Life Cycle Assessment : gas emissions of greenhouse material flows for two types of construction - Application of a holiday cottage

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LIFE CYCLE ASSESSMENT : GAS EMISSIONS OF GREENHOUSE MATERIAL FLOWS FOR TWO TYPES OF CONSTRUCTION

Application of a holiday cottage

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BACKGROUND

The life cycle assessment (LCA) of the series of ISO 14040 standards [1], allows to estimate the environmental impacts of a product, from the extraction of raw materials to the end of life. In the building industry, this method enables to provide quantitative indicators of environmental impacts of the products and materials used.

This concept proposes to take into account a number of principles, methods and technical to reduce environmental impacts at each stage of the implementation of the construction. In the context described above, the aim of this article is directly related to the proposal of an environmental impact assessment methodology, applied to buildings in an analytical and global approach. .

PURPOSE

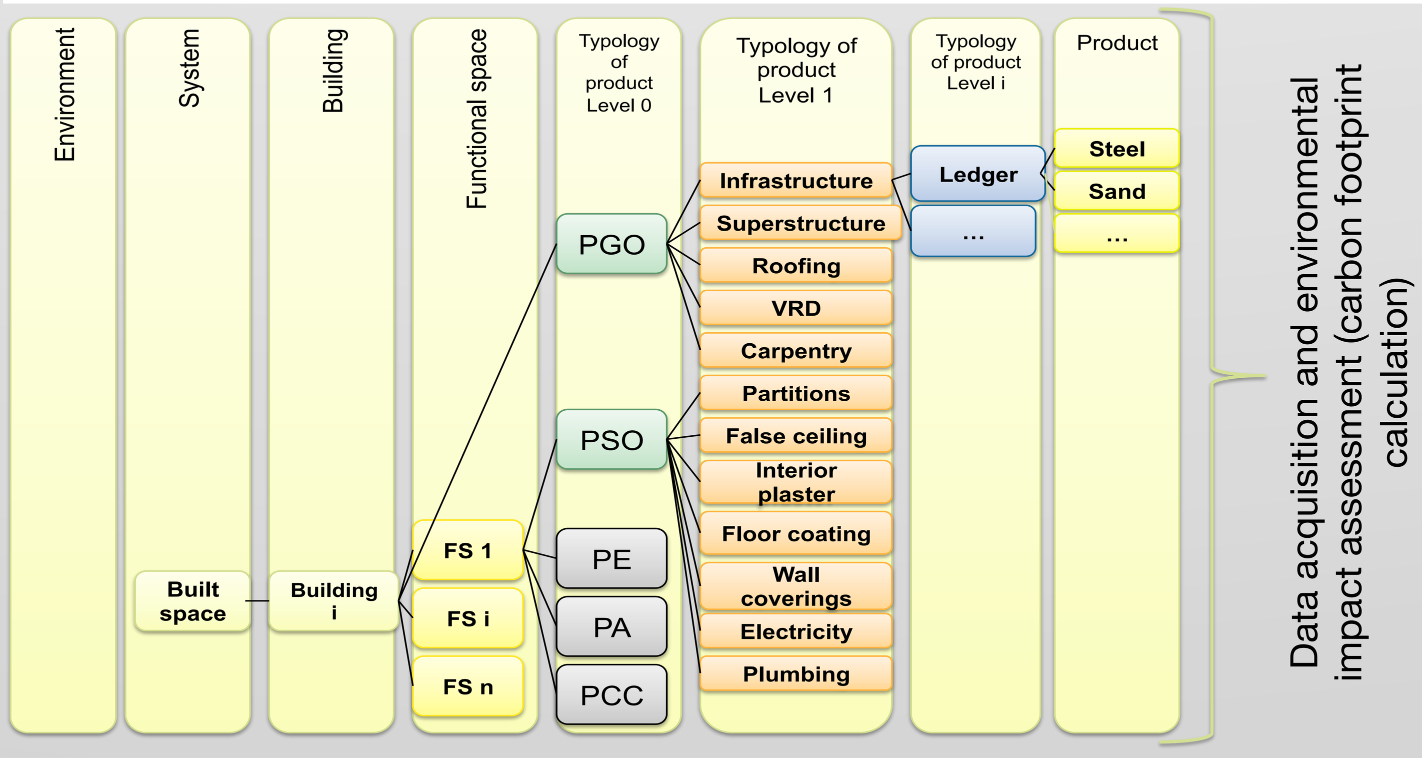
This study provides a new tool for environmental evaluation on the carbon footprint that applies to buildings of any kind. Five types of material are identified at a first level of description: structural work products (PGO), second work products (PSO), equipment products (PE), activity products (PA) and current consumption products (PCC). Several descriptive and analytic parameters are associated with these materials.

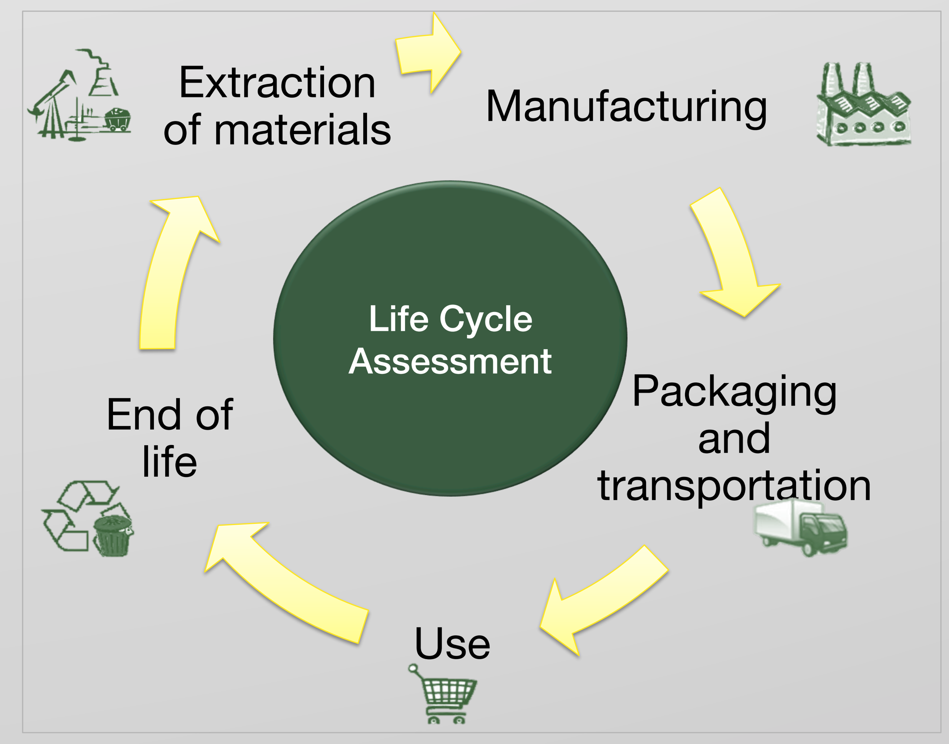
In this study, we intend to assess the environmental impacts of the buildings of a holiday cottage, based on two methods of construction (mineral materials and organic type).

We will illustrate the methodological aspects related to the realization of this tool, based on a systemic and typological approach.

METHODS

The concept of the tool is a systemic and typological approach which makes it possible to assess the problems and developments of a system. Several scales are identified and analyzed :





The idea is to identify, target and analyze all entities of the largest to the smallest scale. It is from this method is that establishes the acquisition of data and calculations of carbon footprint, for two types of construction applied to a case study.

The scope of application covers the steps of life cycle assessment. However, given the difficulties in collecting data, we do not consider the maintenance and waste treatment, but make the assumption of a scenario of end of life for each material.

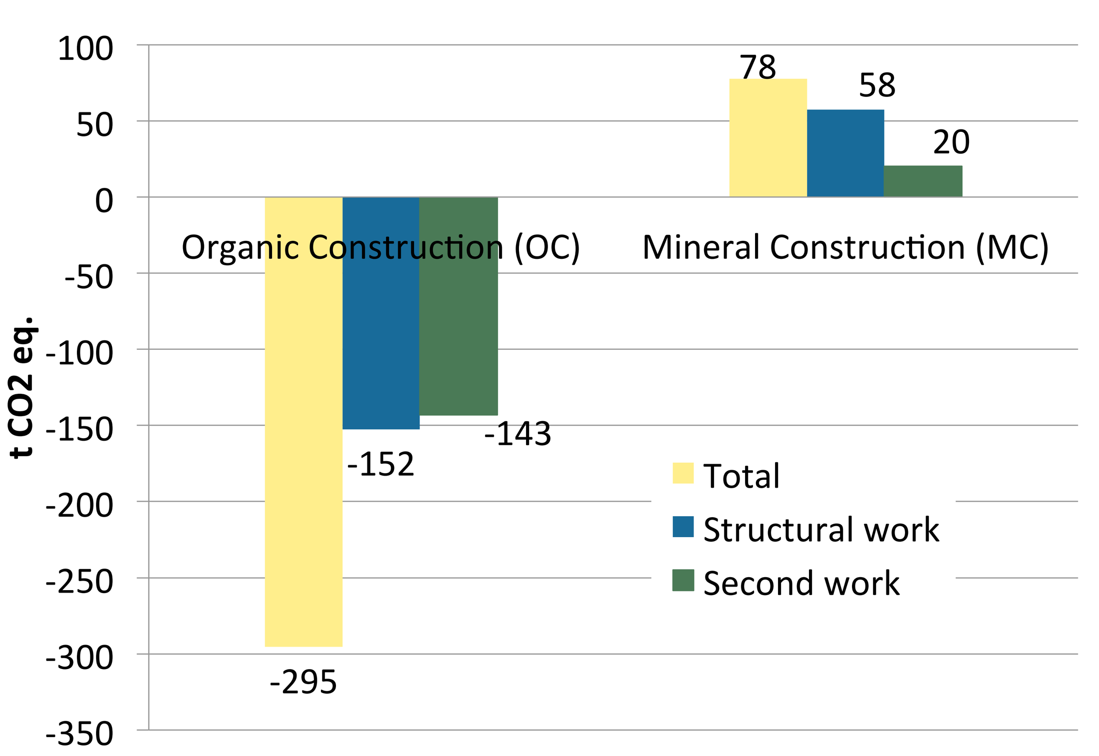
Case study : a holiday cottage

Comparative study for two type of construction

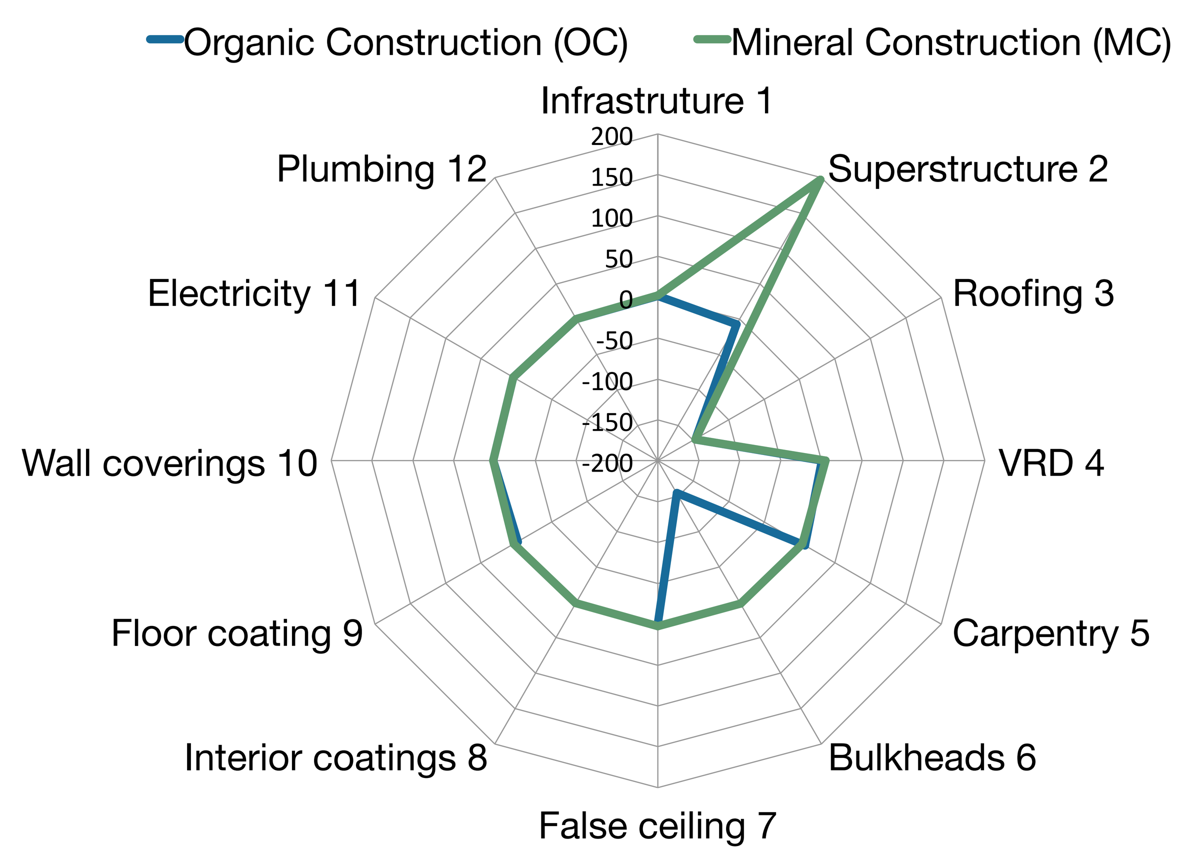
RESULTS

The carbon footprint simulation was performed by the creation of a new Excel tool and the use of databases INIES [2] and Carbon data [3]. It is interesting to note here that the carbon emissions are significantly variable depending on the type of product considered and the type of construction.

It is also interesting to observe the influence of the sub-types of level. The carbon emissions of the organic building are considerably reduced compared to the mineral construction. The largest variances noted are related to the superstructure and bulkheads. Indeed, as for the evaluation of the carbon footprint of the structural work and second work, only the materials that relate to the frame and the structure of the building will have a significantly different value. Emissions of other product types are similar (such as electricity and plumbing), since they are the same regardless of the construction materials considered. In this sense, it is important to consider all types of product level 0 (Structural work and second work) and level 1 (Infrastructure, superstructure...) to be able to target the environmental impact of buildings.



Comparative analysis of emissions of carbon for two types of construction



		OC	MC
PGO	1	2,40	1,78
	2	197,35	-7,38
	3	-147,42	-147,42
	4	5,19	0,57
PSO	5	4,08	7,62
	6	2,00	-154,44
	7	2,41	-0,52
	8	1,37	0
	9	3,92	-2,03
	10	1,41	1,41
	11	4,46	4,46
	12	0,48	0,48

Comparative analysis of carbon emissions (t CO2 eq.) of big work and second work for two types of construction

CONCLUSION

Based on a selection criterion taking into account the environmental impact, a significant reduction of the carbon pollutants is possible. According to this study, the organic building type construction would have less impact than mineral construction with a gap of 373 t CO2 eq. (Either -295 t CO2 eq. for organic construction and 77 t CO2 eq. for mineral construction). More precisely it is when considering the emissions of materials for the structure and the frame, that one can note a difference between the two types of construction.

In this sense, the study not only highlights the influence of the choice of materials, but mainly showed the point of the LCA approach to assess the environmental impact of a building. Indeed, this methodology allows both to have a synthetic and analytical approach.

Furthermore, other test elements will be added to the tool. To consider all the carbon emissions of the built space, equipment products (PE), Activity products (PA) and consumer current products (PCC), will be addressed. This same tool will eventually perform other analyzes of environmental impacts such as the resource use or the air acidification.

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Acknowledgements
This research has been supported by :

UNION EUROPEENNE