

Addressing building stock renovation and selective deconstruction with a lifecycle perspective

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Life Cycle Assessment of urban building stock

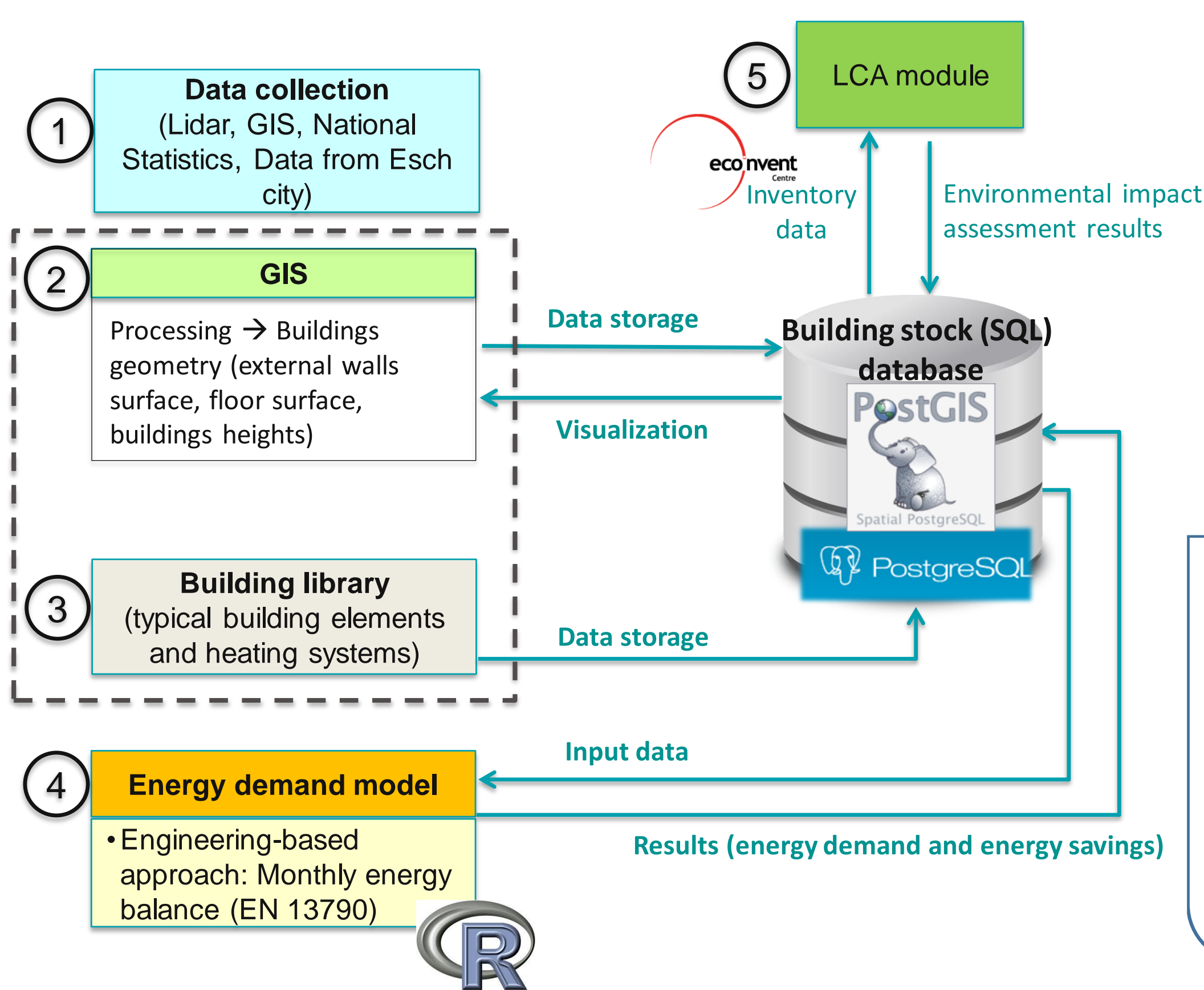
- GIS-based framework for the LCA of building stocks at the urban scale.
- We assessed the potential environmental impact associated with the end-of-life and retrofitting of buildings for one entire city.

Case study

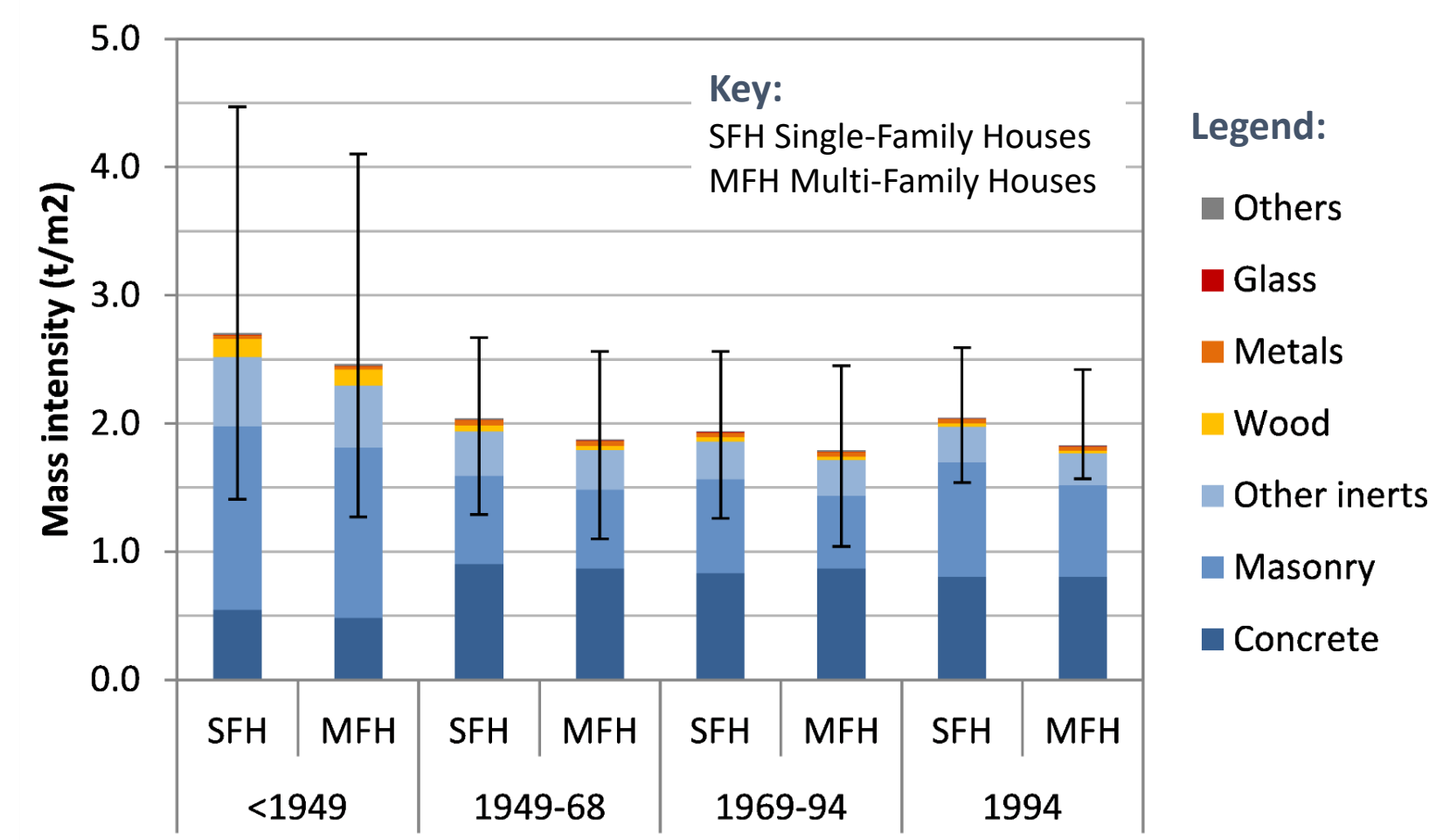
Esch sur Alzette (Luxembourg)
~34300 inhabitants (2017)



Calculation framework



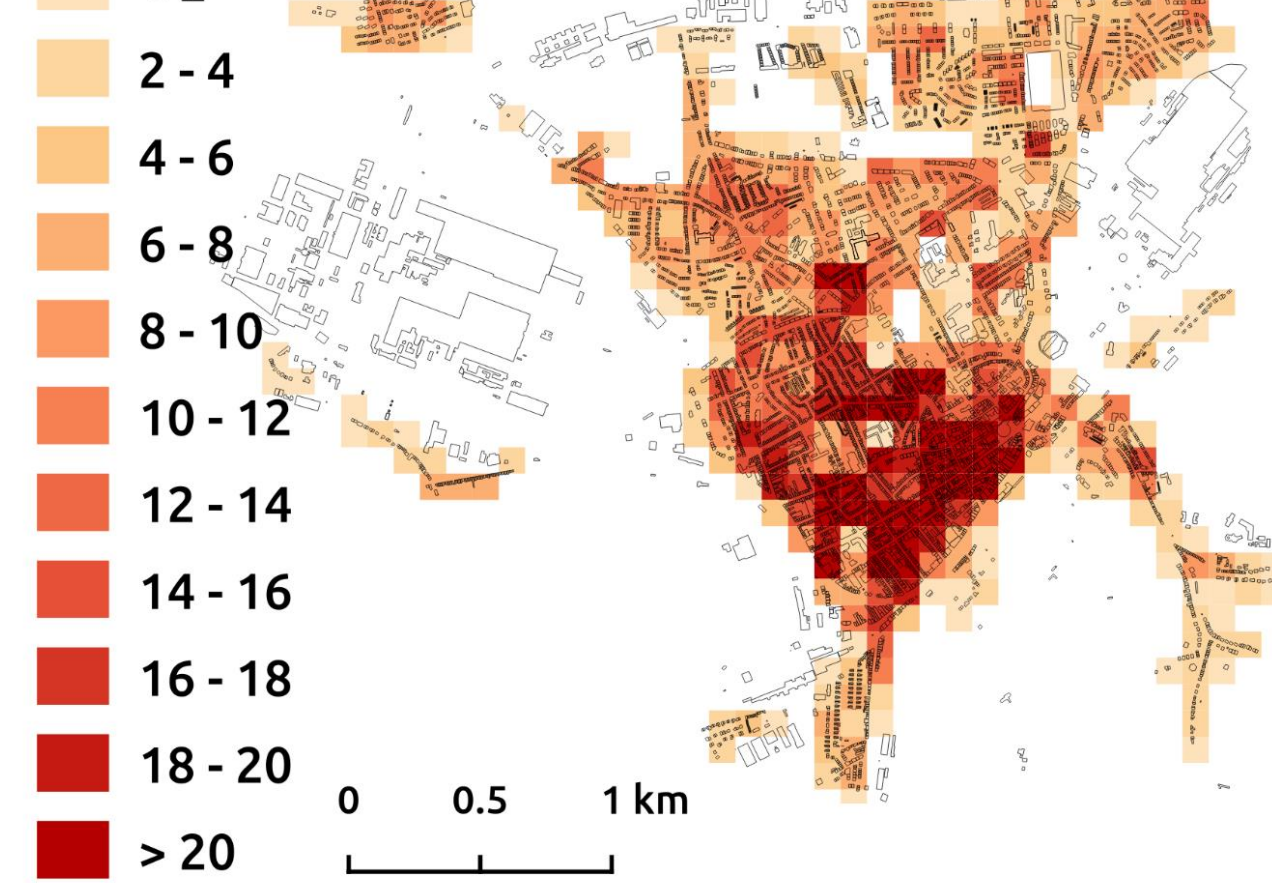
Material stock characterization



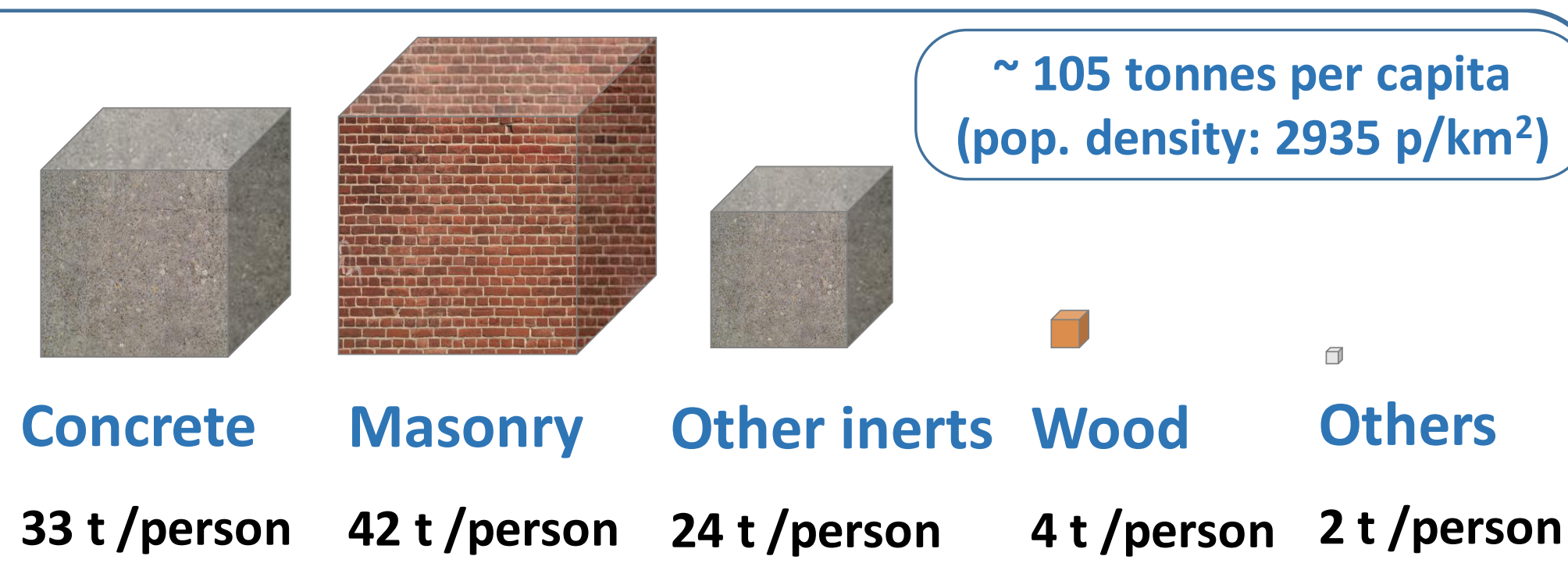
SFH = Single-Family Houses MFH = Multi-Family Houses
Source: Mastrucci et al. 2017

Current material stock

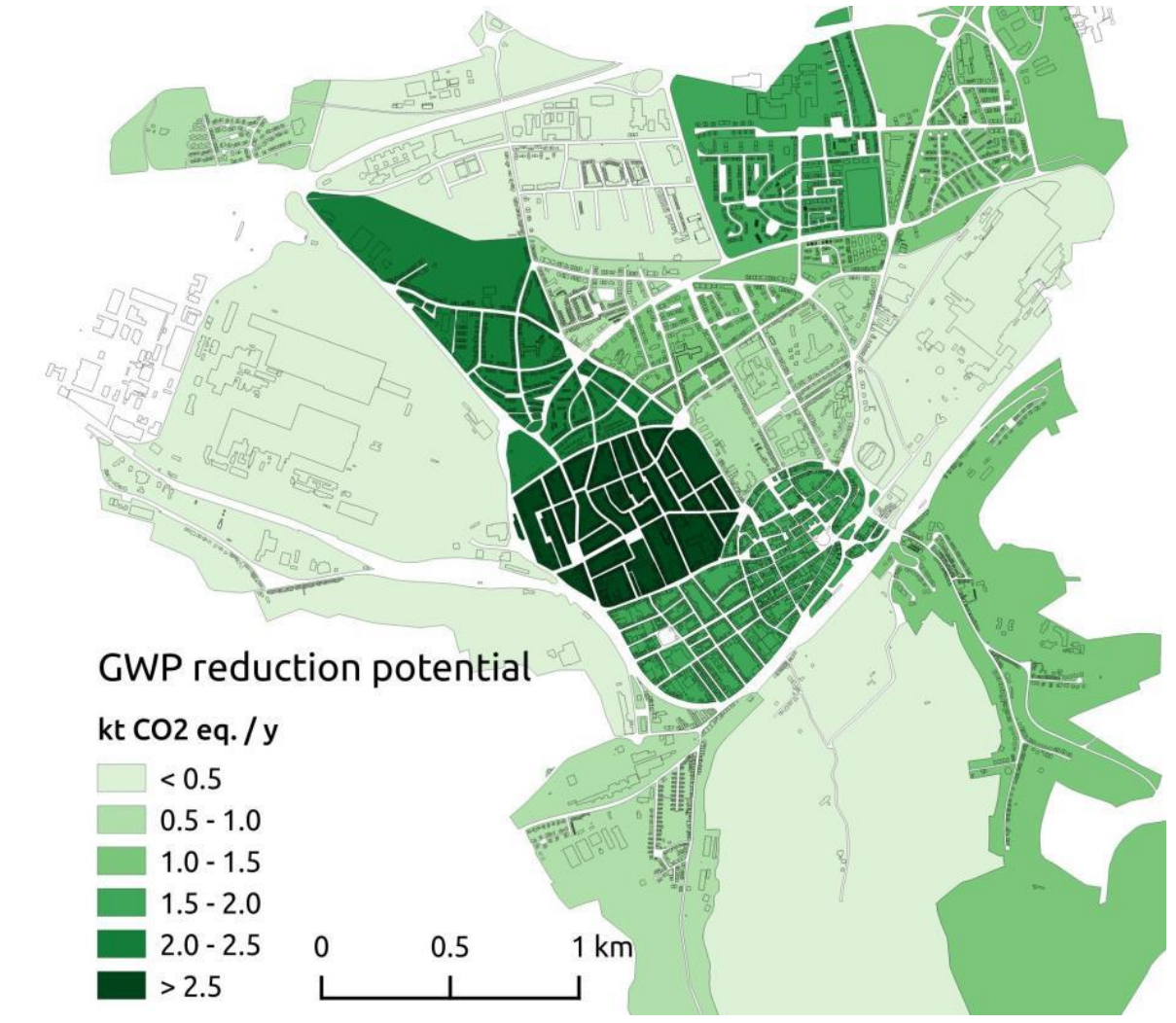
(kilotonnes / ha)



Source: Mastrucci et al. 2017

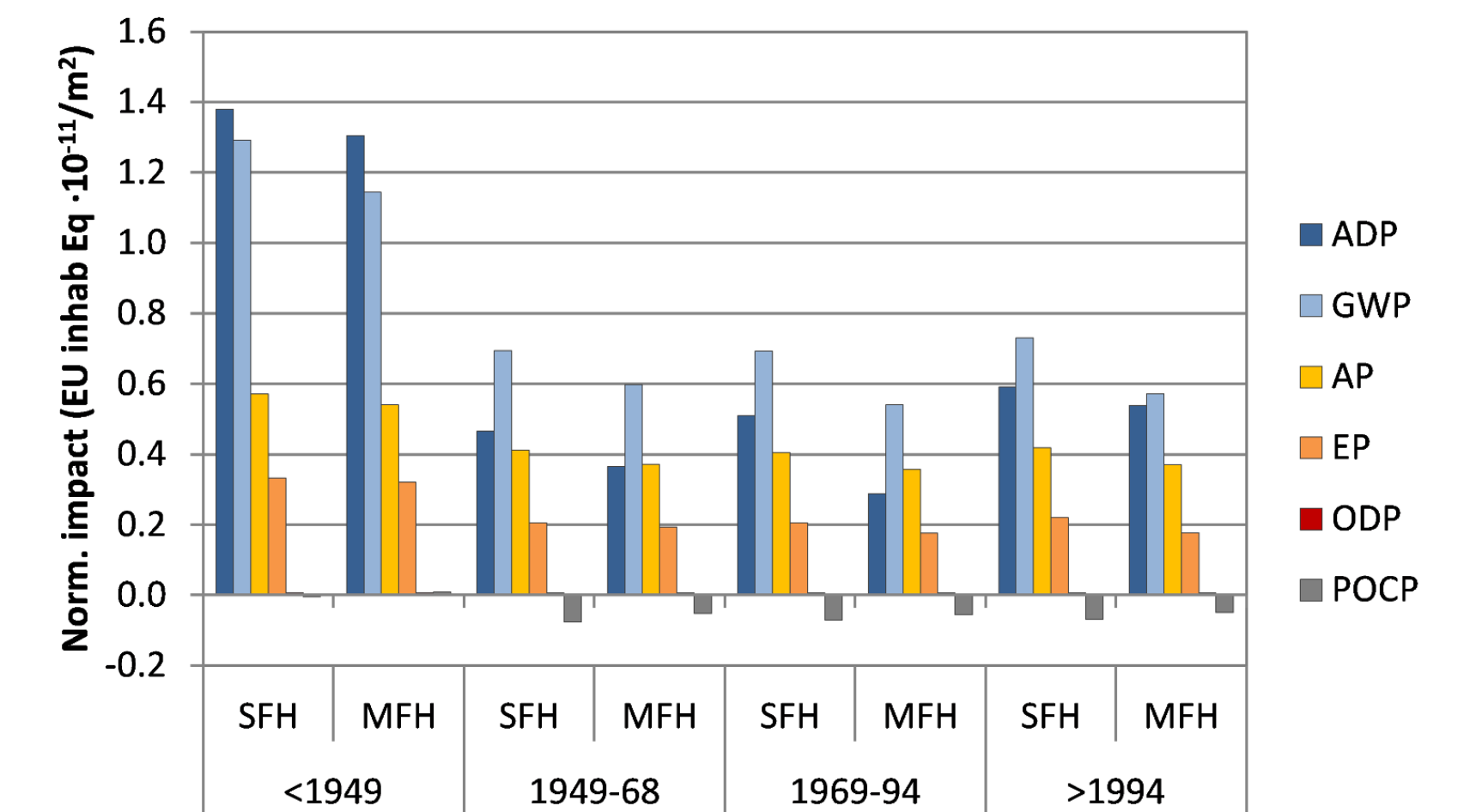


Retrofitting potential



Source: Mastrucci et al. 2016

Environmental impact of demolition



SFH = Single-Family Houses MFH = Multi-Family Houses

Source: Mastrucci et al. 2017

References

- Mastrucci et al. 2017. *Resources, Conservation & Recycling* 123: 54–66.
- Mastrucci et al. 2016. Proc. Sust. Built Environ. (SBE) regional conference. Zurich, Switzerland, June 15-17 2016

DAEDALUS Project

Fonds National de la
Recherche Luxembourg

Pre-demolition audits for resource management of building materials from deconstruction

- Obligation to conduct **pre-demolition audits** introduced in Luxembourg as legal requirement, transposing the European Waste Framework Directive (“material inventories”)
- Dedicated guidelines were published in 2018



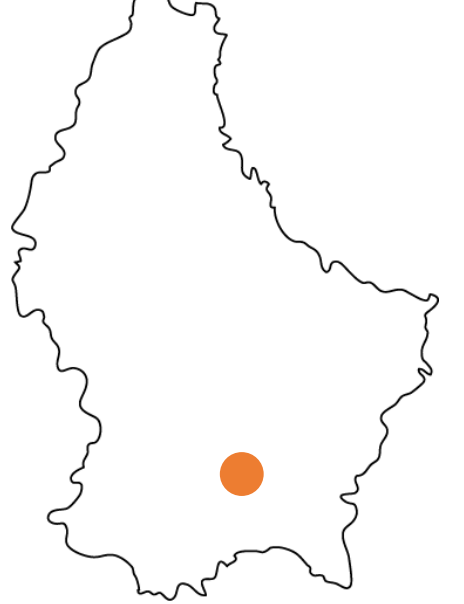
Luxembourgish
guidelines for
pre-demolition
audits (MDDI,
2018)



Office view before (left) and after (right) the test.

Case study for selective deconstruction

Luxembourg city



- Jean Monnet building (1970s) in Luxembourg city
- Approximately 125,000 m² office space and facilities for ca. 2000 staff

Approach

- Multidisciplinary team for the pre-demolition audit (quantify hazardous chemicals and construction materials)
- “Test deconstruction” of main material fractions (identify practices to deconstruct, separate construction materials, further analysis)
- Investigation of recycling options in Luxembourg and the Greater Region
- Public procurement for selective deconstruction: separate collection of 22 fractions and valorisation concept (“technical value”), requirement for *in situ* concrete crushing and backfilling

Key findings

- In-depth pre-demolition audit allowed to ensure the recycling of aluminium and glass fractions at the highest level possible
- Procurement must clarify the objectives of the project in terms of selective deconstruction
- Monitoring of selective deconstruction and valorisation potential on site is key

Outlook

- Supporting building owners and contractors on selective deconstruction requires the development of tender specifications for pre-demolition audit and selective deconstruction
- In order to better exploit operations of higher priority in the waste hierarchy such as “preparing for re-use” and material recycling, material inventories for re-use and assessment of the material properties (e.g. as performed for the aluminium) need to be undertaken

References

- MDDI - Ministère du Développement durable et des Infrastructures (2018). Guide pour l'elaboration de l'inventaire des matériaux de construction lors de la deconstruction d'un batiment
- Ehlert et al. (2019). It's all about planning - pre-demolition audits to inform public calls for tender for enhanced resource management of building materials from deconstruction. SBE19 Brussels BAMB-CIRCPATH.