Position paper

October 2022

Carbon sinks

What role should research play in accelerating their development in France?

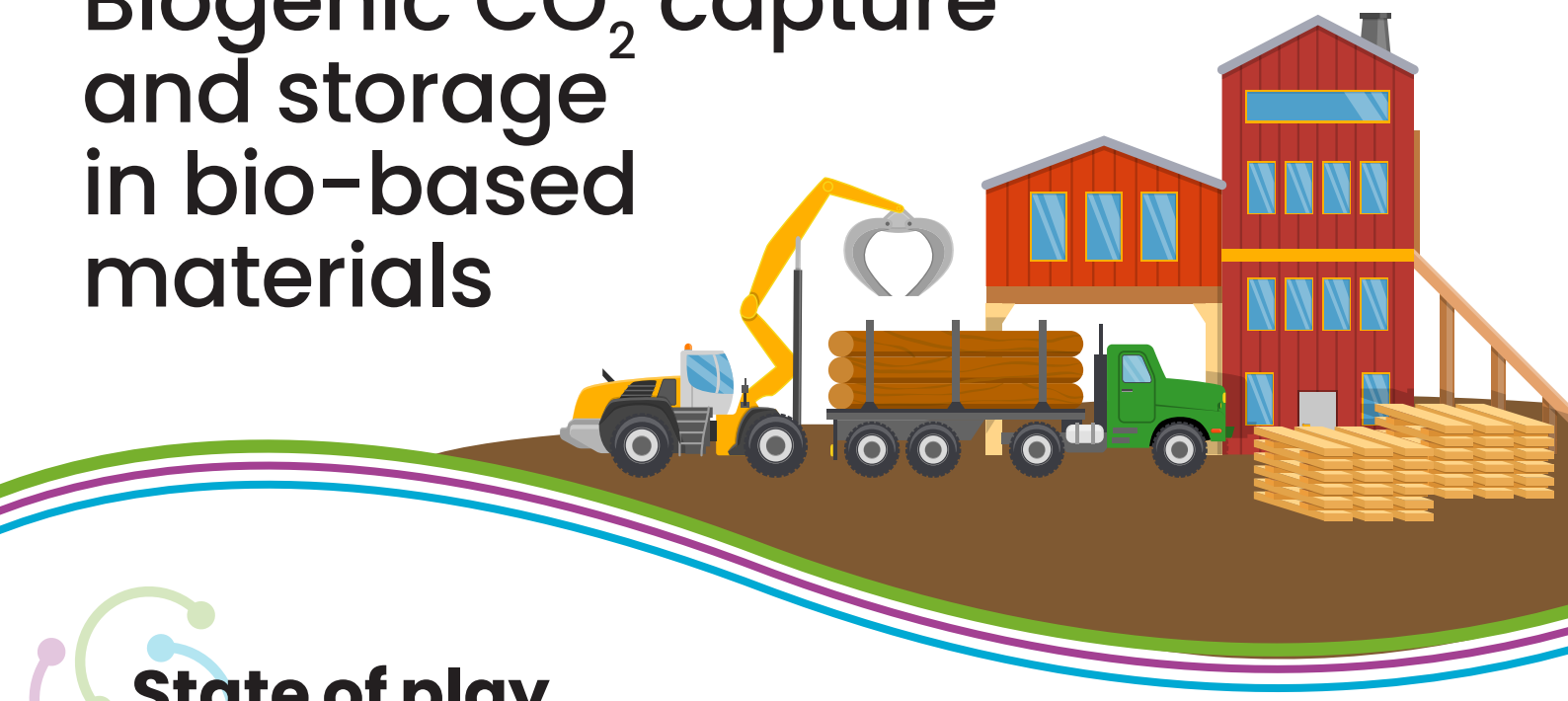
In order to remove CO_2 from the atmosphere, carbon sinks are a solution that is currently being considered as a unavoidable. Increasing but also preserving carbon sinks and, in some cases, restoring them, are priority issues. Based on a study by a group of experts from the ANCRE alliance, six major categories of carbon sinks have been identified for the French context: three categories of natural CO_2 capture solutions in more or less anthropised environments, and three categories of solutions integrating technological developments. The state of play, challenges, barriers and research recommendations for each of the solutions were highlighted in 7 worksheets.

The full report and each of worksheets are available on:
https://www.allianceenergie.fr/etudes-et-rapports/

ANCRE

Alliance Nationale de Coordination de la Recherche pour l'Énergie

Biogenic CO_2 capture and storage in bio-based materials



State of play

Bio-based products and materials are part of the rapidly growing bioeconomy. After harvesting, some of the carbon contained in biomass (agricultural or forestry) can be stored in bio-based products. In order to be a potential carbon sink solution, bio-based products must have a significant lifespan and a high substitution potential (via the replacement of highly emitting fossil-based pathways). These include building materials, transport, sports and leisure components, road materials and pavements, and also packaging, pallet and textiles. A growth in demand or an increase in the lifespan of these products involving additional biomass production can lead to the generation of carbon sinks. At present the main carbon storage pathway in bio-based materials is wood for construction and furnishing in the building sector and to a lesser extent for wood for packaging and paper. In 2016, the total stock of wood products amounted to about 436 Mt CO_2 eq. (CITEPA) and a sink of 1.5 Mt of CO_2 eq. was generated over the year. The "AMS" scenario of the French strategy SNBC provides a decrease in the forest sink in 2050 in favour of wood products, whose annual sink would amount to 21 Mt of CO_2 eq./year, i.e. 25% of all the sink solutions considered.

Nowadays, the major construction companies are involved in the bio-based sector, like Vinci with its subsidiary Arbonis and Bouygues Construction with its WeWood wood construction brand, launched in 2020.

Challenges

There are many ways of developing carbon sinks from bio-based materials, including (i) increasing the market for bio-based products to replace highly emitting fossil energy-based products, while maintaining, or even increasing, the stock of standing biomass, (ii) using other biomass sources that are currently underdeveloped, such as hemp, flax, cork, straw, etc., (iii) extending the lifespan of products through reuse, reworking, recycling, or (iv) adopting less emissive end-of-life solutions such as composting, developing soil construction, combining CO_2 capture and storage to energy production, etc.

The involvement of historical stakeholders and new start-ups is intensifying and the market prospects for several products are already expected to increase, such as concretes and insulators (ADEME, 2021) For the development of these sectors, one of the main challenges is that the French balance of trade in the wood market is currently in deficit, thus the use of a larger harvest requires the development of a more structured French industrial fabric. Furthermore, in order to benefit the climate, it is necessary to ensure good management of the biomass resources mobilised to avoid reducing carbon stock in favour of shorter lifespan pathways. It is also necessary to adapt production systems that have historically relied on fossil or non-biogenic resources. Technological innovations are also expected to develop solutions for the reuse and recycling of these materials. Finally, for all bio-based materials, the management of the end-of-life of products must systematically integrate the avoidance of the emission of the carbon into the atmosphere by identifying and deploying the most suitable solutions to each of the sectors.

Barriers

For the development of bio-based materials market:

MANAGEMENT OF FRENCH FOREST STANDS
not adapted (need to increase softwood sawmill production capacity, promote substitution of softwood timber by hardwood, mobilise more softwood (planting)).

LACK OF ACCEPTABILITY
of some historical stakeholders in the construction industry.

VARIABILITY OF THE QUALITY
and accessibility of wood and of agricultural by-products.

EXTRA-COSTS
for some agricultural biomass (flax, hemp, etc.).

For end-of-life management :

UNDERDEVELOPED TECHNIQUES AND INFRASTRUCTURE
for recycling and not yet operational cost recovery.

UNDERDEVELOPED ENERGY RECOVERY SYSTEMS
in France (end-of-life products are mainly sent to Belgium).

ORGANIC RECOVERY (COMPOSTING, RETURN TO SOIL)
not proven on many materials (insulation, concrete, etc.).

Actions

Research recommendations

- Rationalise the growth of the wood materials sector in relation to the availability of local resources in compliance with the rules of sustainable forest management.
- Identify, develop and prioritise end-of-life routes for each of the materials towards storage solutions.
- For materials that can have energy recovery, develop the French energy recovery chain (rather than exporting abroad) and integrate into capture and storage systems (composting or BECCS or biomine).
- Adapt the logistics of biomass supply and biomass quality (during pre-treatment, conditioning, storage) to the existing material production processes.
- Adapting bio-based materials to existing uses (e.g. flax to replace fibreglass, hemp for lining car doors, etc.).
- Improve the quantification of substitution effects in relation to the competing sectors, the uses of wood and their future evolution, taking into account the behaviour of consumers and market mechanisms.

Implementing recommendations

- Develop a statistical monitoring of bio-based materials markets and of the origin of feedstocks
- Continue the standardisation/regulation of hardwood products for material use.
- Guiding forestry towards the production of wood quality that meets the criteria of the targeted materials (widening of the range of sizes or qualities admissible in sawmills).
- Further develop the value-added chains of French hardwoods
- Favour the substitution of the most energy-intensive materials and the most GHG-emitting fossil fuels
- Communicate on the climate/sink effect of the bio-based material sectors, whose storage can in some cases be more secure than in forest.
- At the regional level, promote long-life uses of materials from sustainable forest management, in accordance with the incentive to use more wood energy
- Pursue the deployment of material and human resources for recycling and reuse sectors.
- Identify and organize collection routes for organic industrial by-products with a material purpose
- Relocate processing industries in France to enhance local bio-resources
- Increase skills in the "technical wood" sector.