CEESEN-BENDER

Building intErventions in vulNerable Districts against Energy poveRty

Deliverable 5.3

Report on building – level renovation roadmaps in 5 pilot regions

Renovation roadmaps and investment strategies for buildings in the pilot region Medjimurje County (Croatia)

- Summary -

Dissemination Level: Public

WP5 Creating roadmaps and support services for building energy renovations for vulnerable districts

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Building – level renovation roadmaps and investment strategies for pilot multiapartment buildings in Medjimurje County (Croatia)

The **CEESEN-BENDER project – Building Interventions in Vulnerable Districts against Energy Poverty** aims to empower and support vulnerable apartment owners and tenants living in multiapartment buildings constructed in the period between the Second World War and the 1990s. The project is implemented in 6 Central and Eastern European countries: Croatia, Estonia, Germany, Poland, Romania and Slovenia, whereby the Croatian region Medjimurje County has been selected as one of the pilot sites for the implementation of the various project activities. The Croatian deliverable **D5.3 Report on building – level renovation roadmaps in 5 pilot regions** focuses on the pilot region Medjimurje County and provides building – level renovation roadmaps and investment strategies for 6 multiapartment buildings in the town of Čakovec, out of which 5 are unrenovated and 1 has been partially renovated during the project duration.

The buildings represent a typical multiapartment housing stock in Medjimurje County, constructed during the second half of the 20th century, whereby the 6 selected pilot buildings have the same or similar characteristics and share common challenges related to the condition of the envelopes, technical systems and ventilation, as well as integration of renewable energy sources (RES). The buildings are predominantly privately owned and managed by the 2 main building managers operating in the area, GP Stanorad Ltd. and Euroland Ltd.

The field activities carried out within the project CEESEN-BENDER provided an evidence base for the development of the planned roadmaps and investment strategies. The implemented project activities included the analysis of the 6 selected pilot buildings, organisation of 9 workshops and Q&A sessions for building managers, landlords, homeowners and tenants, monitoring of the indoor air quality in 7 buildings and 12 apartments, as well as conducted 400 surveys and 7 expert group visits to energy poor households.

Furthermore, energy poverty remains an important structural challenge in the renovation of multiapartment buildings. Vulnerable households may face difficulties participating in renovation projects because the required co – financing can represent a significant financial burden for them. The project, therefore, emphasises the importance of involving social care institutions and building managers capable of identifying, communicating with and supporting vulnerable households throughout the renovation process. Following the mentioned, the energy renovation implies a broad network of stakeholders, including building managers, homeowners and tenants, technical staff, regional and local authorities, energy agencies and financial institutions, as well as fosters a timely, open and quality communication and cooperation in order to achieve the set goals and ensure long lasting benefits.

Stakeholder classification

The renovation of multiapartment buildings in Medjimurje County involves a broad network of stakeholders with complementary roles in planning, financing and

implementation. The main stakeholder groups, their roles, identified barriers and recommended actions are summarised below.

Stakeholder name/group	Specific role in building renovation	Main barriers encountered	Recommended actions
Building managers – GP Stanorad Ltd. and Euroland Ltd.	Coordinate the renovation process, collect documentation, prepare and submit applications, collect offers, coordinate technical staff and contractors, communicate with residents and financial institutions, and manage payments and reimbursement procedures.	Administrative complexity, need for extensive documentation, availability of financing, communication with residents and coordination of multiple stakeholders.	Strengthen project-management capacities, involve technical experts at an early stage, improve communication with residents, and provide systematic support for preparation and submission of renovation projects.
Homeowners, tenants and tenant representatives	Participate in decision-making, communicate residents' interests, contribute to co-financing and support planning and implementation of renovation measures.	High co-financing requirements, different levels of awareness and involvement, limited knowledge of available financing opportunities and renovation procedures.	Improve access to information and advice, involve residents from the early planning stages, and provide targeted financial and advisory support for vulnerable households.
Technical staff – architects, designers, energy experts and contractors	Prepare technical documentation, design renovation measures, carry out works and ensure compliance with technical and energy-performance requirements.	Poor-quality or incomplete project documentation, insufficient cost estimates, rising construction and labour costs, and quality-control challenges.	Engage qualified technical staff early, improve the quality of project documentation and cost estimates, and introduce regular quality control during implementation.
Financial institutions and banks	Provide loans and other financial instruments to cover homeowners' own contribution and renovation costs.	High investment costs, limited capacity of households to provide own financing, and	Develop accessible green loans and financing products for multiapartment buildings and improve coordination between public

Stakeholder name/group	Specific role in building renovation	Main barriers encountered	Recommended actions
		relatively long payback periods.	grants and bank financing.
National authorities and public funding institutions	Establish the regulatory and financing framework and provide public co-financing through renovation programmes and calls.	Limited availability and frequency of public calls, insufficient funding compared with demand, and limited targeting of energy-poor households in multiapartment buildings.	Increase the scale and frequency of renovation programmes, expand support for multiapartment buildings, and introduce targeted support for vulnerable households.
Regional and local authorities	Support the development of regional and local energy and climate policies and may provide financial or organisational support for renovation.	Limited availability of programmes specifically targeting energy renovation of multiapartment buildings.	Establish regional/local support programmes and integrate building renovation and energy-poverty objectives into local and regional policies.
Energy agencies – MENEA	Provide information, education, advisory and consultancy services, support project preparation and implementation, and facilitate communication between stakeholders and funding institutions.	Need for stronger coordination and accessible information on financing and renovation procedures.	Strengthen advisory services and develop integrated One-Stop-Shop services providing technical, financial and administrative support.
Social care institutions	Support the identification, communication with and engagement of vulnerable and energy-poor households.	Lack of systematic information on energy poverty and limited mechanisms for targeting vulnerable households within building renovation programmes.	Strengthen cooperation with building managers and energy agencies and establish mechanisms for identifying and supporting energy-poor households during renovation.

One of the main barriers are, also, the financing opportunities for multiapartment buildings. The Croatian financing framework includes national public calls provided by the the National Recovery and Resilience Plan (NPOO) as the main source of co – funding, while the Operational Programme Competitiveness and Cohesion (OPCC), National Housing Policy of the Republic of Croatia and European programmes such as Interreg, LIFE and HORIZON are not widely used for renovation investments. Additional financing can be provided in the form of savings from homeowners and commercial bank loans, while national development banks can provide interest rate support.

As mentioned, the roadmaps and investment strategies focus on the following 6 selected pilot buildings in Medjimurje County: Vladimira Nazora 32, Čakovec; Travnik 12, Čakovec; Istarska 16, Čakovec; Josipa Jurja Strossmayera 7b, Čakovec; Janka Slogara 4, Čakovec and Istarska 14, Čakovec.

Energy performance synthesis

The six pilot buildings show a significant potential for energy and emission savings through the proposed renovation measures. The available building-level assessments estimate total annual savings of approximately **1.21 GWh of primary energy and 0.90 GWh of final energy**, together with an estimated reduction of approximately **217.69–253.18 tCO2 per year**, depending on the calculation methodology and emission factors applied.

Pilot building	Baseline energy performance / EPC	Expected primary energy savings (GWh/year)	Expected final energy savings (GWh/year)	CO2 reduction (tCO2/year)	Expected EPC after renovation	RES measures planned
Vladimira Nazora 32	EPC class D; building already partially renovated	0.20467	0.13511	33.68 / 42.78	B/A+ (achieved)	PV, battery, heat pump – recommended additional measures
Travnik 12	EPC class E	0.11297	0.08577	20.62 / 23.61	C or higher	PV and other RES measures recommended
Istarska 16	EPC class E	0.20465	0.15551	37.38 / 42.77	B or higher	PV, battery, heat pump
Josipa Jurja Strossmayera 7b	EPC class E	0.33449	0.24616	59.65 / 69.91	B or higher	PV, battery, heat pump
Janka Slogara 4	EPC class F	0.10348	0.07901	18.97 / 21.63	Not explicitly quantified in the roadmap	PV and battery

Pilot building	Baseline energy performance / EPC	Expected primary energy savings (GWh/year)	Expected final energy savings (GWh/year)	CO2 reduction (tCO2/year)	Expected EPC after renovation	RES measures planned
Istarska 14	EPC classes E and G	0.25109	0.19921	47.39 / 52.48	C or higher	PV, battery, heat pump

Taking into consideration the similar construction and technical characteristics, as well as the overall renovation practices in Medjimurje County, recommended interventions in the mentioned buildings include thermal insulation of the external walls, roofs and basement ceilings, replacement of the carpentry and technical systems (mainly heating/cooling and preparation of domestic hot water), installation of RES based systems such as PV panels, heat pumps and energy storage, improvement of the indoor air quality through automatic ventilation and heat recovery systems, as well as air quality monitoring, smaller energy management measures and actions aimed at improving the indoor comfort. Apart from the technical measures, the roadmaps and investment strategies present, also, energy savings and financial estimates calculated using the currently available consumption data, energy saving regulations and recommendations valid in the Republic of Croatia, energy costs currently available on the market and digital tools developed within the project CEESEN-BENDER.

At policy level, the Croatian pilot findings indicate the need to increase the scale and frequency of energy renovation programmes for multiapartment buildings, improve access to information through integrated One-Stop-Shop services, strengthen financial support for energy poor households and expand support mechanisms from individual family houses to multiapartment buildings. The roadmaps, also, recommend programmes specifically targeting energy poor households in multiapartment buildings, including identification, support in co – financing and continued advice on reducing energy consumption and costs.

Finally, the documents provide added value by translating general national and regional renovation objectives into concrete investment proposals for different buildings. They combine technical information, energy saving potential, CO_2 reduction estimates, indoor air quality observations, financing opportunities and stakeholder considerations in a single planning framework. In this way, the 6 selected pilot buildings are considered to be practical examples, that can support future renovation planning in Medjimurje County and serve as basis for replicating the results and approach of the project CEESEN-BENDER in other renovation projects, as well as Croatian regions.

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