



# FRANCE

LAND USE, LAND-USE CHANGE AND FORESTRY  
(LULUCF)

*The indispensable role of  
biomass and soils in France,  
concrete actions still being  
discussed*

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# The indispensable role of biomass and soils in France, concrete actions still being discussed

In 2016, in metropolitan France, the land sector was used to offset 9% of the emissions of other sectors. The goal is to reach 100% or more by 2050, both by reducing emissions and increasing this carbon sink. Research organisations play a key role for this sector where scientific uncertainties are still very significant and where debates on the effects of the actions carried out are not yet settled. The mobilisation in recent years of private actors (timber industry, forest owners, farmers) has resulted in the growing establishment of the private sector, the development of the wood energy and timber markets, national voluntary carbon offset projects and agricultural practices that promote the storage of carbon in soils, through the 4 per 1000 initiative.

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## 1 • CURRENT SITUATION AND UNCERTAINTIES ABOUT THE ANALYSIS

• **THE CURRENT ROLE OF THE LAND SECTOR IN FRANCE'S CARBON FOOTPRINT** • In 2016, the balance sheet of the Land Use, Land Use Change and Forestry sector (LULUCF, or more simply land sector) in France was a net sink of -41 MtCO<sub>2</sub>e. This means that the absorptions (mainly through the growth of trees in the forest) of this sector exceed its emissions (deforestation, wood extraction, artificialisation of soil, etc.). This carbon sink increased between 1990 and 2000, from around -30 MtCO<sub>2</sub>e to -50 MtCO<sub>2</sub>e, to -45 MtCO<sub>2</sub>e in the 2010s (Citepa, 2018). LULUCF is currently able to offset about 9% of emissions from other sectors.

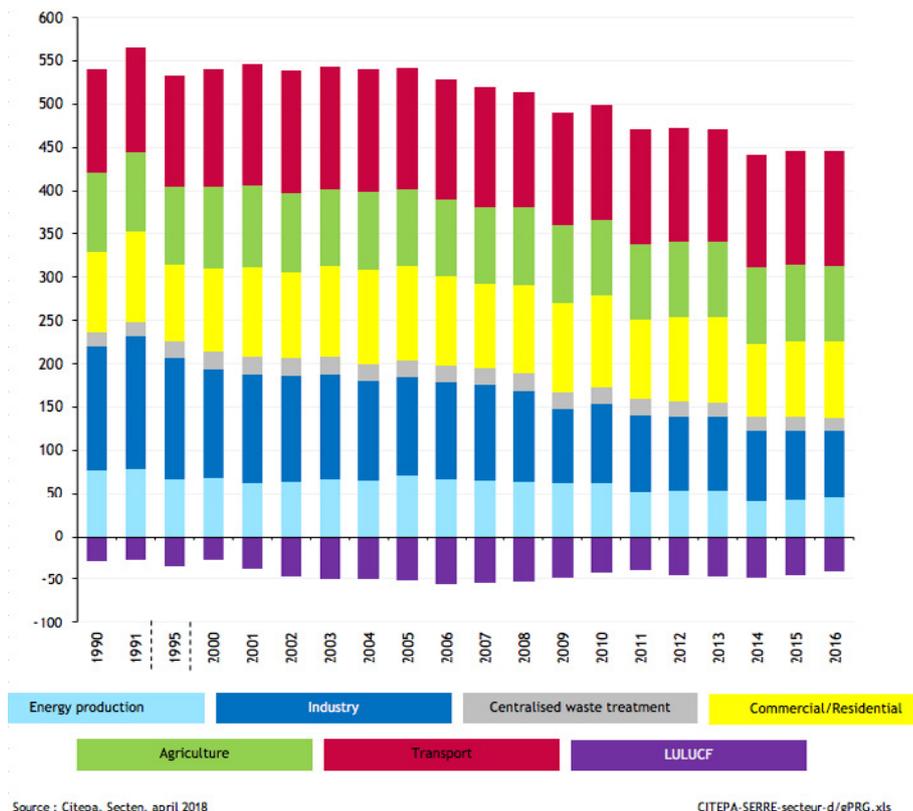


FIGURE 1. ABSORPTIONS IN THE LULUCF SECTOR WITH RESPECT TO GHG EMISSIONS FROM OTHER SECTORS, METROPOLITAN FRANCE, 1990-2016

• **WHAT ARE WE TALKING ABOUT?** • The LULUCF sector accounts for greenhouse gas flows directly or indirectly related to human activities; under a national approach (emissions occurring abroad but attributable to French consumption of wood, biofuel or food raw materials are excluded). It includes:

- the carbon footprint of the managed forest (absorptions related to tree growth and emissions related to mortality and timber harvesting) and timber products,
- the carbon footprint of farmland (variation of their organic carbon stock due to practices)
- the soil carbon footprint after change of use (cultivation of permanent grassland, deforestation, afforestation, artificialisation, etc.).

It is important to note that at no time are stocks (total carbon in a reservoir) counted as such. Only flows are counted. Thus, the mere presence of a forest, however extensive, does not guarantee a carbon sink.

• **WHAT IS THE CURRENT SINK DUE TO? WHAT LEVERS CAN BE USED TO MAXIMISE IT?** • The current sink is mainly due to the growth of biomass in the forest, associated with a low rate of wood extraction. The extension of the forest on the surface plays only a secondary role. The carbon footprint has generally been stable over the last few years, with a slight downward trend in the

sink linked to stagnant organic production and higher extractions. Thus, the wood extraction rate is an important adjustment variable for the carbon sink.

The balance of farmland has less impact in the inventory. The carbon flows associated with these farmed soils remain highly uncertain, both because of the difficulty in tracking relevant land-use changes (Robert, 2016) and the difficulty of matching soil carbon stock changes with management factors (current CSOPRA research programme).

Finally, land use changes as a source of CO<sub>2</sub> emissions are less significant than the carbon footprint of forests. The artificialisation of land alone (mainly by urban sprawl) has accounted for annual gross emissions of about 10 MtCO<sub>2</sub>e in recent years.

• **RECENT RESEARCH** • To facilitate the climate actions of non-state actors in the LULUCF sector, a crucial problem is still to be solved: the major uncertainty regarding the estimate of the LULUCF sector's carbon footprint and the real impact of the different levers of action.

Various research projects have led to progress, especially in 2017, on these issues and the scientific community is mobilising to reduce these uncertainties. Accordingly, very recent works have led to:

- improved monitoring of carbon stocks and flows (harvests, destinations and lifecycle of wood products, monitoring of land-use change surfaces, forest and non-forest biomass, etc.). For example, for the monitoring of land use, recent studies by the IGN (OCSGe project whose interim results were produced in 2016) and the CESBIO laboratory (OSO project financed by the Théia Unit, with results available since 2016) have led to better quantification of the LULUCF sector and monitoring of afforestation actions in particular.

- evaluation of the impact of the various actions carried out by forest and agricultural stakeholders, with expertise from various research organisations (INRA, IGN, Ademe, CNRS, Irstea, IPSL, ONF, Citepa, FCBA, etc.) (Colin, 2014; Colin & Thivolle-Cazat, 2016; Roux et Dhôte, 2017; Valade et al. 2017).
- better estimates of certain flows, currently not calculated in the national inventory, such as forest soils (without conversion of use), whose sink may represent 7 to 15 MtCO<sub>2</sub>e/ year (Jonard, 2017, Roux and Dhôte, 2017); dead wood with a sink of 10 MtCO<sub>2</sub>e/ year (Roux et Dhôte, 2017); or the Guianese forest (excluding deforestation and harvesting).

• **IN 2017 AND 2018, STRATEGIC DISCUSSIONS BROUGHT TOGETHER STATE AND NON-STATE ACTORS** • In 2017 and 2018, forest, agricultural and NGO stakeholders participated in producing the review of the National Low Carbon Strategy (SNBC) and in discussions on the implementation of the European LULUCF Regulation (2018/841). There is no political and scientific consensus on the best actions to be taken by non-state actors to address the climate issue in the short and long term, whether it involves conserving timber in the forest or increasing harvesting. Numerous stakeholder discussions in recent years have not resolved these strategic debates. However, a number of messages have emerged:

- the need for maximum development of negative emissions
- the need to structure the French timber industry and provide incentives for private owners to remedy the inertia of the sector,
- the desire to prioritise the sustainable storage of wood in timber products rather than wood fuel,
- caution regarding the non-permanence of carbon storage in agricultural soils,
- the difficulty of acting through multiple stakeholders (foresters, landowners, sawmills, builders, developers, elected officials, farmers, etc.).



## 2 • ACTIONS IN THE FOREST-TIMBER SECTOR

• **RECENT DEBATES BETWEEN NON-STATE ACTORS ON THE BEST ACTIONS TO BE TAKEN IN FORESTRY** • Forest biomass is currently the main building block of carbon sinks of the French LULUCF sector. According to the latest IGN figures (2017) the Metropolitan French forest is private (75%), fragmented (53% of the private plots occupy less than 25 ha (FCBA, 2016)); and characterised by hardwoods (67%). Its surface area, 16.9 million ha in 2017, is increasing (+100,000 ha/year), as is its volume (+27 million m<sup>3</sup>/year) (Hervé et al., 2016). As wood extractions (45 Mm<sup>3</sup>/year) are lower than production (92 Mm<sup>3</sup>/year), it continues to act as a carbon store (IGN, 2017).

Thus, forest biomass and the decision to optimise its role as a carbon sink (storage, sequestration, carbon replacement) are the focus of the bulk of scientific and political debate (Grassi, et al., 2017; Kauppi & Mäntyranta, 2014). Sequestration consists of prioritising increases in forest carbon stocks (biomass, deadwood and soils) with extensification of harvesting. For proponents of this approach, increasing timber harvesting would create a «carbon debt» that will only be offset by the regrowth of trees in the long term - while the urgent task is to limit emissions in the short term, by 2050. This approach is particularly critical of the use of wood for fuel, resulting from short rotations. During the past two years, NGOs and scientists have promoted this strategy (Beddington et al., 2018; Fern 2016). During these debates, economic stakeholders have rather emphasised substitution, involving prioritising the use of the forest for wood extraction which stores carbon temporarily and replaces other materials of other non-renewable energies with higher emissions. Furthermore, sustainable forest management ensures its ability to continue storing carbon and reduces the risk of mortality (Seidl et al., 2014; Galik & Jackson, 2009; Rautiainen et al., 2010; Nabuurs et al. 2015).

Even if it is possible to advocate an approach using a wide range of levers, in recent years there has been conflict between some economic stakeholders in the timber industry and scientific organisations and NGOs.

• **MOBILISATION AND ORGANISATION OF THE SECTOR** • Recent reports (Houpert & Botrel, 2015; Colin & Thivolle-Cazat, 2016; Alexandre, 2017; Ballu, 2017) take up the well-known finding of the French «paradox» of the under-exploitation of French forestry resources - which are actually expanding. Faced with this challenge, forest stakeholders are mobilising little by little.

At the beginning of 2018, the CNPF launched a platform (laforetbouge.fr) providing forest owners with free tools for training and documentation for better management and use of their plots (forestry work, management, sale of wood, etc.). This site therefore provides a response to certain brakes that have resulted in the under-exploitation of the French forests, to promote the long-term role of carbon sinks and to boost the timber industry.

Between 2014 and 2015, the number of private owners joining a cooperative increased by 4.5%, which made it possible to strengthen the supply of timber and contributed to national harvesting of 6.9 Mm<sup>3</sup> (+4.5% in one year).

In 2014, the forest-timber sector (FBF-FBIE) published its «pact for the future 2020 - the commitments of the sector». The commitments adopted include 110,000 ha/year in renewal, improvement and adaptation of the forest; an increase of 14.5 Mm<sup>3</sup> by 2020 in sustainable timber mobilisation; maintenance of the carbon sink; a recalibration of the trade balance of timber; a rise of 3Mtep of wood energy, etc.

• **THE FORESTRY SECTOR IS MOBILISING IN CARBON RECOVERY** • The French forest cannot currently be used directly as a carbon pump by foresters. In the absence of a binding market, a market for voluntary projects has developed in recent years in order to promote this ecosystem service provided free of charge by the forest and the stakeholders who maintain it. On the one hand, more and more companies want to invest in forest carbon sequestration work.

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### **La Poste Group and GIP Massif Central invest in forest carbon credits**

In 2015, a programme was launched by the National Centre for Forest Ownership (CNPF) in partnership with the Massif Central Public Interest Group to define forestry carbon offset projects to provide carbon credits: afforestation in non-forested areas, reforestation (replacement of diseased, burned, poorly adapted areas, etc.) and improvement of forest management. La Poste Group has invested nearly EUR 300,000 in this programme. The private owners of the Forêt Agir Limousin association have thus been able to finance actions to reinforce carbon sequestration in the forest (monitoring of chestnut coppice, increases in hardwoods, (re) afforestation of conifers), whose effectiveness has been verified by the CRPF.

TEXT BOX 1

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This approach to ensuring the monetisation of a tonne of carbon avoided or sequestered in a French forest project is still to be certified. With this in mind, since 2016 I4CE has been developing a labelling scheme for voluntary carbon projects. Potential in France has been estimated at between 2 and 2.5 MtCO<sub>2</sub>e/year (Tronquet, Grimault & Foucherot, 2017), i.e. nearly 0.5% of non-LU-LUCF metropolitan emissions. The implementation of a low-carbon label, resulting from this I4CE work, supported by the Ministry of Ecology, aims to promote the emergence of these projects by ensuring the reliability of avoided emissions calculations.

#### **• LOCAL AUTHORITIES NOW INCLUDE THE LULUCF SECTOR IN THEIR CLIMATE STRATEGIES •**

Moreover, communities required to produce a climate-air-territorial energy plan (PCAET) are doing the same. The CNPF recently developed a calculation tool to assist councils for better integration of forests in their GHG emissions assessments. This tool is used to compare several ways in which silvicultural programmes can be used to improve the local carbon footprint. Accordingly, communities, businesses and consumer groups now have the tools to encourage them to maximise their carbon sinks.

**• AFFORESTATION AND REFORESTATION ARE BEING DEVELOPED •** Actions aimed at avoiding growth in logging or even reducing forestry management in some forest areas, serve several purposes: carbon storage in standing trees and dead wood, forest litter and soil; improved productivity and better economic use of species; the protection of biodiversity, in particular through the preservation of old-growth patches and by limiting human presence; ecological tourism.

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### **Reforest'ation**

Reforest'ation, a company that was founded in 2010, is one of the key players in reforestation from private funds in France. It was created in response to the finding that forest plantations were decreasing in France, with a consequent reduction in forest renewal, making it more vulnerable to crises. It restores degraded forests (burned, flooded, diseased, destroyed by storms, etc.), reforests areas with limited forest coverage and supports sustainable harvesting and recovery methods for harvested timber. More than a million trees have been replanted in France since 2014.

TEXT BOX 2

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• **THE RISE OF WOODEN CONSTRUCTIONS** • The timber sector is not very competitive, the business is fragmented with limited coordination between upstream production (in a predominantly hardwood forest) and downstream processing (with strong demand for softwoods). In recent years, timber for construction, driven by the success of the CLT (Cross Laminated Timber) manufacturing technique, has led to the creation of new outlets and appreciation of wood-material. Regardless of the origin of the wood, even if it comes from foreign forests, the construction of long-lasting wooden furniture and buildings makes it possible to store carbon sustainably in France, as a substitute for materials with higher emissions. The recent rise in the use of structures built wholly or partly from wood is an indicator of change in the construction sector, technical solutions and demand.

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### ***The rise of wooden buildings in recent years***

Wood real estate projects, including high-rise buildings, have proliferated in France since 2016. Since 2016, the AdivBois (Association pour le développement des immeubles à vivre bois) technical commission has been seeking to facilitate these programmes and to remove technical, economic and regulatory obstacles, for example by promoting technical support for the construction of demonstrators of the first wave of wooden buildings. These projects are also supported by Future Investment Programmes (PIA of the future agriculture and forestry law 2014).

In particular, «the market for buildings with timber structures and concrete infrastructure is booming” (O. Messéant, 2017). In 2017, a call for projects selected the project for two timber-framed towers in Bordeaux, including the Hyperion tower which, at 57 metres, will be the highest tower of this type in France. Another 50 m wooden tower, WoodUp, was also selected in 2017 in Paris. In Strasbourg, the highest tower in France with a 100% timber frame, 38 m high, was delivered in 2018.

TEXT BOX 3

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• **WOOD FUEL AND BIOMASS HEATING PLANTS: MANUFACTURERS AND COMMUNITIES ARE INVESTING** • The benefits of biomass energy for the climate is subject to debate. These actions are based on the idea that wood is a carbon neutral and renewable energy source. Nevertheless, this widespread view does not match the actual balance of carbon flows (Leturcq, 2011; 2013).

Indeed, the supposed carbon neutrality of wood fuel is based on the idea of systematic offsetting, of a cycle at equilibrium between emissions and sequestration. But in reality, this balance is not always achieved and, when it is, it occurs over a long time span. Excluding the emissions of wood fuel on the pretext that the carbon had already been captured in the past or will be recaptured in the future introduces bias in the estimate of the LULUCF carbon footprint: from the moment when the sequestration flows are calculated each year, all emission flows for the year must also be accounted for.

The development of biomass combustion plants in recent years is largely based on two types of incentives: firstly, under the European Emissions Trading System, biomass consumption leads to eligibility for free quotas but the associated emissions are not counted; secondly, the Heat Fund, managed by ADEME, supported the production of 2 Mtoe with € 1.6 billion between 2009 and 2016. Many biomass plants have been built in recent years, making it possible to replace other energies. Ademe has published a document with 54 typical examples of companies that have invested in biomass energy (wood boilers, wood chips, end-of-life wood products, etc.) (Ademe, 2018).

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### **Some examples of recent investments in biomass**

- Bordeaux (2015): creation of a wood boiler at the Charles Perrens hospital, with a total capacity of 9.5 MW, consuming 18,000 t of wood per year and avoiding 10,700 t/ CO<sub>2</sub>/ year.
- Nantes (2017): extension of a 57 km heat system and construction of two wood boilers (Malakoff), with 84% local renewable energy supply (waste recovery or biomass, consuming 45,000 t of wood per year and avoiding 45,000 t/ CO<sub>2</sub>/ year.

- Suez (2018) invests in the CogeBio start-up, which offers innovative solutions for the production of heat and electric energy by gasification of biomass and waste. «Biomass consumption for industrial heat production has doubled in the last five years in Europe and is expected to reach 20 million tonnes in 2021» (Suez, 2018).
- Lyon (2018): creation of the largest public biomass boiler in France. The Surville plant, managed by Dalkia, will prevent 44,000 t/ CO<sub>2</sub>/ year.

TEXT BOX 4

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## **3 • ACTIONS TO MAINTAIN AND INCREASE CARBON IN SOIL**

### **• THE LAUNCH OF THE 4 PER 1000 INITIATIVE BRINGS TOGETHER SCIENTISTS, DECISION-MAKERS AND LOCAL STAKEHOLDERS FOR THE STORAGE OF CARBON IN SOIL**

• While forest biomass has been the major focus of strategic considerations on organic carbon storage, the role of agricultural soils in France and in the world was underlined by the launching of the «4 per 1000» programme, during COP21.

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### **The 4 per 1000 project**

The 4 per 1000 initiative aims to increase organic carbon storage in soils. It has resulted in the establishment of a scientific committee to enable research to identify agricultural practices for carbon storage and disseminate them to farmers, agricultural advisers and chambers of agriculture. In 2017, INRA therefore began a study on the feasibility of the 4 per 1000 target in agricultural soils in France.

TEXT BOX 5

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As yet, there is no consensus on the long-term effects of storing practices and on their wider deployment, although recent research has made progress in this area (Arrouays, et al. 2002; Pellerin, et al. 2013). Practices are, however, being developed:

- the reduction of ploughing, or even the implementation of cultivation techniques without ploughing.
- increased organic contributions to the soil (crop waste, etc.)
- intermediate crops, intercrops and grass strips
- agroforestry and the planting (or preservation) of hedgerows

The difficulty of setting up a carbon storage policy on agricultural land is due to several obstacles: scientific uncertainties related to understanding and monitoring long-term dynamics and spatio-temporal variability; the interconnection of factors, the immensity of the spaces involved; the number of operators; socio-economic barriers to the adoption of new practices; the complexity of existing environmental standards and arrangements affecting agriculture; consideration of other environmental issues (air pollution, water, landscape, soil quality, biodiversity, erosion, etc.).

### **• THE AGRI-FOOD SECTOR IS DEVELOPING LABELS AND ACTIONS FOR STORING CARBON IN THE SOIL**

• Some farmers indirectly render an eco-systemic service by storing carbon in the soil, but their management is constrained by many economic, agronomic, environmental and technical



factors. Beyond European aid (CAP payments subject to virtuous ecological practices in terms of soil carbon, such as the maintenance of permanent grasslands, areas of ecological interest and agro-ecological infrastructures) and national support (reward for the eco-systemic services mentioned in recent discussions around the Climate Plan (July 2017), the National Food Conference (2017), the SNBC (2018) and the Biodiversity Plan (2018), the private sector has also put some actions in place.

Thus, farmers and cooperatives have created labels enabling consumers to opt for agri-food products from soil conservation agriculture, for example the «Ferme Carbone Vert» label (first two farms labelled in Seine-Maritime in 2017); or the "Pour une agriculture du vivant» label, created in 2018 to distinguish products from agroforestry.

Finally, localities have been increasingly concerned to consider carbon in agricultural soils since the integration of the land sector into the PCAETs in 2016.

**• THE ACTIONS OF ELECTED REPRESENTATIVES, DEVELOPERS AND CITIZENS MAKE IT POSSIBLE TO START LIMITING THE ARTIFICIALISATION OF LAND •** Fighting against artificialisation (urban sprawl, construction of infrastructures) makes it possible to avoid losing (most of the time forever) the carbon stock already present in the soil. The objective of «zero net artificialisation by 2050» has been broached at European level (COM (2011) 571) and at national level (C. Duflot, 2013; N. Hulot, 2018). The construction of suburban housing and estates is the main cause of consumption of agricultural land. Developers, local authorities and citizens all have a role to play in limiting the obstacles to densification in urban areas and limiting the economic appeal of construction on agricultural land.

In 2013, the BIMBY project (Build in my BackYard) was completed bringing together research establishments, technical departments and local authorities. It led to the definition of a new habitat production sector, where the «traditional» sectors are unable to act: within the existing suburban fabrics. Identifying this potential for recycling urban space has made it possible to group together different parallel projects and create a network (Bimby+), facilitating exchanges between professionals in this new development sector.

On the side of promoters and owners, initiatives have emerged for the densification of suburban areas. Some metropolitan areas are seeking to limit urban sprawl, such as Rennes or Aix-Marseille-Provence (goal in 2017 of «zero consumption of green space in 2040»). In terms of citizens and NGOs, the last few years have been marked by the emergence of strong, high-profile opposition movements against projects that consume large amounts of agricultural and forestry land. For example, the opposition to the Notre-Dame-des-Landes airport project, in the holiday village of Roybon Isère and the major motorway bypass west of Strasbourg, among others.

## CONCLUSION

To conclude, we can say that in recent years, the climate role of biomass and soils is increasingly recognised by non-state actors. Even if many structural obstacles remain, France's strengths (its agricultural and forestry heritage) are the target of an increasing number of projects by forestry and agricultural stakeholders and research organisations. The years 2016 to 2018 marked the transition to the post-Paris Agreement era in which the overarching principle of carbon neutrality is beginning to be reflected in the actions of forest and agricultural stakeholders.

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