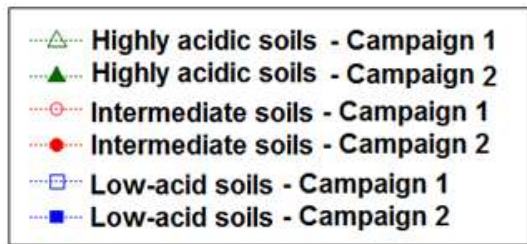
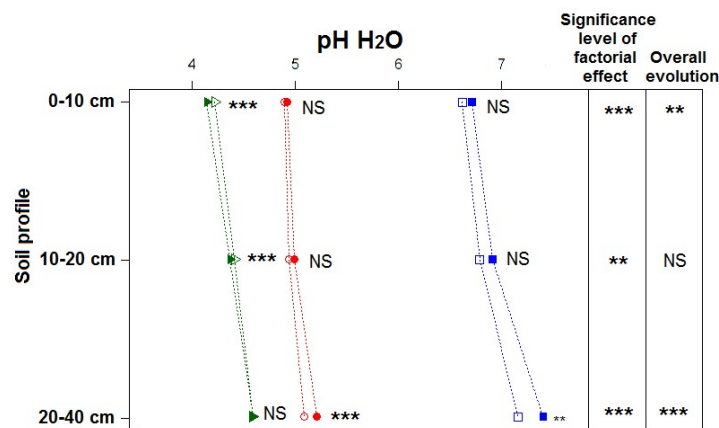
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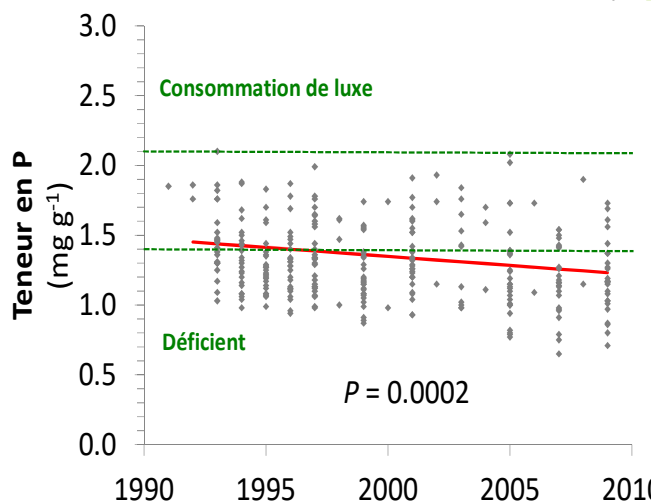
Decrease of the added value of the forestry and wood industry - sustainability of the sector?

Forests grow on poor soils, in general, unsuitable for agricultural purposes. They rely on natural processes (low to no inputs)

After the high 80's S and N deposits, recover of nutrient status is low, acidification still ongoing in highly acidic soils (Renecofor network)

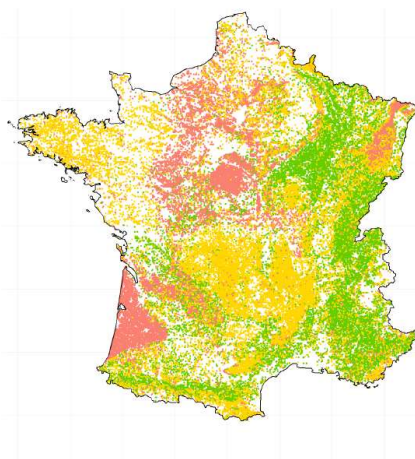
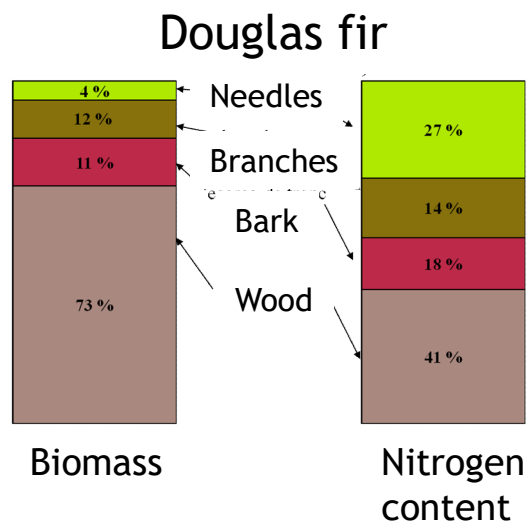


Decrease of P nutrition (Renecofor network)



CO2 fertilization effect reduced by nutrient availability?

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Soil sensitivity to an increased biomass harvest (small branches, whole tree harvesting)

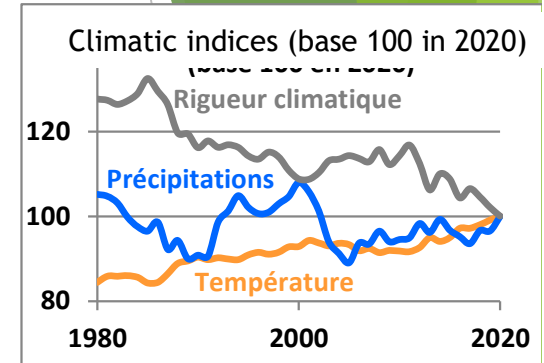
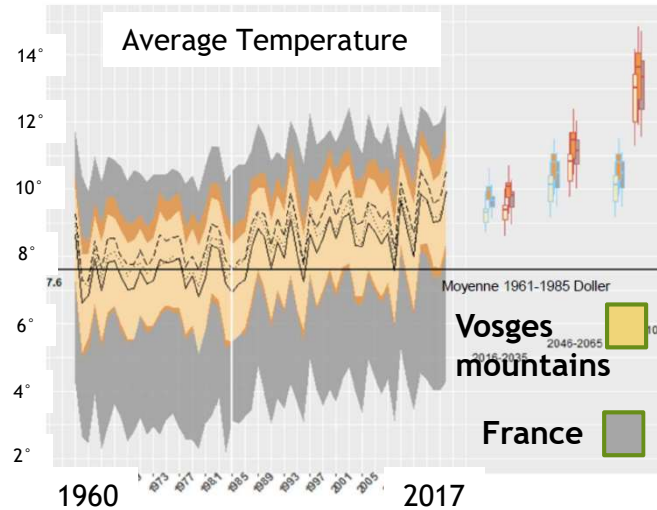
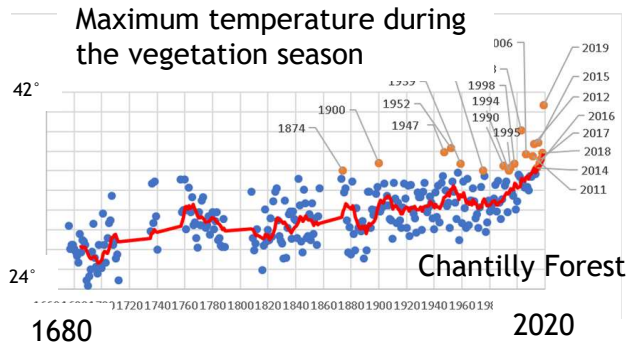
Small branches, rich in nutrients are not wastes for the forest ecosystem

Resilience to soil compaction is a long-time process



Risks of losses in soil fertility, Good practices guide for a sustainable management of soil biological, chemical and physical properties

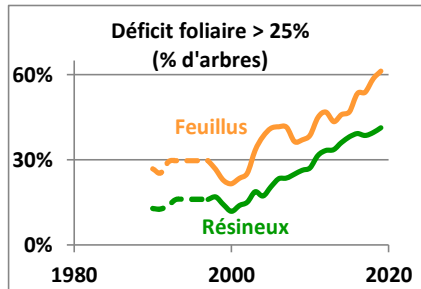
Forests experience unprecedented climatic conditions



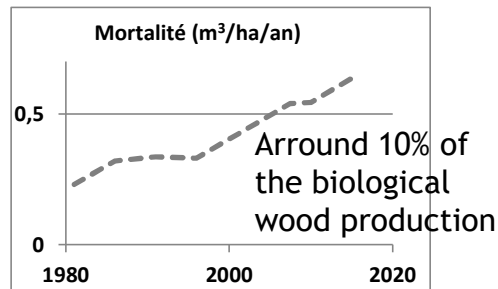
Increased of direct (droughts, storms) and indirect impacts (bio-aggressor)

Forests are in a crisis situation, Adaptation is then crucial to maintain stocks levels as they are..., and if possible maintain levels of C sequestration

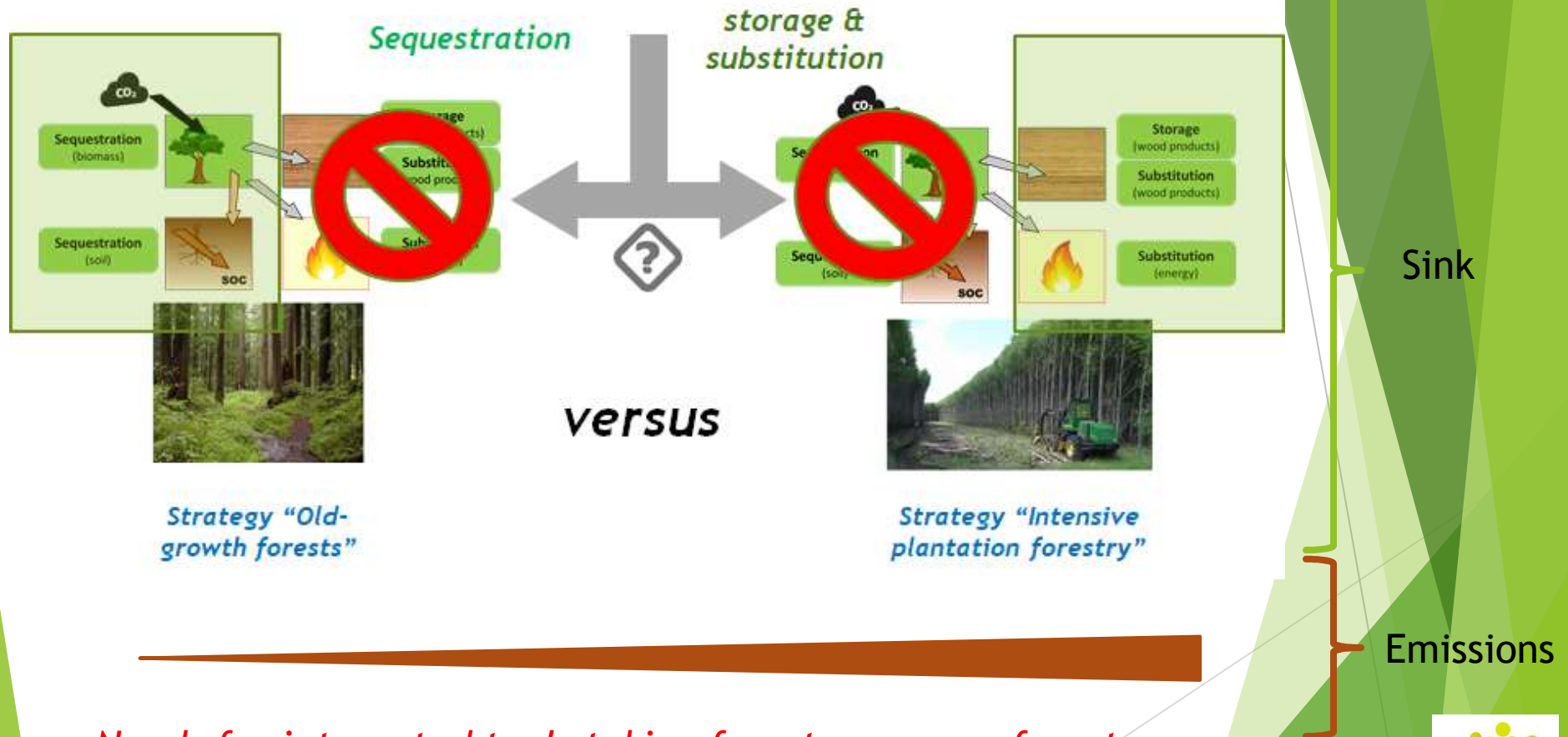
Defoliation



Mortality



Forest management can modulate the balance between Sequestration and Storage/Substitution in Wood (3S Dilemma)



Needs for integrated tools taking forest resource, forestry and wood industry sector, as well as impacts on forest soils

Forest management can modulate the balance between Sequestration and Storage/Substitution in Wood (3S Dilema)

Afforestation of cultivated or degraded soils (poor SOC stocks)

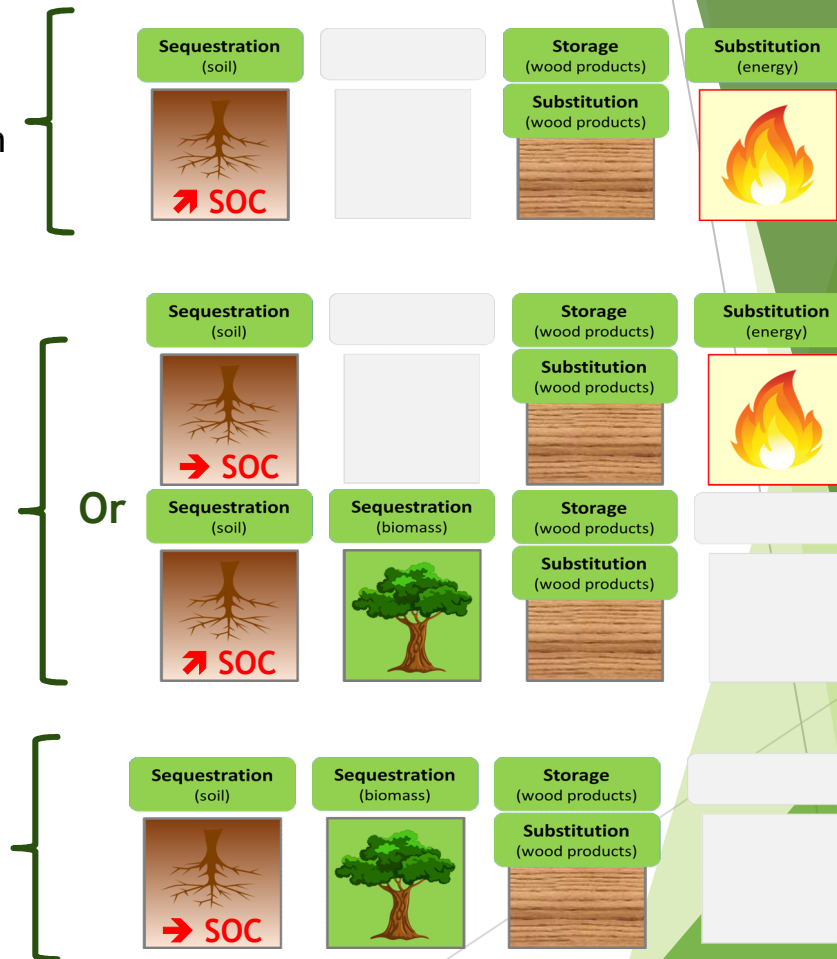
- Fast growing tree species
- Rotation length >50 years to maintain the inherited soil fertility
- Adaptation on the short term to climate changes

Forests with medium SOC stocks

- No whole-tree harvesting
- Increase SOC stocks with nitrogen fixing species
- Reduce soil perturbations
- Adaptation on the mid-term

Forests with high SOC stocks

- Continuous cover
- No soil perturbation during harvesting
- Adaptation on the long term



Need for adaptive forestry, regionalized - co-construction of the roadmaps (work with all forest actors)

Conclusions

- Within the national low carbon strategy, the SWOT analysis is clearly in favor of the forest
 - Investing in forests would then be a good idea !
- Considering impacts of climate changes on forests, adaptation primes on mitigation
 - Challenging in an uncertain future
 - Need to change some paradigms :
 - Save the functions of the forest (inc. C Sequestration) rather than saving existing species at all costs
 - Innovation in forest management (genetics x sylviculture x biogeochemistry)
 - Make research and implement solutions at the same time
 - Share academic and practical knowledge (what worked and what didn't)
- Improving tools to elaborate forest strategies and decision making at national, regional and local scales
 - Modeling tools for projections
 - E.g. at national scale : combining climate, resource assessment, forestry and wood industry sector scenarios, soil C dynamics, LCA on wood products and cascading effects
 - Not only trends, nut also uncertainties
 - Articulations between research infrastructures (ICOS, ANAEE, IN-SYLVA, Renecofor)
 - Comprehensive view of the processes, impacts of climate changes, forest management, ...
 - Innovations in forest monitoring
 - NFI data combined with remote sensing & lidar (downscaling, updating)
 - Extend NFI soil data (at marginal costs like wood density) - ex for C
 - Low costs sensors for experimental and observation networks

Forest Future.....

not under a bell jar,
nor an overexploitation.....

Thanks for listening !