

Simplified Cost Benefit Analysis for Energy Efficiency in buildings

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Context

- Cohesion region, large city of approx. **300.000 inhabitants**.
- Existing need for EE investments, particularly in buildings. 87% of the city's building stock was constructed before 1990. Most buildings are in **lowest energy consumption classes**.
- Buildings account for **42% of the total final energy consumption** in the city (and in the country).
- **Electricity and gas prices** are among the lowest in Europe due to subsidised energy tariffs. Nevertheless, about 10% of city population is exposed to energy poverty due to **low disposable income**.
- At policy level, the NECP envisages ambitious targets of **carbon emissions' abatement**.
- It is estimated that **EUR 10.9 billion** related to the EE renovation of residential buildings are needed until 2030 to achieve the EU and national targets.

Market barriers

The **main obstacles** to residential thermal rehabilitation programs in the region consist of:

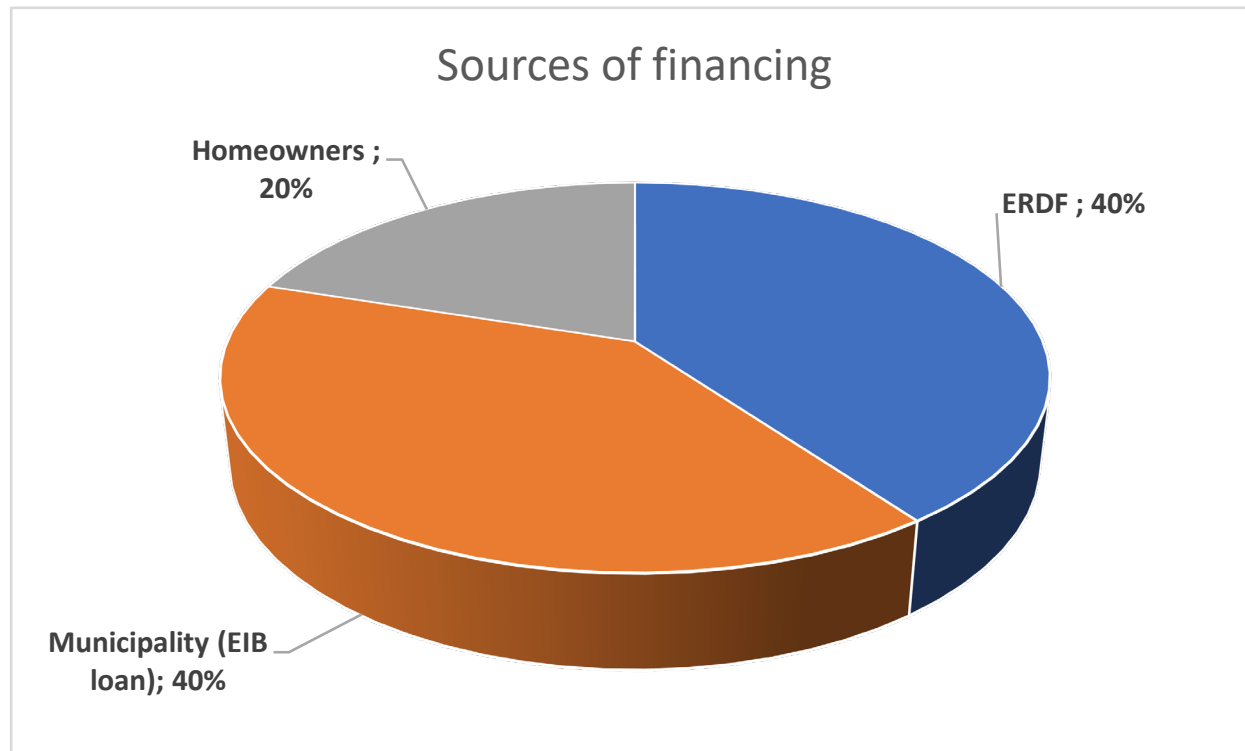
- **Low income** of a significant number of households and structural unemployment of marginalized groups resulting in energy poverty. Most households would face substantial difficulties if they had to pay the full cost of renovation.
- **Heavily subsidized energy prices**, which disincentive the adoption of EE measures.
- **Lack of skilled workers** or low levels of training in the use of new technologies designed for EE.
- **Low awareness among local financial institutions** to invest in energy efficiency and lack of specialized debt providers.

The project

- Programme for the **thermal rehabilitation of 214 buildings** (8,400 apartments).
- The **renovation works** will consist of: insulation of the building envelope (walls, roof, and floors), replacement of the existing windows with PVC double-glazed windows, improvement of the heating, domestic hot water (DHW) and lighting systems.
- On average the baseline energy consumption is 190 kWh/sqm . The estimated energy **saving is 40%**.
- All buildings are connected to **district heating systems**, which uses natural gas as energy source.
- The tariff is subsidized: **homeowner pay only 30% of the cost of heat**, and the remainder is covered by the municipality.
- The project benefitted from ELENA technical assistance.

Investment cost and sources of financing

- The project investment cost is **EUR 84 million** (small-to-medium size for EE).



The ERDF amount is set below the maximum co-financing rate of the Operational Programme Priority Axis (50%)

- The homeowners' quota is paid upfront by the municipality, which recovers it in ten years after works completion (**home rehabilitation tax**)

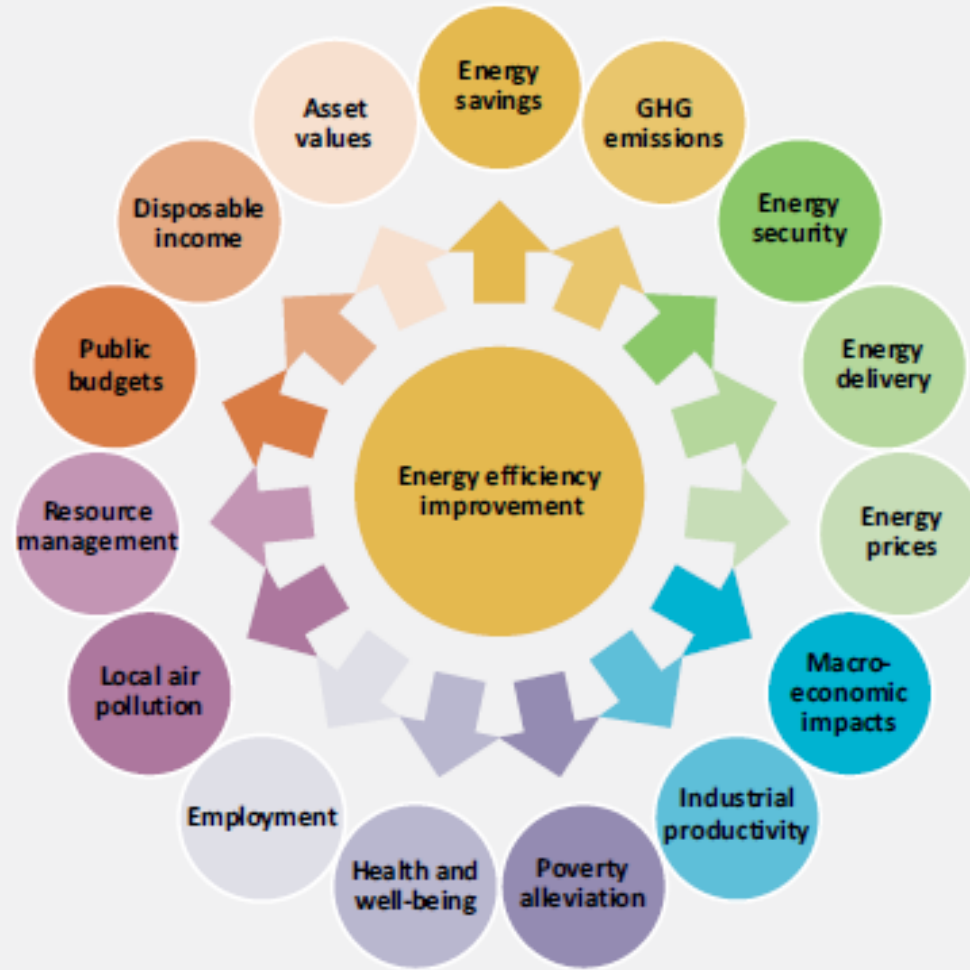
Outcomes

- Unit investment cost (125 EUR/sqm) is considered in line with the sector.
- Annual total **primary energy savings** are estimated to be about 40 GWh corresponding to a reduction of about 7.000 tons of **CO₂ per year**.
- Fostering the growth and development of the **construction sector** with the creation of 3,500 FTEs during the refurbishment phase.
- Ensuring affordable heating for low-income families and therefore tackle **energy poverty**.
- Extending the **lifetime** of the refurbished residential buildings.

Is this enough to assess the worthiness of the project? Or to give it a score in case the project is competing within a budgetary constraint?

A CBA can be useful! And the ERR can be used to better assess the project.

Multiple benefits of EE projects



Note: This list is not exhaustive, but represents some of the most prominent benefits of energy efficiency identified to date.
Source: Unless otherwise noted, all material in figures and tables in this chapter derives from IEA data and analysis.

Fully-fledged CBA for EE projects

A fully fledged CBA would adopt the following approach:

- Annual **energy savings would be valued in shadow prices**. The socio-economic value of heat equals the long-run marginal cost of that technology, which, in a given market, provides the least-cost solution. Depending on the efficiency of the market this might or might not equal the financial price.
- The **reduction of CO₂ and air pollutants** will be monetised and included in the analysis.
- The cost of labour would be valued in terms of **shadow wage**.
- The increased **security of supply** would also be quantified and included.

This is the methodology described in the EIB Economic Appraisal Manual (*new public version forthcoming*).

Simplified CBA for EE projects

Following the EAV recommended approach for EA, a **simplified CBA** can be adopted for the project in question (relatively small size and some methods for benefit estimation are resource/time intensive). The following approach is adopted:

- **Benefits from heat savings are taken from the financial analysis.** That is, the actual heat supply cost borne by the district heating operator is used in the analysis as a proxy of the economic value (shortcut).
- Reduction of CO₂ is valued using the **shadow cost of carbon**:

Recommended aligned EIB shadow cost of carbon (€₂₀₁₆/tCO_{2e}) for the period 2020-2050.

	2020	2025	2030	2035	2040	2045	2050
Value (€/tCO _{2e})	80	165	250	390	525	660	800

- Reduction of air pollutants is monetised following a **benefit transfer** approach: damage values (in EUR/ton) for SO_x, NO_x, PM can be found in the **NEEDS** study (“New Energy Externalities Developments for Sustainability”).
- The other benefits such as job creation and security of supply are described qualitatively.

Conclusions

The simplified CBA offers a similar explanatory value:

- The project is barely (if not) financially profitably and would not take place without the ERDF grant (also because of the incentive split between homeowners and municipality)
- The economic analysis shows that the project is good value for money.
- The ERR can be used to score (and eventually rank) the project:



	Fair	Good	Very good	Excellent
Growth (ERR) rating	[3.5-5%)	[5-7%)	[7-10%]	>10%

More Information

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