The study of LCA based indicators to evaluate the pressure on mineral resources in the building sector

Nada BENDAHMANE

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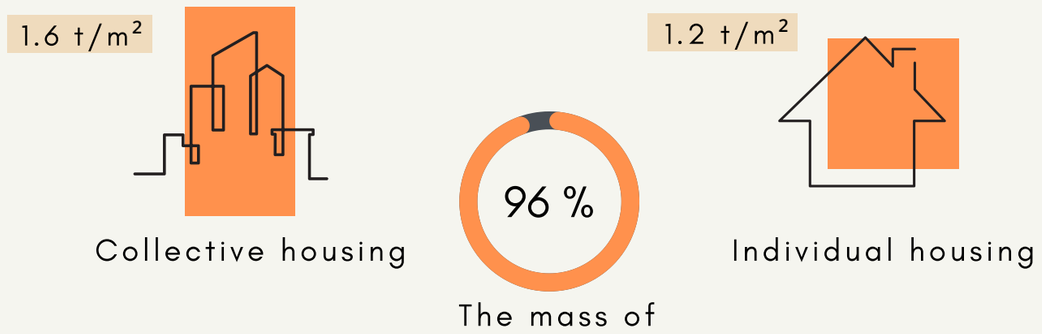
Context and goal

Context

- The construction sector is one of the biggest users of resources

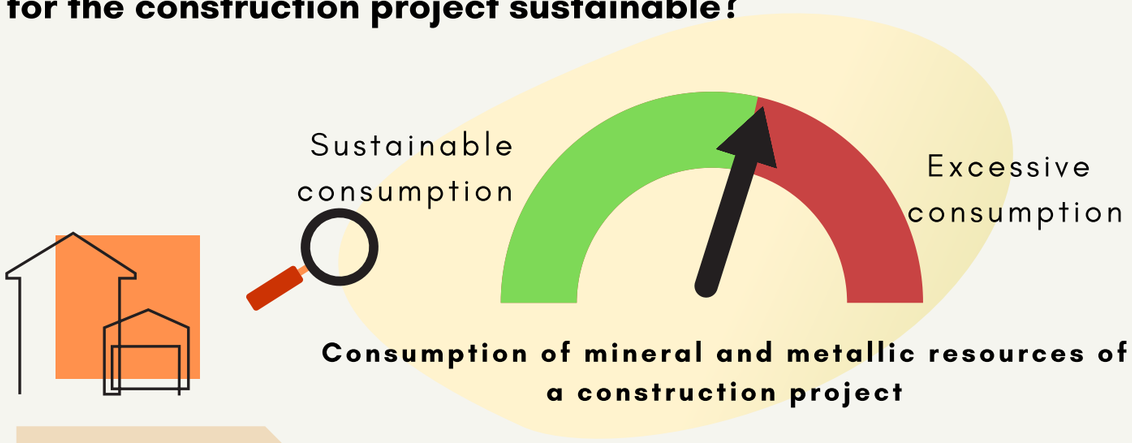


  - LCIA characterization methods related to mineral and metallic resources have different limitations:
    - The units are difficult to interpret
    - The impact assessment is not assessed at a spatial scale adapted for each mineral or metallic resource
    - Characterization factors are missing for certain resources present in the building sector
    - The flows resulting from recycling and reuse are not considered
    - The results are aggregated
    - Evaluation is relative

- The methods using the so-called AESA (Absolute Environmental Sustainability Assessment) approach do not integrate the pressures on mineral resources because they consider that the depletion of mineral resources is a socio-economic problem rather than an environmental one. [Bjorn et al., 2016]

Goal

Propose a decision support tool that answers the following question: is the consumption of mineral and metal resources for the construction project sustainable?



Case study

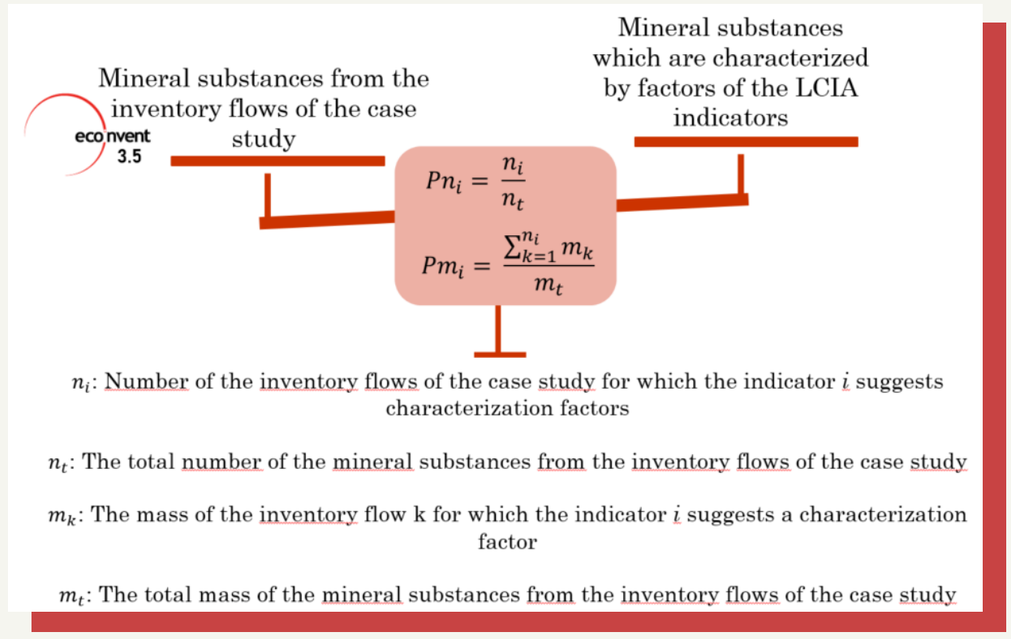
The scope is the new housings in France in 2015 as described by (Leonardon et al., 2018). The total mineral and metallic materials consumption for new housings in 2015 in France is about 41.523 ktons and is distributed as described in the table below

	Mass (10^3 t)
TOTAL	4,15E+04
Aggregates	1,80E+04
Sand	1,39E+04
Cement	4,40E+03
Terracotta	2,83E+03
Plaster	1,34E+03
Steel	6,79E+02
Glass	9,50E+01
Mineral wool	9,70E+01
Slate	6,80E+01
Aluminium	1,80E+01
Copper	2,10E+01
Zinc	1,00E+00

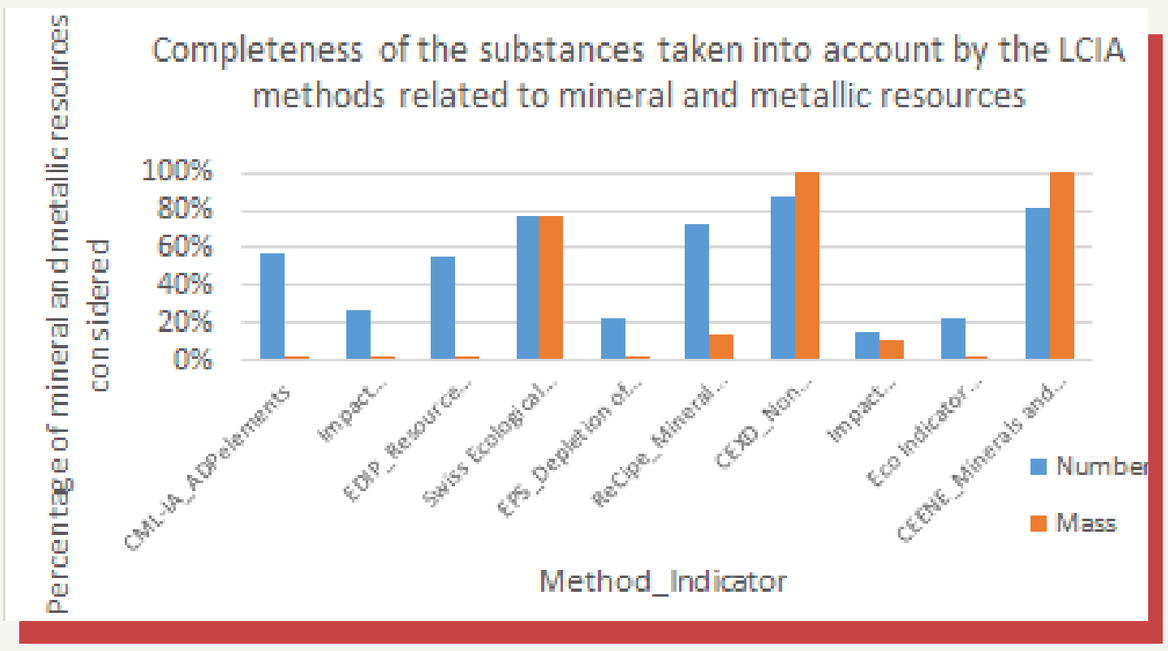
Mineral and metallic resource consumption in the new housing in 2015 in France (Leonardon et al., 2018)

Methodology

Comparison between mineral and metallic substances from the life cycle inventory and substances considered by each characterization LCIA method



Results



Perspectives & methodological discussions

- The developed method should:
  - Be inspired by the AESA approach by proposing a sustainable resource budget for each mineral or metallic substance
  - Integrate flows from recycling and reuse
  - Consider an appropriate spatial scale for each resource
  - Propose different scenarios for reducing the consumption of mineral and metallic resources which tend towards zero extraction of natural resources

Currently in the methodological development phase, several stages follow one another:

- Definition of the most suitable spatial scale for each mineral or metal flow from the anthropogenic stock
- Dynamic estimation of accessible flows from the anthropogenic stock estimated at the spatial scale of each mineral or metal flow
- Definition of scenarios for reducing the consumption of mineral and metallic resources
- Definition of a sustainable resource budgets for each resource and each scenario
- Definition of a sustainable resource budget allocation methodology

Methodological development is carried out in parallel with the case study in order to learn iterative improvements to the model.

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