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Building intErventions in vulNerable Districts against Energy poveRty

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Report on building – level renovation roadmaps in 5 pilot regions

Renovation roadmaps and investment strategies for buildings in the pilot region Kidričevo and Ptuj pilot areas

(Slovenia)

- Summary -

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Building – level renovation roadmaps and investment strategies for pilot multiapartment buildings in Kidričevo and Ptuj pilot areas (Slovenia)

As part of the CEESEN-BENDER project, building-level renovation roadmaps were prepared for six multi-apartment buildings located in the Slovenian pilot area of Kidričevo and Ptuj. Four buildings are located in Kidričevo and two in Ptuj. All six buildings are connected to district heating and represent older multi-apartment housing stock with remaining needs for energy renovation, improved comfort and reduced exposure to energy poverty.

The roadmaps are intended to support building managers, apartment owners, residents, municipalities, local energy advisors and other relevant stakeholders in preparing future renovation activities. They provide a practical basis for understanding the current condition of the buildings, identifying priority renovation measures, estimating investment needs and planning the next steps towards implementation.

The Slovenian roadmaps were prepared on the basis of available building data, Task 4.1 energy-consumption information, technical documentation where available, household-visit findings, national CEESEN-BENDER reports on regulatory, technical and economic barriers, and the CEESEN-BENDER Renovation ROI Calculator Tool. The level of technical detail differs between buildings, depending on the availability of building-specific documentation. For some buildings, renovation measures are based on more concrete technical documentation, while for others the roadmap provides planning-level estimates and identifies the need for further technical verification.

Main findings

1. Façade and building-envelope renovation are the main priorities

The main renovation priority across the Slovenian pilot buildings is the improvement of the building envelope, especially façade and external-wall insulation. Depending on the building, this may also include plinth and basement-zone insulation, attic or roof insulation, basement-ceiling insulation, treatment of window reveals, adaptation of external sills and downpipes, and fire-safety details.

In Kidričevo, façade renovation must also take into account cultural heritage requirements. This means that materials, façade colours, plaster structure, insulation thickness, balcony details and other visible elements may need to be coordinated with the Institute for the Protection of Cultural Heritage of Slovenia. These requirements can influence both the technical solution and the investment cost.

2. Energy poverty and comfort are central issues

The roadmaps do not treat renovation only as a technical or financial investment. They also address energy poverty, indoor comfort and living conditions. Household visits carried out in Kidričevo confirmed problems such as high heating costs, mould risk, cold surfaces, thermal bridges and summer overheating in similar unrenovated buildings.

These findings show that building-level measures are necessary, because household-level advice alone cannot solve problems caused by uninsulated façades, attics, cellar ceilings or poor building-envelope performance.

The roadmaps therefore link energy renovation with wider benefits, including better winter comfort, reduced mould risk, lower exposure to heating-cost increases, improved summer resilience, better protection of the building structure and improved living conditions for vulnerable households.

3. Investment planning must remain realistic and building-specific

The total indicative investment estimate for the six Slovenian pilot buildings is approximately EUR 2.05 million. The expected final energy saving is estimated at approximately 206.5 MWh/year, corresponding to a weighted average heat-saving assumption of around 26% across the six buildings. These values are planning-level estimates and should be updated once final technical documentation, bills of quantities, tenders and/or building-specific energy-audit calculations are available.

The investment values differ between buildings because the available documentation and technical complexity differ. For example, some Kidričevo buildings require heritage-sensitive renovation details, while the two Ptuj buildings use a neighbouring Ptuj PZI as an indicative technical reference only.

4. ROI results confirm the long-term character of envelope renovation

The CEESEN-BENDER Renovation ROI Calculator Tool was used as an additional planning tool for all six Slovenian pilot buildings. The calculated simple payback periods are relatively long, which is expected for façade and building-envelope renovation. The ROI results therefore need to be interpreted carefully.

Unlike photovoltaic investments, envelope renovation does not generate quick financial returns only through energy-cost savings. Its value also lies in comfort, health, durability, reduced mould risk, improved building protection and reduced energy-poverty exposure. For this reason, the roadmaps present ROI as one part of the decision-making process, not as the only criterion for renovation.

Building observations

<u>1. Kajuhova ulica 11, Kidričevo</u>

Kajuhova ulica 11 is the largest Slovenian pilot building, with 51 apartments. No building-specific PZI documentation was available, so the roadmap provides a planning-level renovation approach. The main proposed measure is façade and external-wall insulation with complementary checks of the roof/attic, basement ceiling, windows, doors and district-heating regulation. Because the building is located in Kidričevo, heritage requirements and affordability for residents must be considered before implementation.

<u>2. Čučkova ulica 7, Kidričevo</u>

Čučkova ulica 7 is a smaller multi-apartment building with four apartments. The roadmap provides a more detailed envelope-renovation package, including façade insulation, plinth/basement-wall insulation, attic-floor insulation, basement-ceiling insulation, fire-safety details and façade accessories. The building is relevant for demonstrating how a smaller heritage-sensitive building in Kidričevo can be prepared for renovation while addressing comfort, heat losses and affordability.

3. Ulica Borisa Kraigherja 8, 10, 12, Kidričevo

This building replaces the earlier BK 7, 9, 11 pilot building and is supported by more concrete technical documentation. The proposed package includes graphite EPS façade insulation, XPS plinth insulation, attic and basement-ceiling measures and fire-safety details. Due to the heritage context of Kidričevo, the renovation must be coordinated with ZVKDS. The investment value is relatively high, reflecting the technical and heritage-related complexity of the works.

4. Ulica Borisa Kraigherja 20, 22, 24, 26, Kidričevo

For this building, the roadmap uses an older PZI/cost basis and updates it to reflect the current assumption of 13 cm graphite EPS façade insulation and present market conditions. The roadmap recommends updating the technical description, quantities and cost estimate before implementation. Available energy-audit or updated calculation results should be used to confirm the expected savings.

5. Ulica 25. maja 7, 9, Ptuj

For Ulica 25. maja 7, 9, the main proposed measure is façade/external-wall insulation. The technical and material assumptions are based on a neighbouring Ptuj PZI for Ulica 5. prekomorske 9 and must be adapted to the actual building before implementation. The roadmap therefore treats the current investment and ROI values as indicative planning-level estimates.

6. Arbajterjeva ulica 3, Ptuj

Arbajterjeva ulica 3 is also treated as a façade-focused renovation case. As with Ulica 25. maja 7, 9, the neighbouring Ptuj PZI is used only as a technical reference. Before implementation, the actual façade build-up, previous insulation, roof/attic condition, window details, fire-safety requirements and heating settings should be verified through building-specific technical documentation.

Common recommendations and overall conclusions

Based on the six Slovenian building-level roadmaps, the following actions are recommended:

- validate the indicative investment values through final PZI documentation, bills of quantities and tenders;
- confirm energy-saving values through building-specific energy audits or simulations;

- coordinate heritage requirements early for the Kidričevo buildings;
- prepare financing scenarios using Eco Fund support, loans, reserve funds and possible additional support for vulnerable households;
- communicate renovation benefits clearly to apartment owners and residents, including both financial and non-financial benefits;
- monitor heat use, costs, comfort, moisture risk, overheating and resident satisfaction after renovation;
- consider complementary future measures such as ventilation improvements, renewable energy integration, passive shading and accessibility improvements where technically and financially feasible.

Overall, the Slovenian roadmaps demonstrate that building-level renovation planning must combine technical, financial and social aspects. The main investment focus is façade and building-envelope renovation, but the expected benefits go beyond energy savings. The roadmaps support a staged and realistic renovation pathway that can improve energy efficiency, indoor comfort, affordability and resilience, while helping local actors in Kidričevo and Ptuj move from problem identification towards concrete renovation planning and future implementation.

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