

RENOVATING THE BUILDING ENVELOPE

QUO VADIS?



Approximately 75% of the current EU building stock is energy inefficient, and it accounts for almost 40% of the EU total energy consumption and 36% of greenhouse gas emissions.

The renovation rate for residential buildings is estimated at 1%, dropping to 0.2% when focusing on deep renovations only. The target for EU-27 is well above 2% in the next ten years in order to achieve the renovation of almost 80% of existing buildings by 2050.

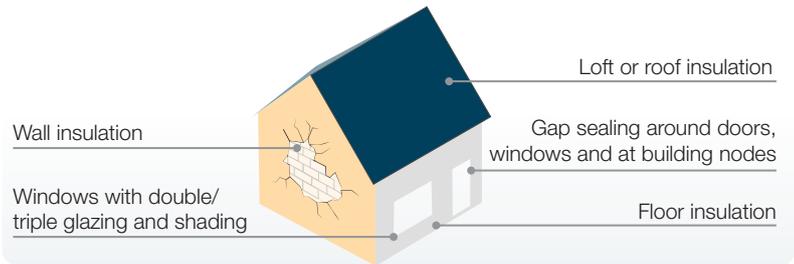
The renovation or retrofitting of the building envelope is one of the most important ways to reduce thermal losses and operational CO₂ emissions.

Evidence shows that such renovations, focusing on the insulation and the substitution of single-glazed windows with double-glazed ones, are expected to lead to a 50% and 90% reduction in heating demand and CO₂ emissions, respectively.

Recently, the EU has implemented policies and practical initiatives to foster the implementation of innovative solutions to renovate building envelopes.



The building envelope is the physical separation between the conditioned (the interior) and unconditioned environment (the exterior) of a building. It serves three primary functions: support (structure); control (energy and climate through insulation and ventilation) and aesthetics (the architectural design).



Overview of the main benefits linked to renovating the building envelope

BENEFITS

ECONOMIC



Reduce the resources needed to heat/cool buildings

Support **energy affordability** (vs energy poverty)

Higher real estate values

ENVIRONMENTAL



Lower energy consumption and CO₂ emissions (and other pollutants resulting from combustion processes such as fine particles).

SOCIAL



Building envelope renovations **increase thermal and acoustic comfort**

Improved indoor **air quality**

MACRO-LEVEL



Building envelope renovations help to improve the indoor quality and the health of occupants, and their **comfort and well-being**

Climate change mitigation and preventing related climate damage costs

Main barriers to building envelope renovation

Technical barriers



1. Lack of skilled workers
2. Technologies' limited maturity
3. Accessing user energy data

Financial barriers



1. High upfront investment costs
2. Long pay-back timeframe
3. Lack of funding opportunities

Social barriers



1. Decision making process
2. Users' limited awareness and understanding of benefits

Regulatory barriers



1. Building permit procedure
2. Architectural constraints

CASE STUDIES

The RenoZEB project: installation of Plug and Play facades

RenoZEB promotes building renovations and nZEB buildings by providing users with: i) cost effective multifunctional modular Plug and Play solutions for large-scale deep nZEB rehabilitation schemes; ii) innovative methodologies and ICT tools; iii) training; iv) guidelines; and v) demonstration cases.

A preliminary analysis of the results shows a reduction of energy consumption by 60% and a 53% increase in the overall energy efficiency of the building.

The RE-COGNITION project: integration of renewable energy technologies

The RE-COGNITION project aims to foster large-scale deployment of building-level renewable energy and safely connect it to the grid. It is developing an integrated solution to maximise the use of locally-produced energy, by building-level renewable energy technologies, leveraging both scalable technologies and less mature ones.

The project had six pilot implementations in four European countries (Italy, Greece, Romania, and the United Kingdom). The development and optimal exploitation of RES technologies through the RE COGNITION integration framework resulted in significant **cost benefits** (reduction of 11% to 42%) **and reduced emissions** (10% to 25%).

The ProGInreg project: Green infrastructure for urban regeneration

The ProGInreg project – which stands for “Green productive infrastructure for post-industrial urban regeneration” was launched in 2018 with the aim of creating living labs in four cities to advance nature based solutions. As part of the nature-based solutions, green building envelopes reduce storm water runoff, capture CO₂ emissions, filter pollutants, and increase biodiversity. The green wall of the mini urban farm was finalised in September 2021, together with the installation of sensors (measuring temperature and relative humidity) to monitor the air conditions.

TAKEAWAYS FOR POLICYMAKERS

1. Co-financing the development of sustainable innovations allowing them to reach the commercialisation stage.

2. Innovative solutions should unburden owners and users to the largest extent possible from some of the renovation disturbances (like noise, waste etc.).

3. Provide financial incentives for construction enterprises and building owners to engage in building envelope renovation activities.

4. Providing technical assistance for companies as well as buildings owners and users.

5. Public authorities can ease administrative procedures by simplifying and modernising building permit processes, including the use of interoperable BIM models.

6. Support cross-border mobility of companies and workers should be promoted.

7. Facilitating collaboration and partnerships between construction companies, associations, academia, and civil society to foster credibility and engagement.

8. Engage with end users, throughout the process of renovation, highlighting the benefits to human health and wellbeing.