



LUCAS

Accounting for land use dynamics in the calculation of carbon substitution by wood products

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PhD project :

- **Context and objectives :**

The principle is to use wood products as a substitute for other fossil fuel sources that emit more greenhouse gases. The difference in emissions between wood products and other energy sources is measured through the "carbon substitution" of wood products. Nevertheless, the variety of methods used does not allow us to objectively assess the effectiveness of the "carbon substitution" of wood products. And in similar products and contexts, the values obtained vary greatly from one study to another; probably due to an incomplete consideration of emissions over the entire life cycle of wood products.

In particular, the thesis co-funded by the LUCAS project and the CLIMAE metaprogram focuses on taking into account changes in land use in the calculation of carbon substitution.

The objective is to provide a methodology for calculating "carbon substitution" by wood products that takes into account emissions related to forest dynamics and socio-economic dynamics. In particular, it will aim to quantify emissions related to indirect effects:

- consumption of wood products;
- the production of wood products, taking into account changes in behaviour as a result of technological gains.

He will also study in situ the dynamics of forest carbon according to harvest levels.

These studies will be carried out on a French scale over the short term (< 20 years), the medium term (20-50 years) and the long term (50-70 years).



Path :

- **Approach :**

The thesis relies on the link of the FFSM (french forest sector model) and the NLU (nexus land use) model in order to model the dynamics of land use changes between forest soils and other soil types as a result of increased production of wood products. As a first step, the project will determine what types of land use changes are observed and how they are considered in the environmental impact assessments of wood products in the literature.

The aim is to start by conducting a literature review with the Scopus tool, to see to what extent land use changes are taken into account in the environmental impact assessments of wood products. This preliminary work will allow us to see whether land use changes are generally included in environmental impact assessments, if so, how they are quantified and which indicators of environmental impacts are considered. Then, it's useful to determine the magnitude of land use changes and the values of the associated indicators.

- **Expected results :**

- A quantified review of the literature that will allow us to know the proportion of papers taking into account the land use changes in environmental impacts assessment of wood products, and the comparison of indicators of carbon emissions and biodiversity loss, between papers accounting for land use changes and papers that do not include it.

- It is expected that papers that include land use changes have higher environmental impacts indicators than those that do not consider it, thus highlighting their stakes and significance.

Therefore, the objective is to model the impact of additional wood production on forest soils dynamics and land use changes in France and abroad through the coupling of the FFSM and NLU models.