

BSc Proposal for the use of increase of wood/timber as an insulation material for building objects.

Prepared: Kasper Broek (Staatsbosbeheer) & Henny ter Huerne (University of Twente)

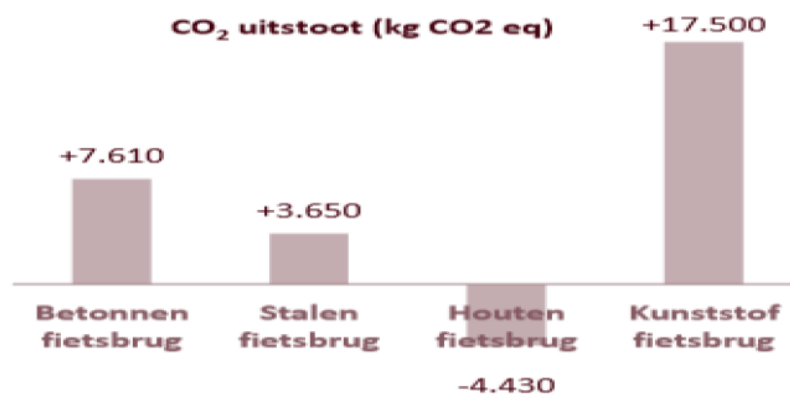
General:

Buildings and constructions together cause significant CO₂ emissions. This is according to the UN's 2020 Global status report for buildings and constructions. The sector appears to be responsible for 10 per cent of total global CO₂ emissions and is characterized by the large-scale use of CO₂ polluting raw materials such as steel, concrete and aluminium. By using more biobased raw materials, CO₂ emissions can be drastically reduced.

Wood is such a biobased raw material and can even ensure that a positive CO₂ balance (=CO₂ emissions) is converted into a neutral or even negative CO₂ balance (=CO₂ absorption or capture) during the construction of an object. The use of timber in building objects can therefore contribute to the reduction of CO₂ in the atmosphere.

The Dutch construction sector is in the transition to a sustainable sector. This is reflected on many fronts in the chains. From investors and project developers to architects and builders. But to determine a direction for the sector to become more sustainable, it is possible to look at the environmental impact of common and commonly used materials for both housing construction (B&U) and objects in civil engineering. In determining how environmentally friendly a material is for an object to be built, the MPG and the MKI are leading in the Netherlands.

As an illustration the graph below, a comparison of different building materials and the effect in CO₂ emissions for the realization of a bicycle bridge in this example. In this example, different materials (concrete, steel, timber and plastic) were used as construction materials for the construction of a bicycle bridge.



Example CO₂ emissions bicycle bridge timber compared to other materials

In the graph above, the focus is on CO₂ emissions to combat global climate change. If the MKI value (MKI represents several environmental aspects, not only CO₂) is expressed in a similar figure, comparable (less extreme) figures can be made in which timber also score much better than other materials.

Research proposal efficient use of timber as raw material:

The above example indicates the differences in the choice of the type of material for construction use. In this case, CO₂ emissions as a result of the construction phase. In the present proposal, we do not want to focus exclusively on the timber used as a material for the primary construction but look more broadly at other possibilities for using timber as a material for the construction of civil engineering and building engineering objects. This can be done, for example, by using timber as a partition wall or as an insulating material.

In addition, we focus on the more efficient use of all the timber/timber that is released from a felled tree. At the moment, the construction industry often works with CLT (Cross Laminated Timber) and HSB (Timber Skeleton Construction) in combination with OSB (sheet material pressed timber chips). A beam or a plank has been only a small part of the whole tree. About 50 per cent of the sawing process concerns sawing residues and goes to other destinations. These are not always the most durable. Think of biomass or animal bedding.

In what way can a much larger proportion of the timber present in a tree be used in construction? Also take a look www.steico.com. This also includes the fact that we have a lot of tropical high-quality timber in our forests.

Surplus timber or residues of timber can be processed into timber wool. www.steico.com. How valuable and/or efficient is timber wool as an insulation material compared to existing insulation materials such as cellulose, Rockwool, etc. What would this mean in the emission or storage of CO₂ or if other factors important for the environment are considered?

This research focuses on the efficiency of the use of wood/timber as an insulation material. For this (BSc-level) assignment, questions 1 to 8 apply, in consultation with the relevant student.

Relevant research questions regarding:

Timber as insulation material

1. How efficient is " wood material" as an insulation material compared to common materials such as Rockwool and glass wool and PUR or PIR foam (and variants)
2. What is the insulating effect of timber wool in comparison with traditional insulation materials such as Rockwool, glass wool, PUR, PIR, EPS, etc.
3. How wide can timber wool be used as an insulation material,
4. What is the sustainability gain compared to alternatives (including other biobased materials such as hemp)
5. What are the possible disadvantages of using wood wool?
6. What are the short and long term effects of using wood wool as an insulation material in a home or building?
7. What are the short- and long-term effects on land use if we massively switch to biobased?
8. What are the short and long-term economic effects and social appreciation?

Contact:

Kasper Broek

Staatsbosbeheer Buitenzaken

M 06-51553592 **T** 0570-747245

k.broek@staatsbosbeheer.nl |