

THE IMPACT OF BUILDING: BE ENERGY AND MATERIAL EFFICIENT!

Energy losses and energy consumption in buildings are falling sharply due to energy performance legislation. Heating of buildings generates less CO₂ emissions.

But the **materials needed for these energy-efficient buildings also have an environmental impact of their own** during their entire life cycle: in the extraction of raw materials, in the processing of raw materials into building materials, in the installation at the building site, in the maintenance and replacement of materials, in all transport, and in demolition and waste processing. **Not only are CO₂ emissions important**, other aspects of environmental impact also count: acidification, carcinogenic properties, ecotoxicity, etc.

This is why OVAM encourages calculating the overall environmental impact of the building using the **TOTEM**-tool (**T**ool to **O**ptimise the **T**otal **E**nvironmental impact of **M**aterials). The tool allows to find an optimum between the energy and material impact. As such, when designing a building materials can be chosen in accordance with that optimum.

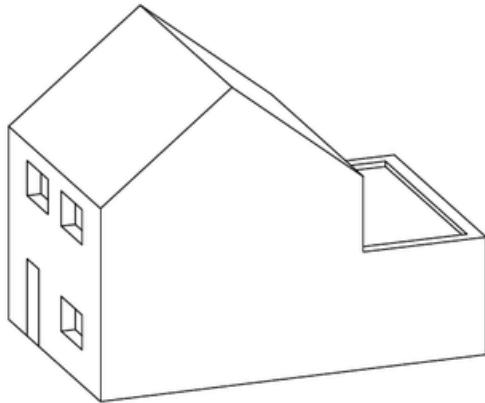
In order to **support** the Belgian construction sector in **quantifying and reducing the environmental impact of buildings**, the three Belgian regions have developed the TOTEM tool. TOTEM is based on a transparent life-cycle analysis methodology in line with the European framework.

RENOVATE OR BUILD A NEW ONE? THICKNESS OF INSULATION MATERIAL?

A user can model his building in TOTEM as a collection of building elements (walls, roofs, windows, etc.), which in turn are composed of processed materials (masonry, insulation materials, etc.). The tool then calculates the total environmental impact of the building (based on all life phases and all environmental aspects).

Demolish and rebuild a house or renovate it? TOTEM enables the client or architect to assess the environmental performance of different scenarios in an objective and transparent manner.

An example:

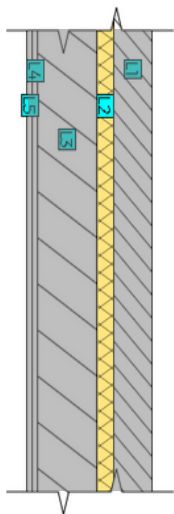


- Single-family house
- Semi-detached
- 2 floors
- Gross floor area = 125.5 m²
- 1960s
- Not insulated

Typical single-family house from the 1960s

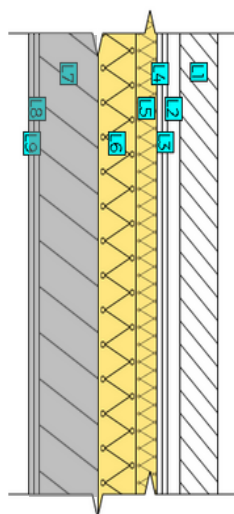
The original, non-insulated exterior wall will be adapted in 3 ways (figure below): limited renovation, thorough renovation and new construction. The same happened for the other elements (roofs, floors, etc.). In this way, the environmental impact of the entire dwelling can be calculated in 3 ways (see next paragraph).

Limited renovation



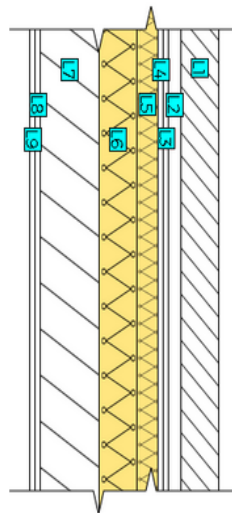
Existing cavity wall with 4 cm of PUR in

Thorough renovation



Remove existing facing bricks, new insulation (14 cm of PUR) and new facing bricks

New construction



Completely new cavity wall with 14 cm of

Three scenarios for the original non-insulated exterior wall (grey: existing materials)

FIND A BALANCE BETWEEN ENERGY AND MATERIAL IMPACT

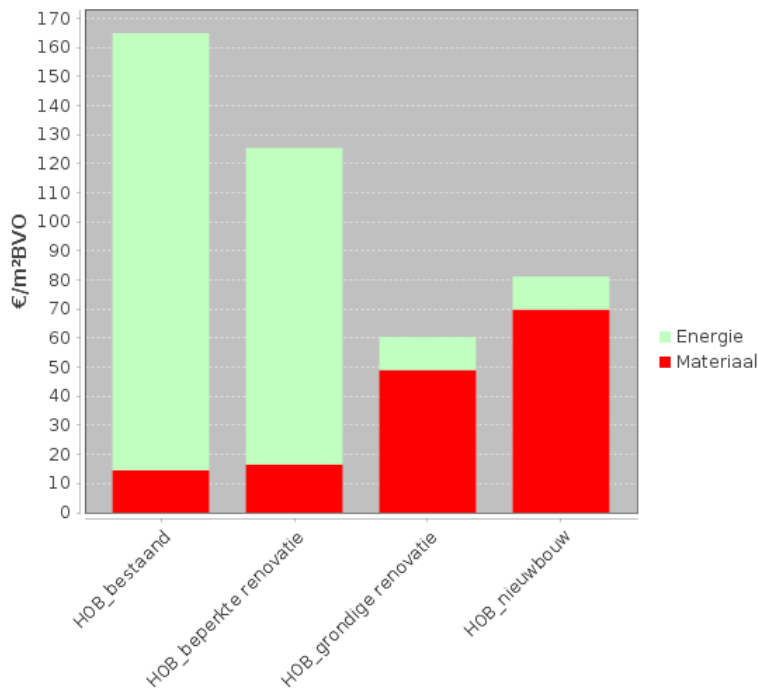


Figure 3: the total environmental impact expressed in €/m² gross floor area (GFA) for the dwelling in its current condition (left) and the 3 scenarios (from left to right: limited renovation, thorough renovation and new construction). The environmental impact is divided into the environmental impact linked to energy (green) and material consumption (red).

For the current example:

- The existing house has the highest total impact and a remarkably high energy consumption due to the lack of insulation.
- Few additional materials are required for the limited renovation. The impact linked to the materials thus increases only slightly. But the energy impact does not decrease much either.
- The thorough renovation has the lowest overall impact. As many of the existing materials as possible are retained, which limits the amount (and impact) of new materials. At the same time, the renovation is far-reaching enough (e.g. sufficient insulation is added) to significantly reduce the energy impact.
- The new building project has a lower energy impact, but requires a lot of new materials and therefore in this case scores less favourably than the thorough renovation.

Attention: this is a purely illustrative example, the results are not to be generalised to the rest of the building stock. Using TOTEM modelling for your building, you can weigh up different options and determine the best one for your building.

WANT TO KNOW MORE?

More figures ...

Buildings emit 30% of the total Flemish greenhouse gas emissions from the non-ETS sectors¹ (Flemish Energy and Climate Plan 2021-2030). With the Flemish Energy and Climate Plan 2021-2030, Flanders is committed to a greenhouse gas reduction of -35% compared to 2005 in the non-ETS sectors by 2030.

The objectives for the use of materials are less clear. The construction industry consumes up to 50% of the world's raw materials. The way in which we deal with scarce materials strongly determines the potential of these materials for future generations.

In the coming decades, a high level of renovation/adaptation of the current building stock will be necessary in order to achieve the energy objectives. If we want to (re)build in a sustainable way, then the choice and combination of materials depending on the specific building solution is very important.

However, the pace of renovation is too slow. In Belgium, barely 0.33% of homes are thoroughly renovated every year (Essenscia press release, 21/9/2018). This percentage is more than three times higher in our neighbouring countries.

EPD database and TOTEM ...

At federal level, the EPD database was developed in 2017. Material manufacturers who invest in screening the environmental impact of the products they place on the market can use Environmental Product Declarations (EPDs) to integrate their environmental data into the TOTEM tool (from the end of 2019). Architects and clients will thus be able to make a conscious choice for specific material solutions and building concepts when designing buildings. In this way, ecodesign is rewarded by manufacturers.

Building passport ...

As in other sectors, the construction sector is strongly committed to digitisation (BIM, Building Information Modelling/Management). If all parts of a building with their specific characteristics are stored in a digital data system, it is possible to gain an insight into the material reserves within the current building stock in the long run. These materials can then possibly be used in new buildings.

¹ ETS: Emissions Trading System. Non-ETS sectors are agriculture, buildings, transport and waste.

SOURCES

TOTEM web tool: totem-building.be

TOTEM documentation: ovam.be/afval-materialen/materiaalbewust-ontwerpen-produceren-en-aankopen/materiaalprestatie-gebouwen

Flemish Energy and Climate Plan 2021-2030: omgeving.vlaanderen.be/vlaams-energie-en-klimaatplan-2021-2030