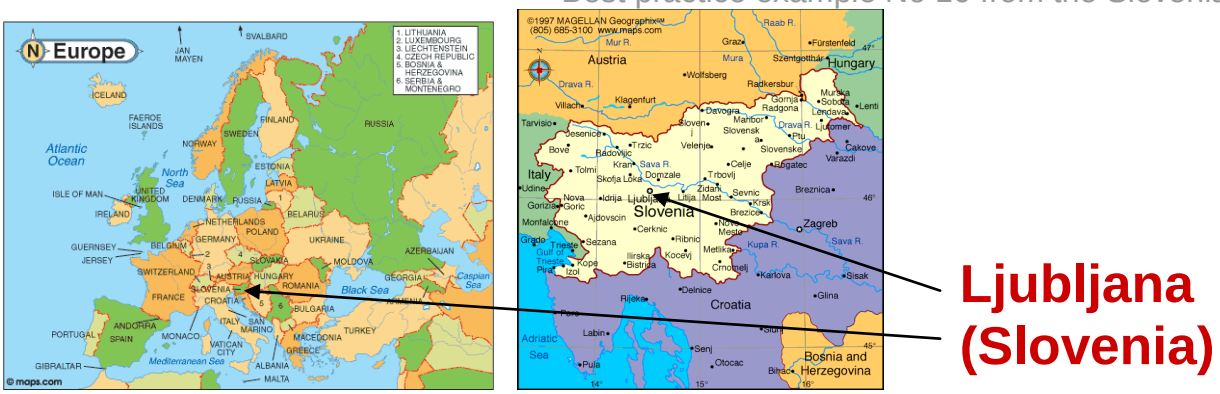

25% energy saving

Total living expenses lower than before renovation

Nearly all users have chosen for energy saving measures

Project data

Location, address:	Martina Krpana 5,7 Ljubljana
Region:	Central Slovenia
Surroundings:	Ljubljana, Centre
Climate:	Sub-Alpine
Heating degree days:	3300
Year of construction and renovation:	1961 (constructed); 2004 (renovated)
Typology:	Apartment building
No of dwellings:	39 dwellings
Total floor area:	1893 m^2
Owner:	Various private owners
Architect and Builder:	Facade: Toplak d.o.o., Ptuj; Windows: Interalta d.o.o.
Costs of energy saving measures:	€ 83.000
Renovation financed by:	Private, state subsidy

Figure 1: Apartment building Martina Krpana 5, 7 after renovation

Objectives and Results

Thorough renovations of the building envelope were carried out to improve thermal characteristics of the building and to reduce the energy consumption by 25%.

Renovation concept

Key renovation features

- Insulation of façade
- Energy efficient windows

State-of-the-art

Before renovation	After renovation
Constructions [U-values: W/m^{2}K] • Non-insulated facade [1,2] • Timber windows (double glazing) [2,3] [1]	*Constructions [U-values: W/m^{2}K]* • Insulation of facade [0,35] • replaced windows with energy efficient AL-PVC windows with low-e + argon glazing [$U_{windows}$=1,3]

Figure 2: Apartment building Martina Krpana 5, 7 before renovation

Energy saving and monitoring

Energy consumption before renovation:
KWh/m^2: *162*

Energy consumption after renovation:
KWh/m^2: 122
Percentage saving[2]: 25%

Figure 3: Energy efficient window

Additional information

- Two main problems of the building were identified:
  - as insufficient thermal protection and
  - dilapidated facade.
- The building was designed and built in the period when there was no regulation on thermal insulation and energy efficiency in buildings. The building is a representative of a few concrete panel buildings that are not very common in Slovenia. The existing envelope structure consists of prefabricated concrete plates (total thickness 16 cm) with a core of concrete mixed with wooden chips (“betocel”) in thickness of 8 cm as a thermal insulation. That resulted in U value of approx. 1,3 [W/m^{2}K] for outer wall. Double glazed cast windows in existing state resulted in U values of approx. 2,3 [W/m2K] with normally high air leakage
- The recommended measures were the following:
  - thermal insulation of the outer walls and
  - replacement of existing windows with energy efficient windows, according to the requirements for new buildings, set in the Regulation for thermal insulation and energy efficiency of buildings from 2002.

Lessons learned and conclusions

- The project would not have succeeded without co-operation and of course without financial contribution of the occupants and state subsidy. The benefit for the occupants is manifested through lower heating costs and higher level of thermal comfort as well as through better appealing architecture.

References

[1] Building management: Finance Operativa d.o.o.; contact person: Miloš Šulin.

[1] Total U-value of glazing and the window frame
[2] Compared to the situation before renovation