

Nature Based Solutions

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context

Participation CEA including LSCE and BIAM to prospective on carbon sink and removal.

Position paper from “alliance de la recherche pour l’énergie” (ANCRE)
“Carbon sinks: What role of research in accelerating their development in France”

Including authors from CEA: LSCE: N Viovy C Rabouille, BIAM: T Heulin

Others: V. Artero, G Boissonnet S. Nizou →

to stakeholder meeting, Brussels September 2023

context

- What ecosystems we consider:
 - Forests
 - Permanent grasslands
 - Natural areas
 - Wetlands
- Current stock and fluxes in France:

Type	Surface (ha*1000)	Stock (tCO2/ha)	Sink (tCO2/ha/y)
Crops	24 004	224	-0.06
Grasslands	8 565	320	0.37
Forest (metropolitan)	17 158	598	5.06
Forest (Guyane)	8 130	1110	0
Others natural ecosystems	2724	443	0.42

Challenges

- It is important to create new carbon sinks, but it is mandatory to avoid new carbon sources that could jeopardize any effort to reach carbon neutrality !
- **First challenge:**
 - Protect natural carbon rich ecosystems**but also**
 - Full evaluation of carbon gain from sequestration or fuel substitution projects considering current stocks and fluxes!
- **Second challenge:** Climate change will affect ecosystems and then modify the carbon cycle → *It is not sufficient to avoid exploitation of carbon rich ecosystems, we should also improve their resilience.*

How climate change will impact ecosystems carbon sequestration

- **Direct impact:**

- Increasing temperature and drought will increase mortality
- Increasing temperature could enhance soil carbon decomposition



- **Indirect impact:**

- Increasing risk of fire
- Increasing risks related to others extremes events (windthrow, flooding, landslides) (but impact of climate change not well established)



- Increasing pests damage because of degraded health and new species



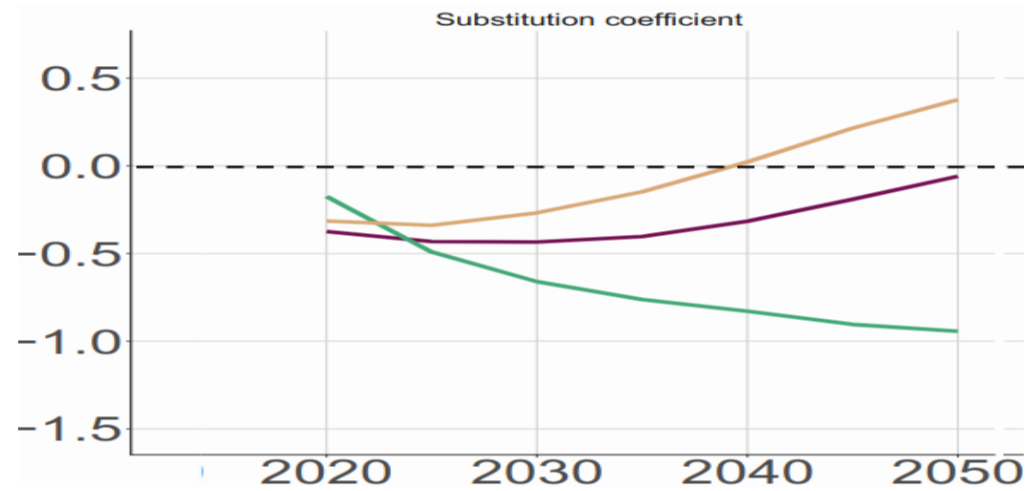
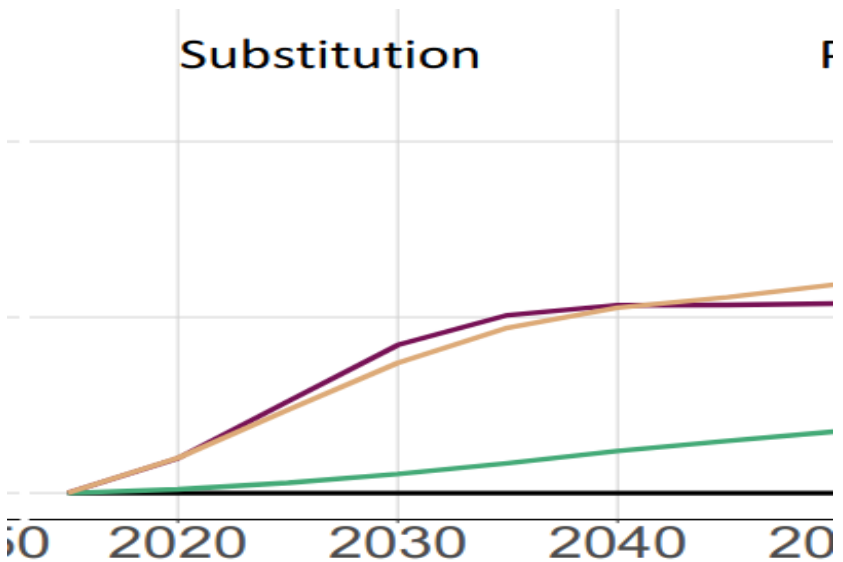
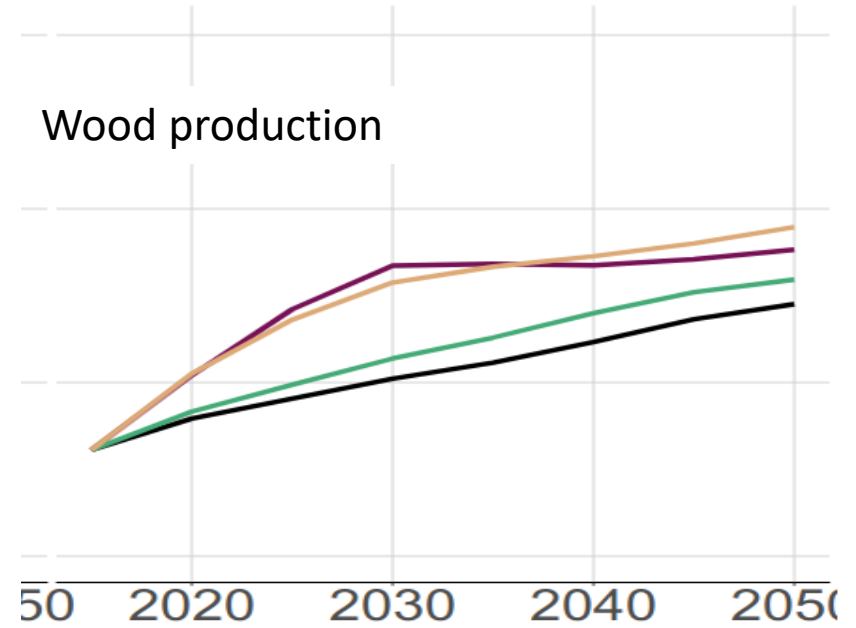
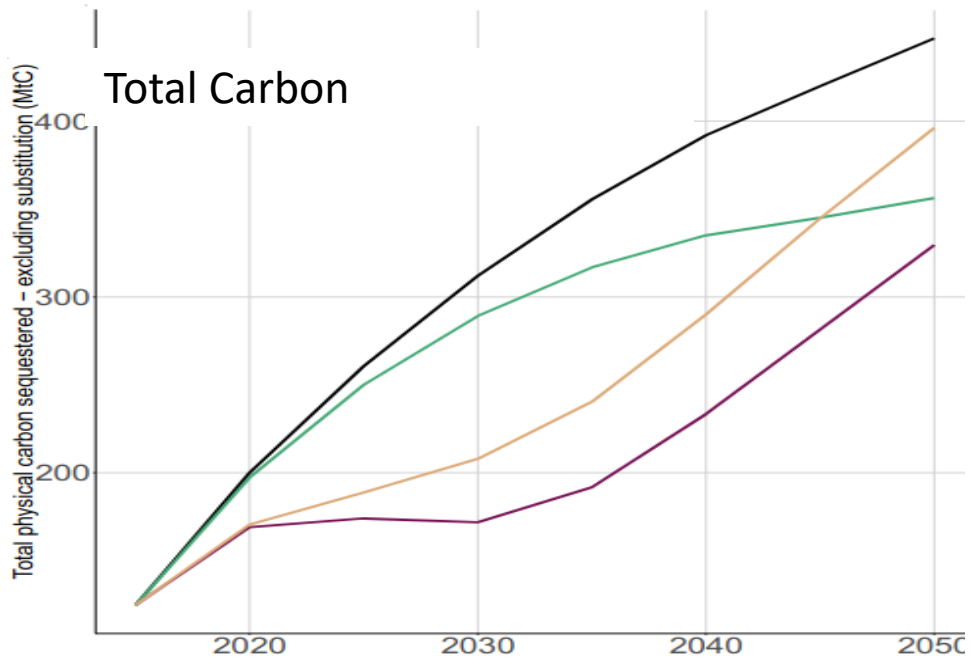
The difficult tradeoff between carbon mitigation and carbon storage preservation

E.g: use of wood biomass for fossil fuel substitution
(Valade et al 2020)

Theoretically 50% of biomass can be used → substitution coefficient= 0.5

→ 3 scenarios of increasing wood harvest:

- 1/ Increasing harvest in over-dense forests
- 2/ Harvest in abandoned forests
- 3/ Decreasing rotation time in intensively managed forests



Barriers

- Lack of data on current stocks and fluxes and long term monitoring
- Lack of understanding of climate change effects on ecosystems (and then on carbon stocks)
- Lack of systemic evaluation of practices
- Little insight on long term effects of changing practices on stocks
- Land use conflicts between food, carbon mitigation, stocks conservation and all others ecosystems services

Research actions

- Improve database and long term monitoring of carbon rich ecosystems (natural areas, forests, wetlands...)
- Improve knowledge on ecosystem response to climate change
- Improve modeling of climate change scenarios and their impacts on carbon stock and fluxes
- Development of systemic evaluation of scenarios for carbon sequestration to assess: impact of carbon stocks, ecosystems services taking into account for climate change

Implementation recommendations

- Develop and maintain long term monitoring of C,N,P cycles
- Protection of rich carbon ecosystems
- Full estimation of effective gain of projects for carbon sequestration or substitution in term preserving existing stocks
- Identify the full range of ecosystem services
- Develop projects that enable resilience and adaptation of ecosystems to climate change