RENOVATION TRACKS FOR EUROPE UP TO 2050

Building renovation in Europe - what are the choices?

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Which way to go?

Renovation of the EU building stock offers an enormous cost-effective potential to reduce GHG emissions, provide energy savings and re-launch the economy through job creation. Therefore, there is need to address it as **efficiently**, **effectively** and **urgently** as possible.

Buildings account for nearly 40% of the EU's final energy consumption and 36% of its CO_2 emissions, and the need to tackle this sector seriously is reflected in various EU strategies and legislative initiatives:

- On the one hand, the European Commission has established, in its "Roadmap for moving to a competitive low carbon economy in 2050", a long-term objective of decreasing CO_2 emission levels for the building sector by 88-91% by 2050, compared to 1990 levels.
- On the other hand, the Energy Efficiency Directive requires EU Member States to establish long-term strategies for the renovation of their national stock of public and private residential and commercial buildings.

How can these requirements be combined and mutually reinforce each other? What is the best way for the EU, national, regional and local authorities to fully tap the potential of their building stock to ensure CO_2 emission reduction and energy savings, while preserving cost-effectiveness and boost their economy?

The new Ecofys study, **"Renovation Tracks for Europe up to 2050: Building renovation in Europe – what are the choices?"**, analyses and compares possible Tracks for the renovation of the EU building stock, quantifying and graphically illustrating energy savings, mitigation of CO_2 emissions, financial impacts and effects on employment.

This leaflet provides a short summary of the study's findings.

Three renovation Tracks

The study compares three possible Tracks for the renovation of the EU building stock, with a 2050 horizon:

- **Track 1: Shallow renovations** with a low contribution from renewables
- **Track 2: Shallow renovations** with a high use of **renewable energy**
- **Track 3: Deep renovations** with a high use of renewable energy

The three renovation Tracks were developed and assessed using the Ecofys Built Environment Analysis Model (BEAM²). They are characterised by two important parameters, namely:

- Speed of renovation (= renovation rate)
- Ambition level in terms of energy efficiency improvement (= depth of renovation) and use of renewable energy

Track 1 shows a high speed of renovation (3%yearly retrofit rate), but a low energy efficiency ambition level.

Track 2 shows a moderate yearly retrofit rate (2.3%) and low energy efficiency ambition, but higher use of renewable energy.

Track 3 shows a moderate yearly retrofit rate (2.3%), but high energy efficiency ambition.

The 2050 horizon was selected to ensure a strategic view, assessing the choices to be made now and in the next years within a long-term perspective. This goes in line with the requirement of the Energy Efficiency Directive for Member States to establish long-term Roadmaps for building renovation.

The Tracks assume renovation rates no higher than 3% per year, and take into account normal renovation cycles (30 to 40 years). This makes it possible to connect the “energy renovations” with already planned renovation activities (even if they are non-energy-related). Renovation rates in all scenarios ensure that the entire EU building stock is refurbished before 2050.

Modelling results

The following table provides an overview of the Tracks and associated findings for the period 2012–2050:

	Track 1	Track 2	Track 3
Retrofit rate per year	3.0%	2.3%	2.3%
CO_2 emissions from space heating and domestic hot water in the EU27 by 2050 [Mt]	498	103	93
Final energy use for space heating in the EU27 by 2050 [TWh]	1,987	1,228	613
Reduction in final energy use for space heating by 2050 compared to 2010	32%	58%	80%
Total costs (investment costs **and** energy costs for space heating and domestic hot water, discounted costs for the period 2012-2050) [trillion Euro]	8.2	8.8	8.5

Analysis of the three Tracks shows:

- **CO_2 emission savings:** ***only Tracks 2 and 3 perform***. The 88-91% target can be achieved by 2050 with the two most ambitious Tracks. Track 1 clearly misses the target.
- **Savings in final energy consumption**: ***Track 3 outperforms the other two Tracks***. Deep renovation (Track 3) can yield 80% energy savings for heating, Track 2 a significantly lower 58%, and Track 1 just 32%.
- **Total costs:** ***there are no major differences***. However, between the options showing the best overall performance for other criteria (Tracks 2 and 3), the deep renovation one (Track 3) presents better economic results.

An essential element that could prove decisive for national, regional and local authorities when choosing their long-term building renovation strategies is the **impact on job creation**. The study concludes that ***Track 3 doubles job creation compared to shallow renovation***, in fact, compared to Track 1, Track 2 has the potential to create 0.9 million additional jobs, and Track 3 as many as 1.4 million additional jobs.

REDUCING CO_2 emissions by over 90% is POSSIBLE!

CO_2 emission savings

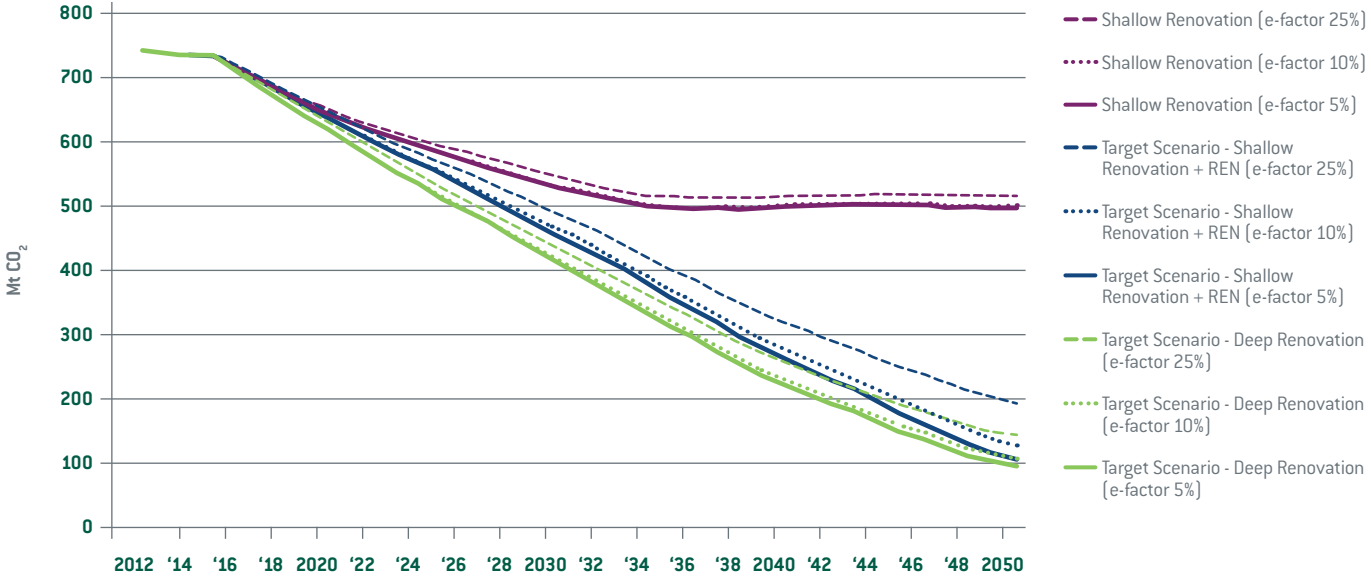
Which Track provides the greatest CO_2 emission savings?

The built environment is widely recognised as being the single sector with the highest potential for mitigation of CO_2 emissions in a cost-effective way (i.e. at no or even negative cost).

The Ecofys study analysed the potential for CO_2 emission reduction for the three Tracks in question, taking as a starting point the previously mentioned target of an 88-91% decrease in emissions from the residential sector by 2050.

The results are clear: while Tracks 2 and 3 achieve emission savings of approximately 90%, Track 1 clearly misses this target.

TOTAL CO_2 EMISSIONS EU27 (Mt/a)



Note: For all indirect emissions (from electricity and district heat) different CO_2 emission factors (e-factors) are taken into account up to 2050, reaching 25%, 10% or 5% of the 2010 CO_2 emissions. The e-factors for indirect emissions are used as average values per year, while all other emission factors are considered as constant.

Reduction of final energy consumption[1]

Which Track provides the greatest energy savings?

A substantial reduction in final energy consumption would allow the CO_2 savings target to be met, and bring enormous benefits in other areas, such as security of the energy supply and decline in energy poverty.

The Ecofys study analysed energy savings generated by each of the Tracks.

Track 1 is by far the least ambitious in this respect, providing just 32% energy savings.

Track 2 shows better results, achieving energy savings of up to 52%, but still falling short of fully tapping the potential of the existing building stock.

Track 3 can deliver **80%** savings related to energy used for space heating[2]. This coincides with the goal determined by the European Parliament in its report on the Energy Efficiency Directive[3].

[1]Final energy consumption includes all energy delivered to the household.
It excludes deliveries for transformation and/or own use of the energy producing industries, as well as network losses.

[2]When considering space heating and domestic hot water together, the deep renovation Track (Track 3) yields 75% savings. If further energy uses (energy for cooling, auxiliary energy and lighting, all primarily supplied via electricity) are taken into account, related final energy saving potential needs to be adjusted accordingly.

[3]The European Parliament's report on the Energy Efficiency Directive established a goal of 80% savings on final energy to be achieved by 2050, compared to 2010.

FINAL ENERGY FOR SPACE HEATING EU27 [TWh/a] WITHOUT NEW BUILDINGS

Millions of jobs just around the corner

Which Track creates more jobs?

Building renovation is a unique tool that can be used to re-launch the EU's economy and boost growth. It is well documented and widely known that building renovation has enormous potential to generate local employment.

In addition, numerous studies based on real-life cases, such as that conducted by the Jüllich Research Centre for the German KfW Bank[4], have shown that putting people back to work on construction sites for building refurbishment can result in immediate benefits for public authorities. The Jüllich study concluded that every Euro invested in building refurbishment programmes yielded a four- to five-fold return the same year through the creation of some 340,000 local jobs.

Based on the assumption that approximately 17 jobs (person/year) are created per million € invested in building renovation, the Ecofys study found that of the three defined Tracks, Track 3 would generate most work, doubling job creation compared to shallow renovation.

Compared to Track 1, Track 2 would create 0.9 million additional jobs and Track 3 an impressive 1.4 million additional jobs.

[4]"Impact on public budgets of KfW promotional programmes in the field of energy-efficient building and rehabilitation", Jüllich Institute/KfW, 2011.

Track 1: Baseline

Track 2: 0.9 million additional jobs

Track 3: 1.4 million additional jobs

Choosing the right investment Track

Which Track provides the most favourable investment/results balance?

When facing a political decision, and especially in times of economic constraint, public authorities are under increased pressure to make the right choice, combining responsibility for reaching political targets with the goal of ensuring the best quality of life for their citizens and the highest returns. The Ecofys study provides the required elements for a balanced judgement.

Track 1 (shallow renovation) misses the environmental target (CO_2 emission reduction) and provides poor results on reduction of final energy consumption, while it does not offer any substantial economic advantage compared to Track 3.

Track 2 (shallow renovation and high use of renewable energy) meets the CO_2 target, but shows significantly lower energy savings and higher resulting costs than the deep renovation Track.

Track 3 (deep renovation) achieves the best results in terms of CO_2 emission reduction and energy savings, while showing similar total costs to shallow renovation in the long term.

TOTAL YEARLY COSTS EU27 (BILLION EURO/a)

Conclusion

The Energy Efficiency Directive requires EU Member States to draft long-term roadmaps for building refurbishment programmes. This leaves national, regional and local authorities with a critical choice to make about which renovation Track to take:

- On the one hand, there is a strong need to integrate energy savings and CO_2 emission reductions (taking into account the long-term objective of cutting GHG emissions in the residential sector by 88-91% by 2050[5]).
- On the other hand, it is vital to ensure cost-effectiveness and provide a much needed boost to the economy by creating jobs in the construction sector, an area badly hit by the economic and financial crisis.

This independent analysis clearly shows that deep renovation of the EU's building stock has the capacity to generate significant CO_2 emission reductions and energy savings, while providing a strong impetus for economic recovery and job creation.

The direction for future policy-making is clear: strong, concrete actions and legislative measures are required to achieve long-term targets. This is the challenge facing today's decision-makers.

The Ecofys report unequivocally concludes that while it is possible to renovate all existing buildings by 2050, **there is probably only one good path to get there**. We need therefore to:

Plan AHEAD
Renovate RIGHT - Go DEEP

[5]As established by the "Roadmap for moving to a competitive low carbon economy in 2050".

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European Insulation Manufacturers Association

Avenue Louise 375, Box 4 • BE 1050 Brussels, Belgium
Tel +32 (0)2 626 20 90 • Fax +32 (0)2 626 20 99 • www.eurima.org