

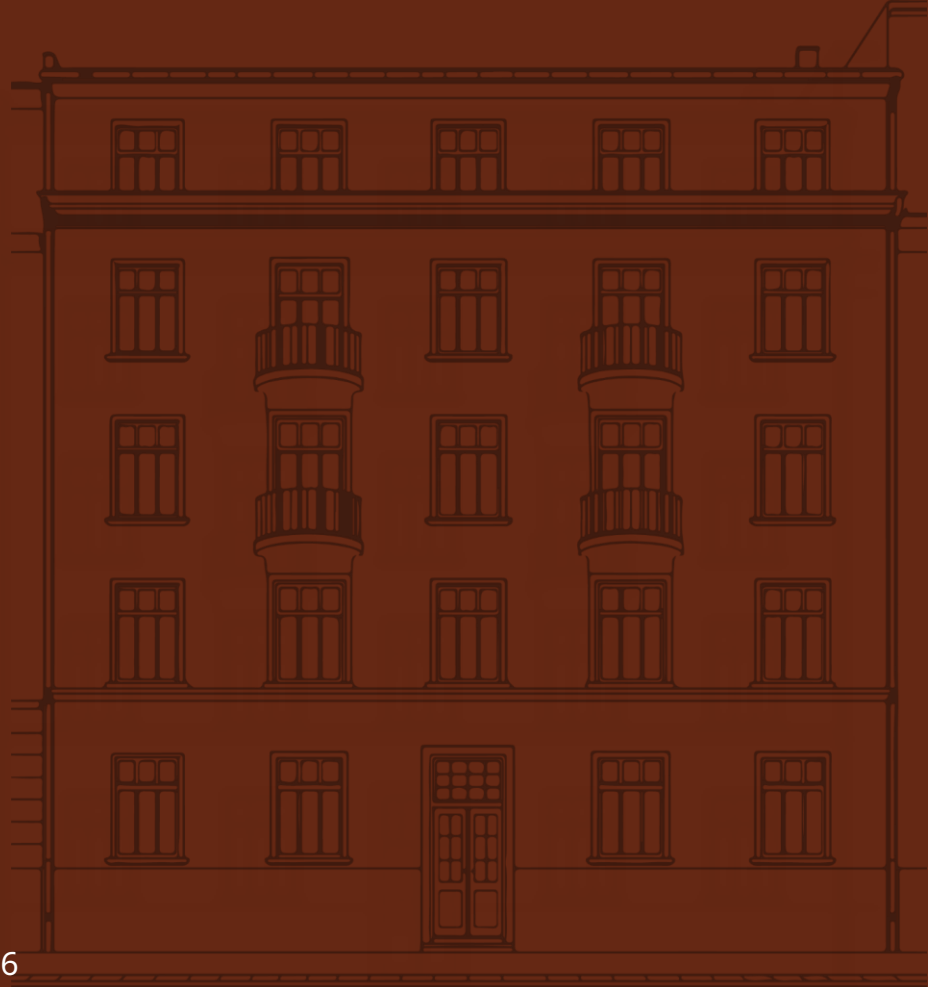
Energy Retrofit Report:

5, Syrokomli Street, Kraków, PL

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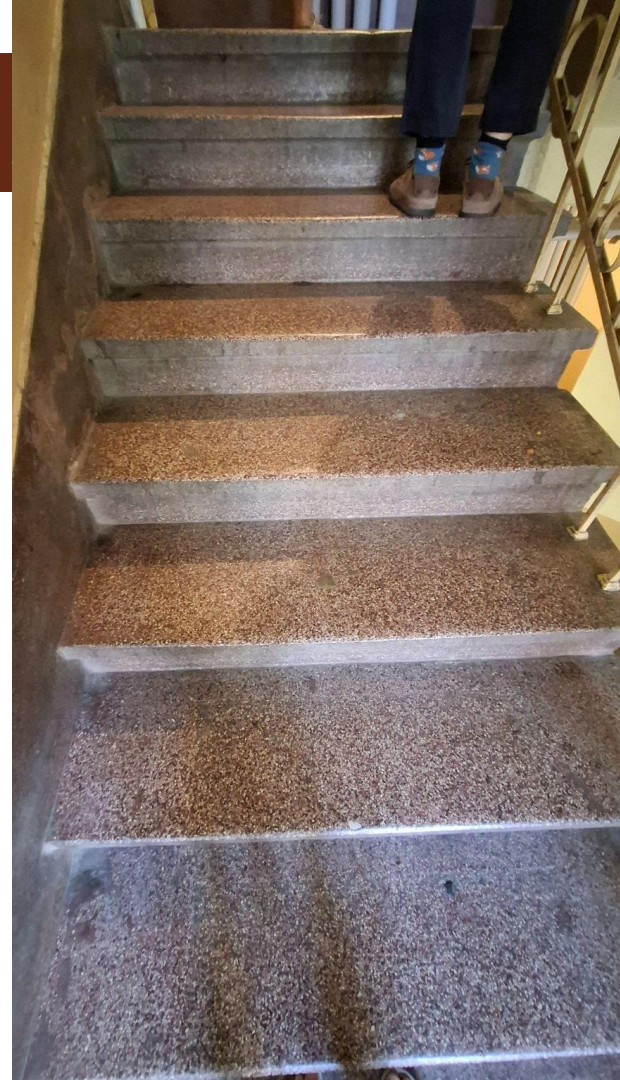


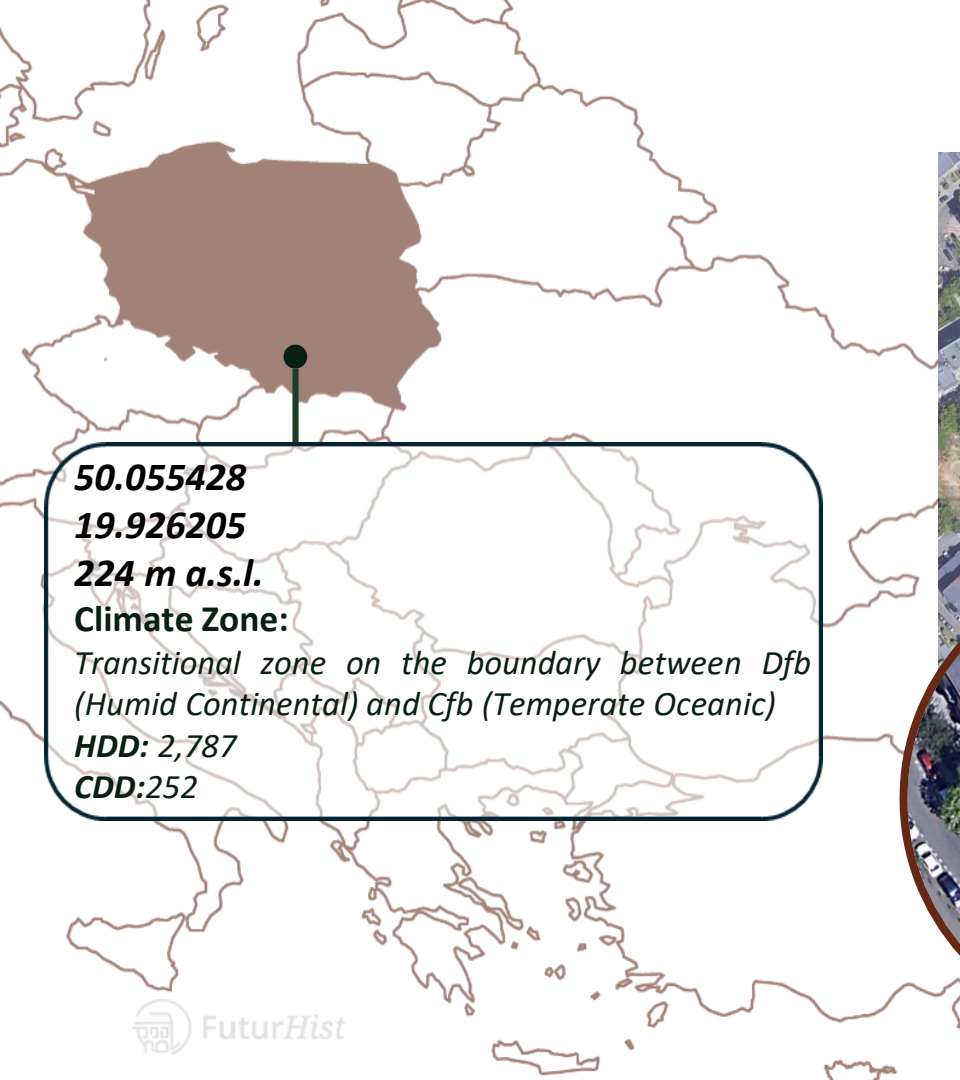
FuturHist Summer Academy 9-13 September 2026



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50.055428

19.926205

224 m a.s.l.

Climate Zone:

*Transitional zone on the boundary between Dfb
(Humid Continental) and Cfb (Temperate Oceanic)*

HDD: 2,787

CDD:252



**5 Syrokomli Street,
30-102 Kraków,
Poland**

Historical Typology

The building is a typical early 20th century version of the '**Kamienica**' residential tenement buildings.

They were initially made of brick or stone, later integrating (as in this example) concrete.

Although single-family versions exist, most were designed as multi-family housing and were the basic type of housing in Polish cities from the 19th century.

They line up with other similar buildings forming the street frontage, in the manner of terraced houses.



Occupancy: Permanently occupied, 31 occupants

Number of Floors: 7 *Levels: 5 residential floors, a basement, and an attic*

Roof Surface Area: 302 m²

Footprint Area: 298,934 m²

Year of last renovation: 2017-2018
(installation of district heating and domestic hot water system)



Protection Level Municipal register of monuments	Building Age About 1930	Building Use Residential (urban)	Building Area Net floor area [mq]: 1104,08	Construction type Brick masonry wall
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External finish: *Concrete render over brick*

Internal finish: *Plastered (on substructure)*

Roof Type: *Gable roof, covered with corrugated metal sheets (attic space) and bitumen (covering residential part of the attic)*

Radiant heating: *Central heating supplied by the municipal district heating network+radiators*

Domestic hot water: *Central supplied by the municipal heating network*

Other Building utilities: *Gravity ventilation, water and sewage, electrical heating.*



State of the art

Front façade



Windows



Ventilation



Attic



Garden façade



Heating



Basement



FuturHist Typology

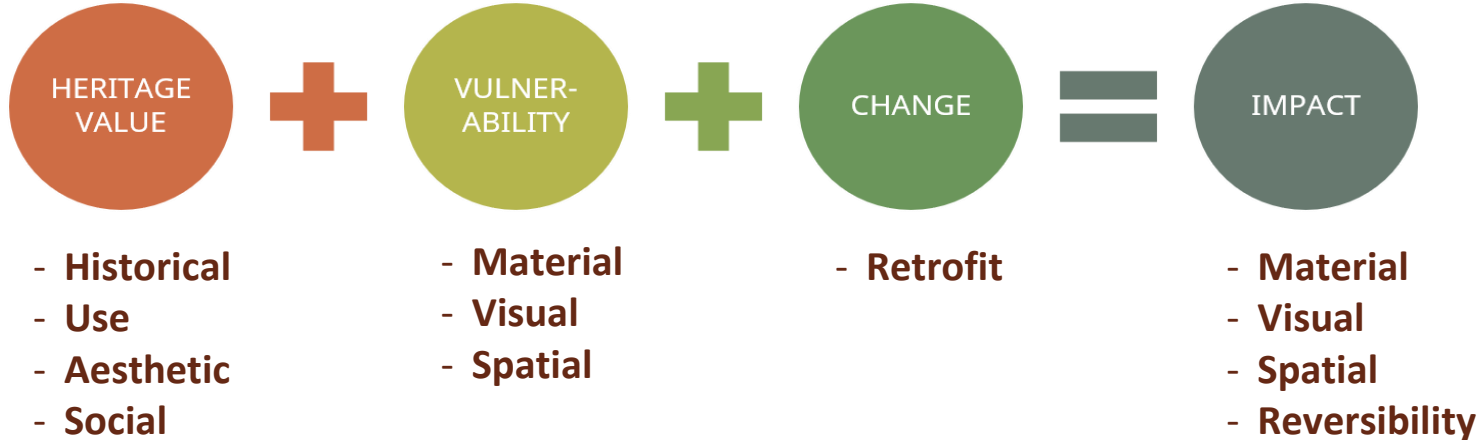
Heritage Assessment



Willa miejska
Polish garden-city/urban
villa
(1900-1945)



Kamienica
Polish terraced
tenement building
(1750-1945)



Aim of retrofit

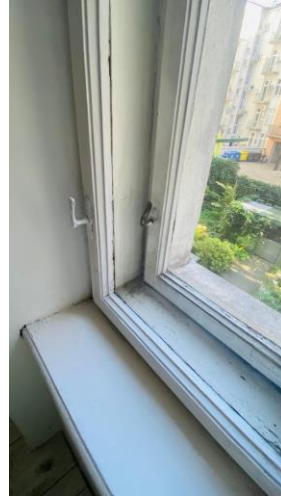
Improving indoor climate and reduce energy consumption while at the same time improving the apartment facilities.

FuturHist Typology: Original Historical Materials

External: Windows + Doors



Internal: Stairs + Iron balustrade + Timber roof structure + Doors + Windows



Authenticity:

Original/historic material, evidence of historic craft, art etc. The authentic material is the main source of value.

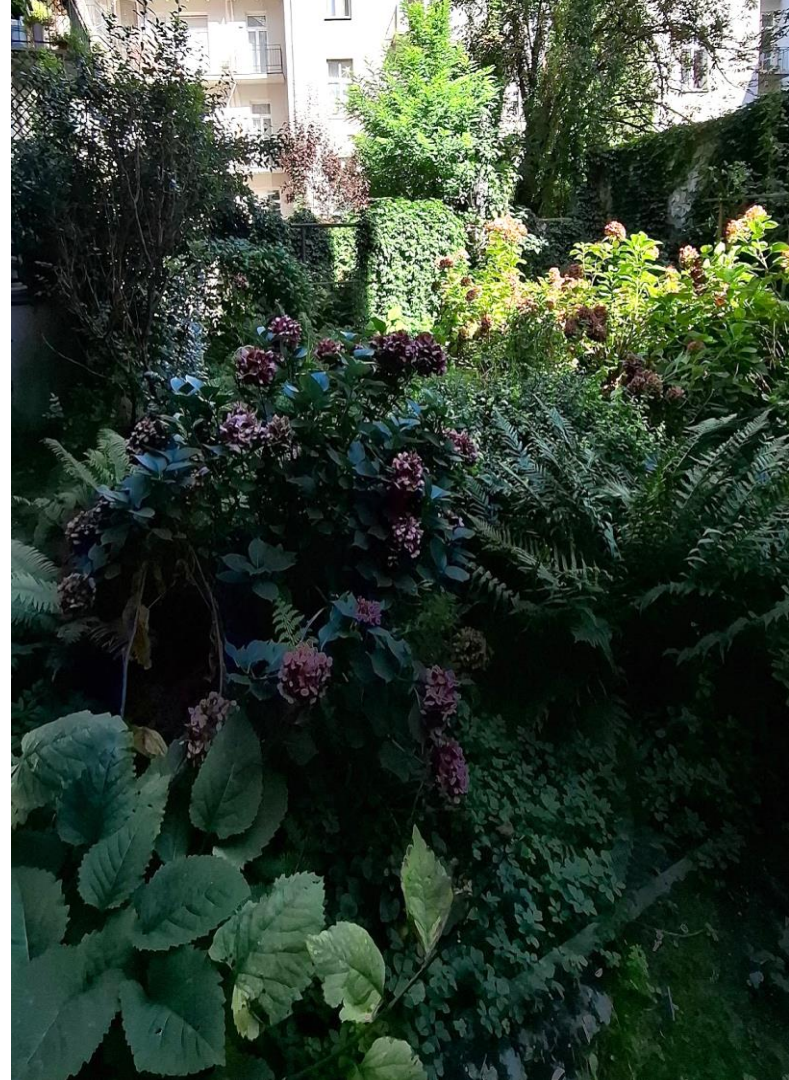
Integrity:

Vulnerable to fabric interventions, high risk of historic evidence distortion.

Limitations beyond historic features

Limitation	Measure
The building is inhabited	low to medium level disturbance required, some application methods or interventions must be discarded
The building is partially publicly owned*	low-cost to medium-cost solutions are preferred; longer service life and low-maintenance solutions are preferred
The basement is only 206 cm high, its floor is sealed with concrete	there isn't much leeway for the floor insulation, presumably 5-6 cm layer is maximum
District heating and domestic hot water systems are installed	the choice of active solutions should depend on existing system, some enhancement is possible
The back garden is well maintained, and the plot is in the archeological surveillance zone	interventions and excavations within the back garden should be minimized

*the building is undergoing the process of unifying its ownership status

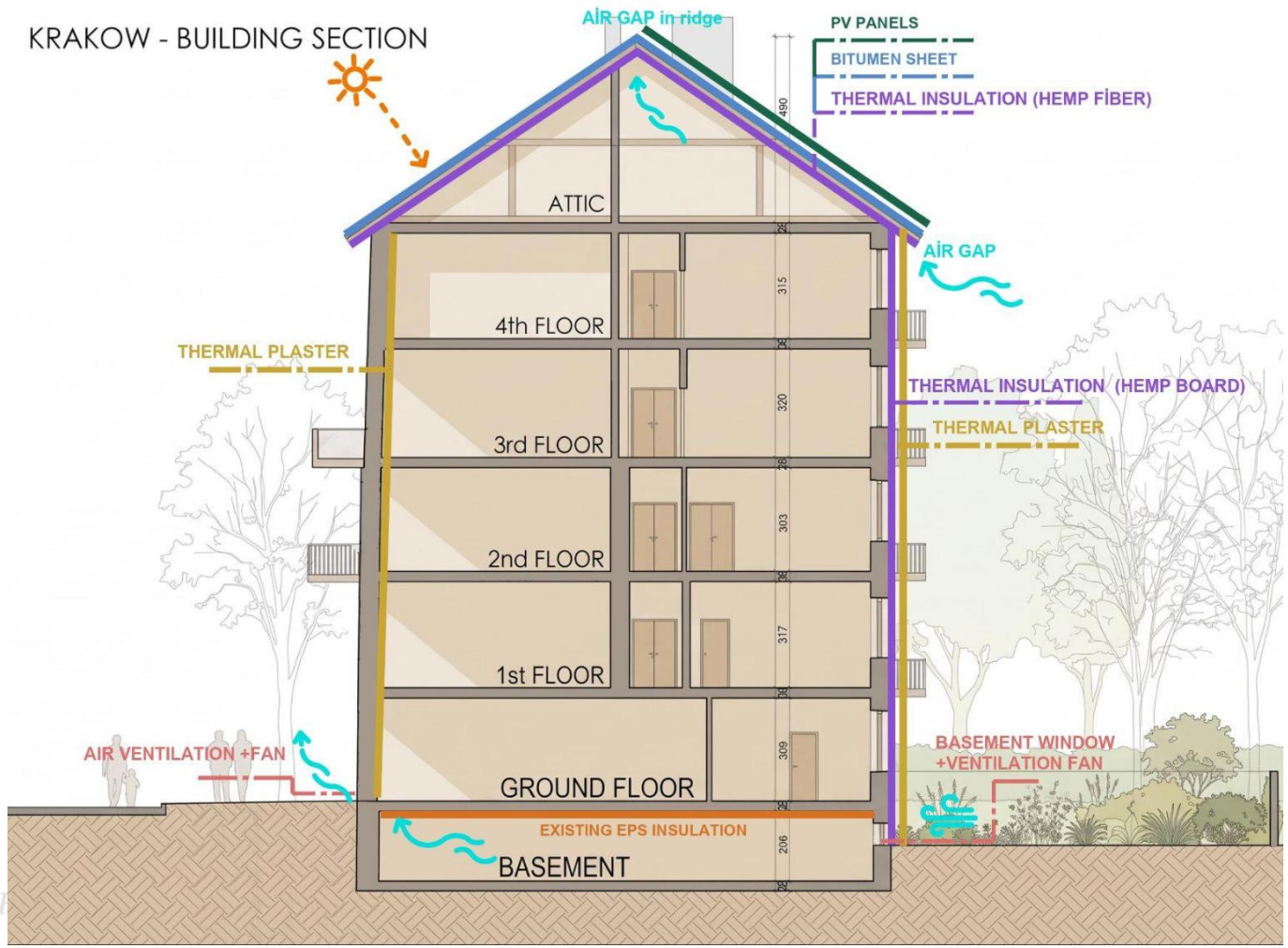


Energy Improvement Strategies

	Solution	Alternatives
Front façade	Thermal plaster	
Garden façade	Hemp fiber + thermal plaster finishing	Mineral wool + thermal plaster
Roof	Hemp fiber + ventilation gap + bitumen (unification with neighbouring buildings and residential part of the attic)	Mineral wool + ventilation gap + bitumen
Basement	Assessing existing XPS insulation and exchanging for new adequate material if required	
Heating	Existing district heating and domestic hot water system supported with air source heat pump (ASHP) located in the garden, fan coils in tenements	Existing district heating and domestic hot water system
Ventilation	Mechanical (fans in basement grills)	Natural + gravitational
PV panels	150m2 photovoltaics, installed on the garden-facing slope of the roof to support ASHP and ventilation system (about 20 kW)	
Windows	One flat has original windows to be evaluated and repaired if possible or exchanged (single window with double glazing, timber frame, keeping original articulation). Windows that were already exchanged need to be checked for regulation and exchanged for timber-frame ones when they reach service life limit.	
Heating controls	Thermostats in each flat is a minimum	Smart Monitoring Systems
Doors (street, garden, flat)	Weatherproofing: Reversible weatherstripping strips and surface-mounted door sweeps.	Vacuum Insulation Panels (requires diss-and-reassembly of doors)

Energy Improvement Strategies

KRAKOW - BUILDING SECTION

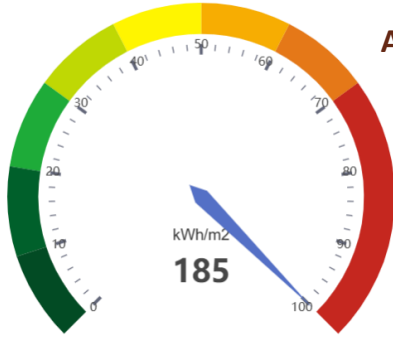




Heritage Impact Assessment

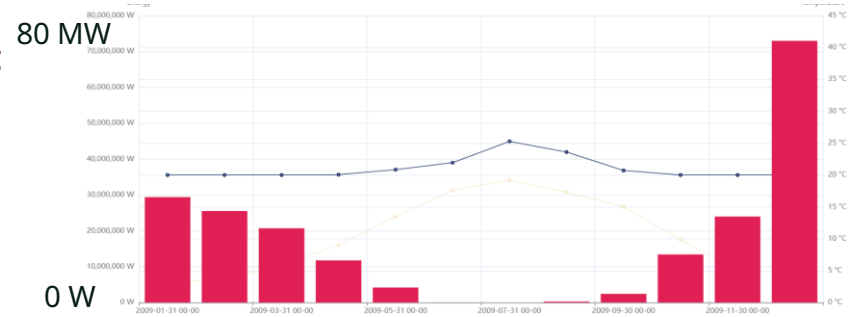
SOLUTION	Material	Visual	Spatial
Roof - Bitumen	High	Low	Low
Roof - Thermal Insulation	Low	Medium	Medium
Garden Facade Thermal Insulation & Plaster	Medium	Medium	Medium
Street Facade Thermal Plaster	Low	Low	Low
Basement Ventilation with Fans	Medium	Low	Low
Window repair/replacement (only one flat has original windows)	Low	Low	Low
Air Source Heat Pump	High	High	High
PV panels on the garden-facing slope of the roof	High	Low	Low
Door weatherproofing	Low	Medium	Medium

Python Simulations: currently

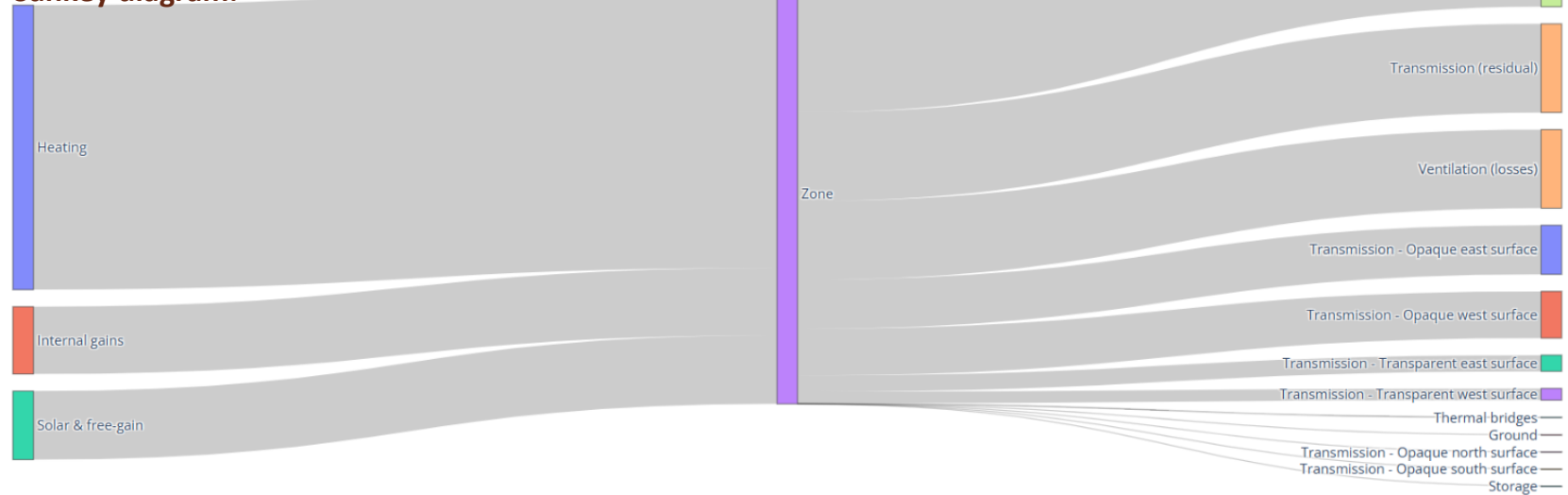


Annual energy need for heating

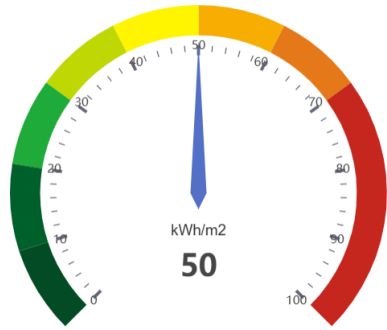
Monthly energy need:



Sankey diagram:



Python Simulations: after the intervention

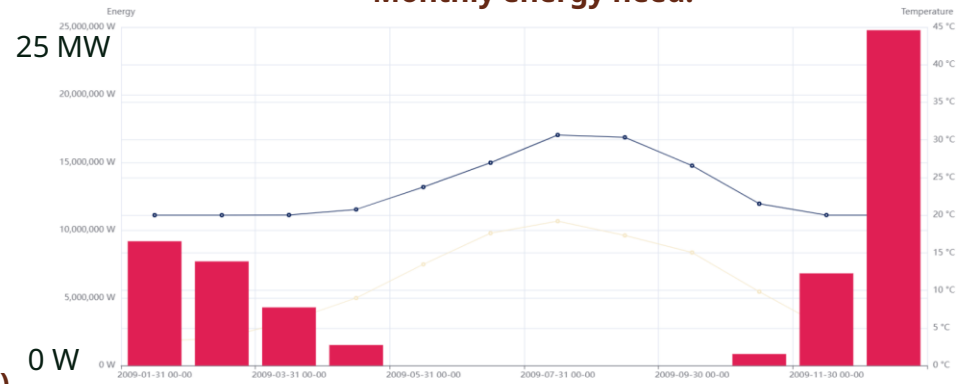


Annual energy need for heating:

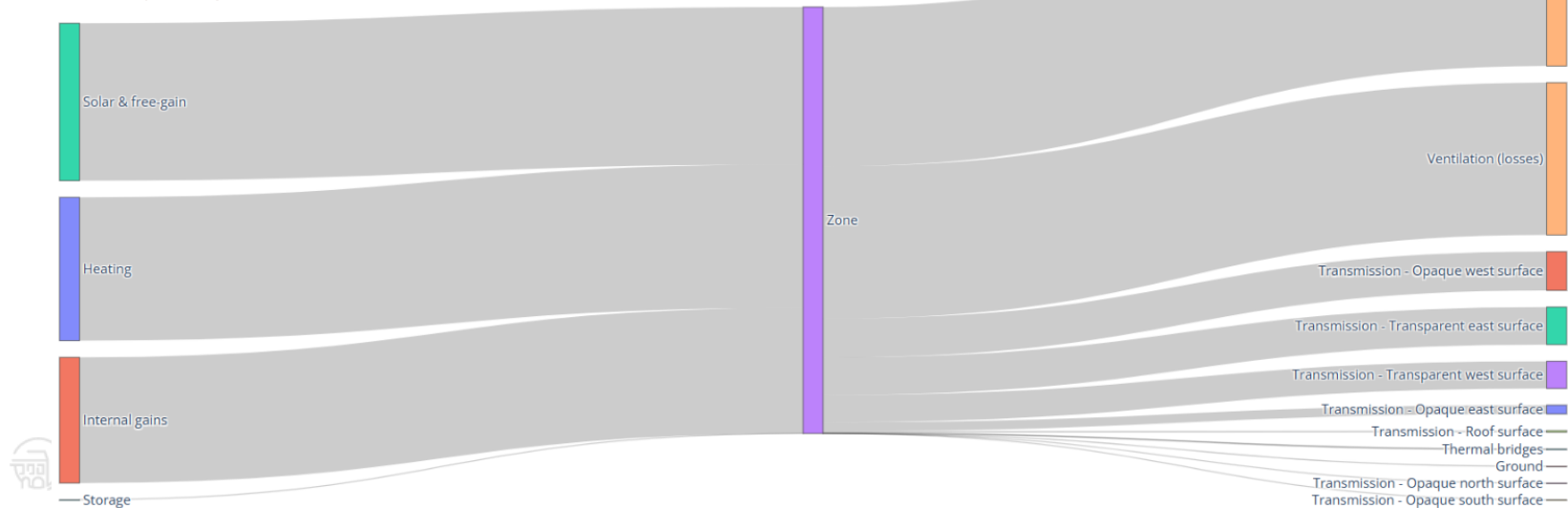
With the addition of heat pump
supplementing 50% of energy
need we may go down to:
 $(25 + 25/3,5) \text{ kWh/m}^2 = 32,14 \text{ kWh/m}^2$

Overall improvement:
73% (passive solutions)
83% (passive + active solutions)

Monthly energy need:



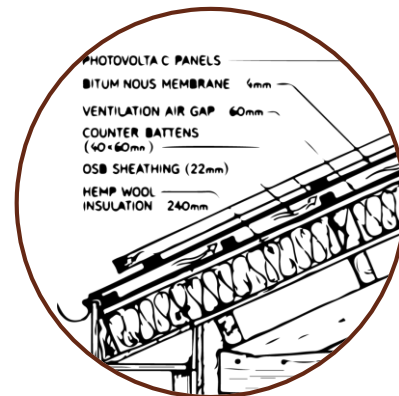
Sankey diagram:



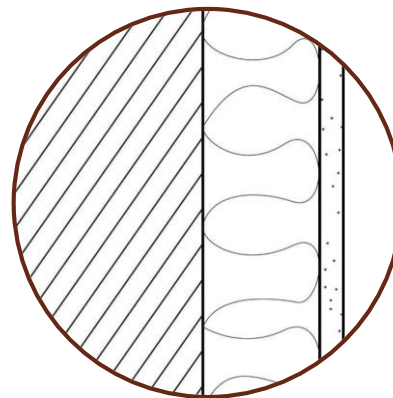
U-Value Comparison: Before and After

Layer	Existing Solution	Proposed Solution
Roof	Corrugated metal $U = 6,5 \text{ W/m}^2\text{K}$	24 cm hemp fiber + ventilation gap + bitumen U $= 0,14 \text{ W/m}^2\text{K}$
Basement	Concrete slab $U = 2,6 \text{ W/m}^2\text{K}$ + existing XPS on the ceiling	Concrete slab $U = 2,6 \text{ W/m}^2\text{K}$ + existing XPS on the ceiling to be assessed and exchanged if needed (for adequate material)
External Wall (front facade)	Full brick wall d=47 cm $U = 1,28 \text{ W/m}^2\text{K}$	Full brick wall d=47 cm Thermal plaster d=4cm $U = 0,99 \text{ W/m}^2\text{K}$
External Wall (Back/Garden)	Full brick wall d=47 cm $U = 1,28 \text{ W/m}^2\text{K}$	Full brick wall d=47 cm Hemp fiber d=10 cm Thermal plaster d=2cm $U = 0,27 \text{ W/m}^2\text{K}$
Windows	Existing windows require assessment for regulation and repairs	

Roof solution



Garden Wall solution



LCA- LCC for Suggested Roof Intervention

Solution	Key technical specification	Emissions	Costs
Hemp fibre fleece; density 38 kg/m³	$\lambda = 0.038$ and 0.040 W/(m·K)	Production: -20.26 Kg CO ₂ eq. Waste processing_Recycling: 55.8Kg CO ₂ eq. Disposal_Recycling: 0 Kg CO ₂ eq. $\approx 35,54 \text{ kgCO}_2/\text{m}^3$ $\approx 2576,65 \text{ kgCO}_2$	Material cost: $0,24 \times 20 \text{ €/m}^2 = 4.8 \text{ €/m}$ Work Hours cost: 7.6 €/m^2 Maintenance: 0.062 €/m^2 Disposal: 3.1 €/m^2
Bitumen (torch-on)	$\lambda = 0,17$ and $0,23$ W/(m·K)	Production: 5.798 KgCO ₂ eq. Disposal: 0.22 Kg CO ₂ eq. $\approx 6,018 \text{ kgCO}_2/\text{m}^2$ $\approx 1745,22 \text{ kgCO}_2$	Material cost: $0,24 \times 20 \text{ €/m}^2 = 4.8 \text{ €/m}$ Work Hours cost: $\text{€}1.32/\text{m}^2$ Maintenance: 0.03 €/m^2 Disposal: 1.53 €/m^2

Adaptation and Transferability

Replicability

- Solutions present replicability potential in the similar climate and typology,
- Buildings should be carefully assessed before deciding on the best possible solution,
- The fact that the solution is possible to replicate, doesn't automatically mean that it was best solution,
- Heritage value varies strongly between the buildings in the same typology depending on the date they were created and the preservation status,
- The more reserved character of chosen intervention, the better it transfers between buildings, but it also means that the improvement of energetic and thermal performance might be lower.

Transferability

- Strictness of heritage preservation guidelines varies strongly between countries,
- Availability of infrastructure (district heating, domestic hot water from network etc.) varies between countries,
- Heating and cooling needs vary strongly between countries and climates which strongly influences the legitimacy of introducing some solutions.





PROJECT
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