Clearinghouse Support

Bridging RUE in Building Projects and Financing

ISO 9001: 2000
Q-612

Intelligent Energy Europe

Gradbeni inštitut ZRMK

Replication potential of the ClearSupport concept beyond the current PSF regions

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TOOLS FOR SUPPORTING SUSTAINABLE DEVELOPMENT POLICY
ClearSupport Conference
Gdansk July 8, 2009

General aspects:

Concept – when and where

Guidelines, tools and reports

?!

Facts: Building stock in Slovenia (2002)

Population	2 mio inhabitants
Area	20.000 km2

Number of residential buildings	463.029
Number of dwellings	777.772
Average number of dwellings per building	1.7

Total floor space of dwellings	58.031.187 m2	
Average floor space of dwelling	71.3 m2	8.000 dw./year

Average size of private household (persons)	2.8

Share of dwellings in urban settlements	51.6%
Share of population in urban settlements	50.5%
Occupation of dwellings in urban settlements	89.5%
Occupation of dwellings in rural settlements	81.2%

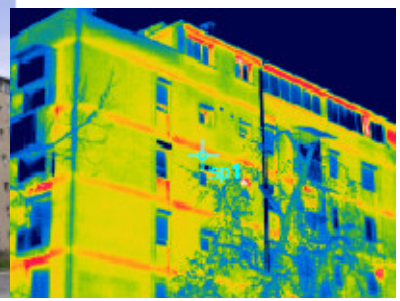
After privatisation in 90-ties 90% of flats are private

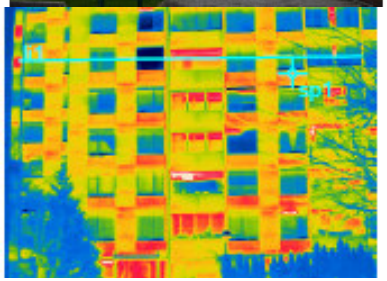
Source: SURS, Census, 2002

1946-1980 apartment buildings

- 61% of all residential buildings are from 1946-1980 period,
- **1946-1953** rehabilitation of WW2 demolished buildings,
- **1954-1967** state-owned social housing built,

- **late 60-ties and 70-ties - flourishing period !**
- 1967 national regulation for design of dwellings
- 1973 Ljubljana - municipal rules for apartment buildings construction
- 1971 New construction technologies introduced – “outinord” cast in place concrete buildings
  up to 3 cm insulation obligatory – first attempt!





Residential buildings in urban areas

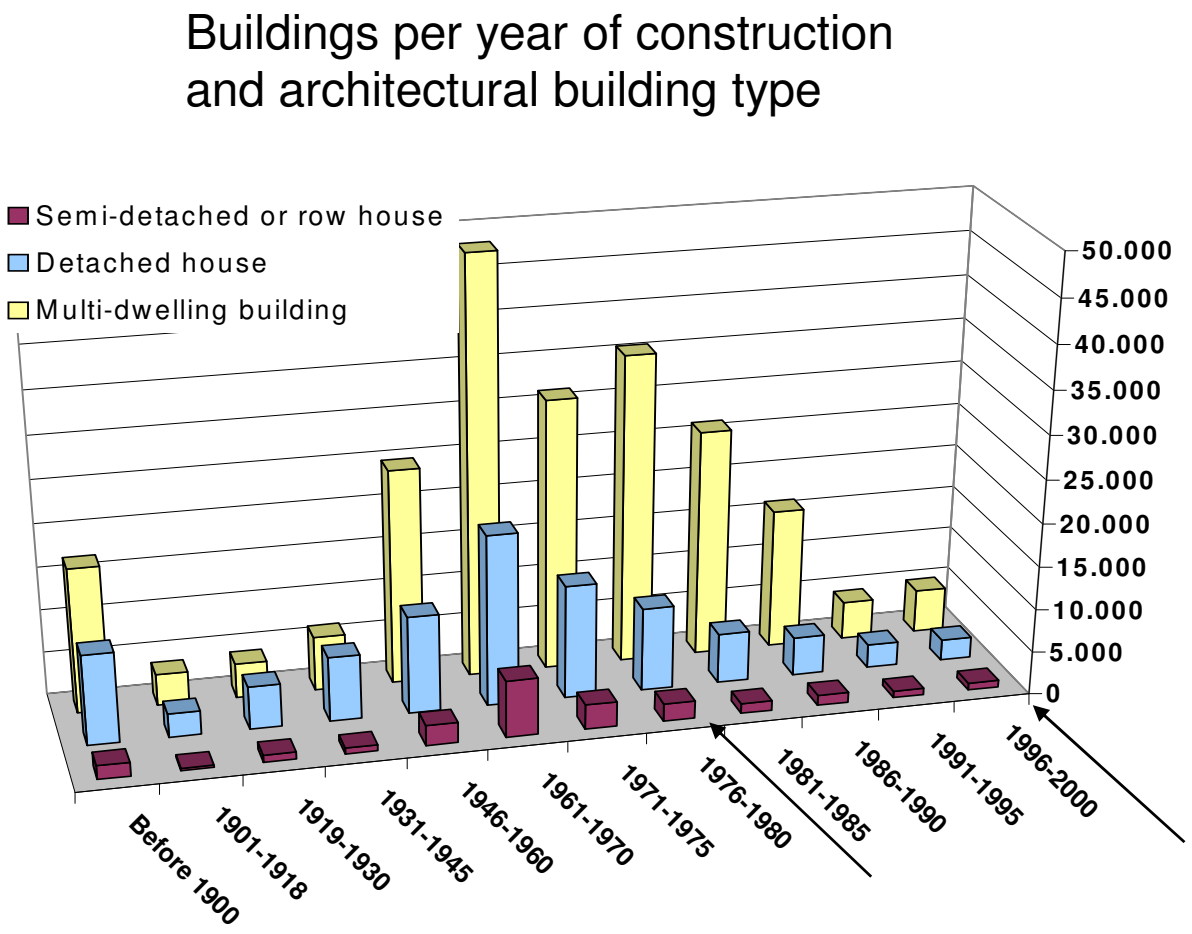


Figure: Distribution of houses and buildings in urban settlements by their age (Source: SURS, Census, 2002).

Some buildings from the most frequent groups subject to refurbishment

50-ties, masonry, no TI, GF + 3 storeys

late 50-ties, masonry, no TI, high rise building

early 60-ties, masonry, no TI, self-standing building

late 70-ties, reinforced concrete, pre-cast large panels; low TI , thermal bridges, envelope elements, masonry, GF + 4 storeys

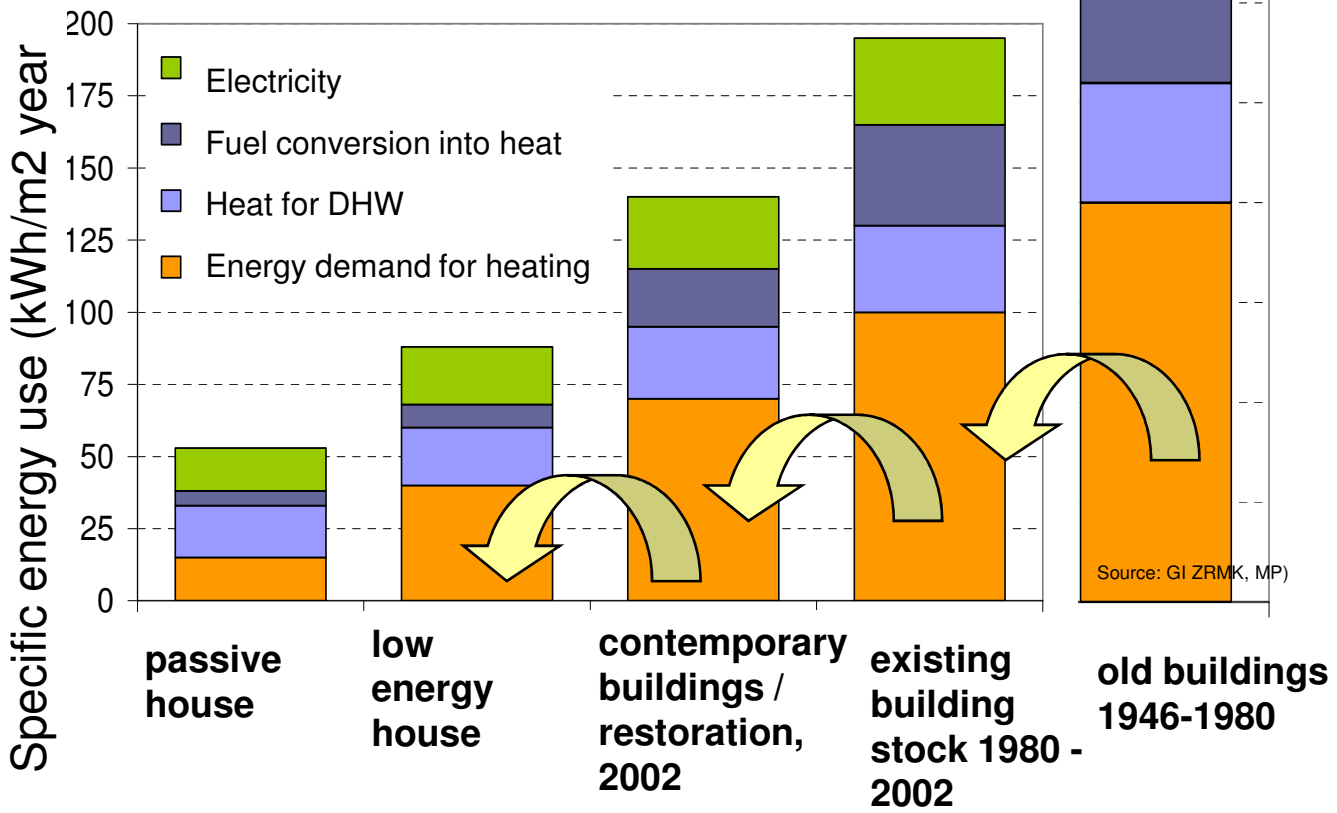
late 70-ties, cast in place reinforced concrete “self standing” blocks, low TI

late 70-ties, concrete high multi-story buildings with pre-cast large panel envelope elements

Upgrading quality standards…




Energy use for heating and DHW, electricity consumption

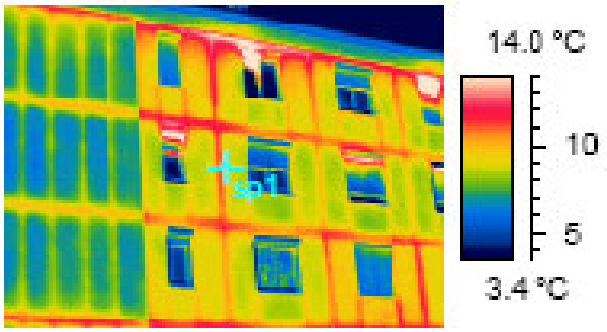


EPBD legislation 2007:

Reduction of heat demand by improved envelope and beyond, by mechanical ventilation heat recovery min. 0.8

Supported: RES for DHW and for space heating

Typical renovation case study



1960

40 flats, 95 residents, 1860 m2

Walls: prefabricated conrete plates mixed with wooden chips

U=1,3 W/m2K

Windows U=2,7

Non-renovated apartment house Sisenska 42-44 in Ljubljana. IR thermography detected cold bridges in the envelope: (joints of concrete panels).

2005

(investment 100.000 EUR, 10% subisdy)

Wall: 0,35 W/m2K (67.100 EUR)

Windows: U glazing=1,1 W/m2K (31.300 EUR)

Savings: 125.000 kWh (21%)

7.000 EUR/year, PB 14y (total), PB incremental investment PB 3-4 years

Outer wall: thermal insulation of outer wall with 8 cm thick polystyrene layer.
Windows: installation of energy efficient windows with low-e double glazing (Ug=1,1 W/m2K with six-chambers PVC window frames, where the Uw=1,1 W/m2K.

Facts: Ljubljana Housing Fund

- 3200 flats owned by Ljubljana Housing Fund – public fund of Municipality of Ljubljana (280.000 inhabitants)
- Mixed ownership: difficult decision-making
- Low income tenants – paying the operational costs may become a problem and additional burden for Ljubljana Housing Fund
- Aim: EI-refurbishment of existing buildings and new energy efficient construction
- Participation in EIE projects, FP5 demonstration projects, energy certification, passive house, LCC

Pipanova pot, Ljubljana, 20 new flats in low energy standard, design 2007

JSS MOL – Hermana Potocnika, Ljubljana
Passive House Refurbishment

JAVNI STANOVANJSKI SKLAD MESTNE OBČINE LJUBLJANA



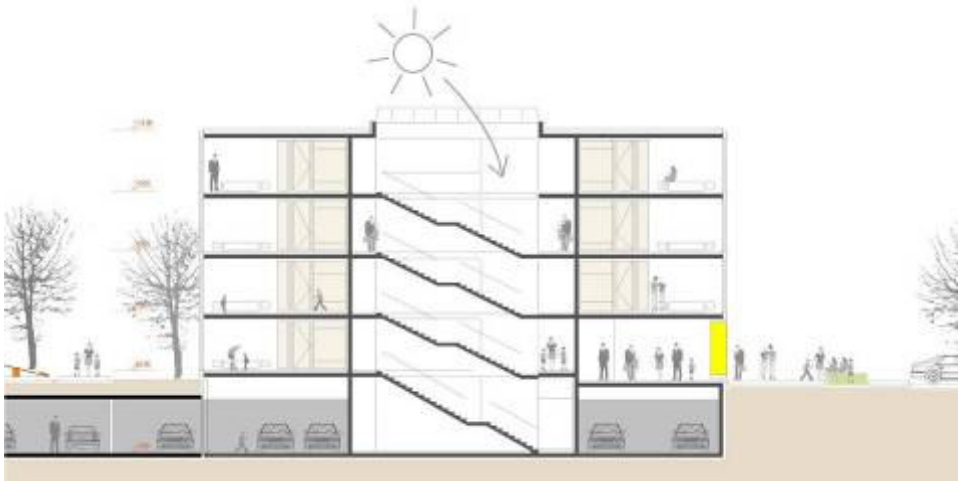

1975/2004, EU FP5 Large High Rise Reconversion Housing - University of Ljubljana, Faculty of Civil Engineering & Ljubljana Housing Fund JSS MOL;

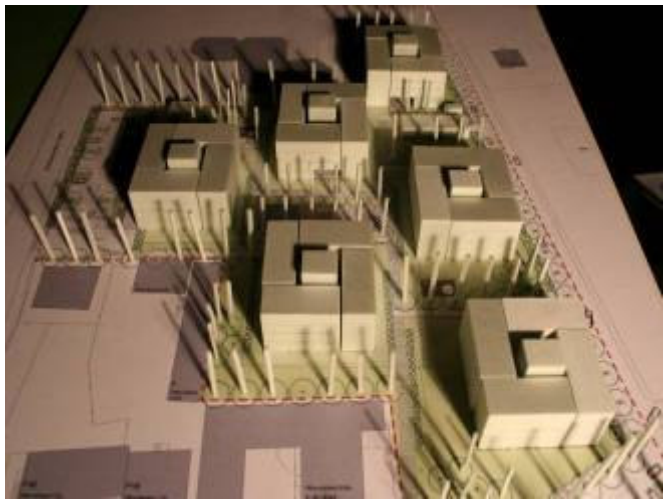
- energy savings - 63%
- Insulation of facades
- insulation of roof
- Insulation of ground floor
- New balconies without thermal bridges
- Solar protection roller blinds + night insulation
- High efficiency insulation glazing and frames
- Management and control system: BMS, heating system management and control

New social housing Polje II, Ljubljana

JAVNI STANOVANJSKI SKLAD MESTNE OBČINE LJUBLJANA

- Low energy buildings
- Controlled ventilation incl. humidity control
- Local d.h. system
- Solar collectors for DHW 50m2 /bld.
- 1 PV power plant 12 kW
- Design: ongoing in 2007
- Construction: 2009

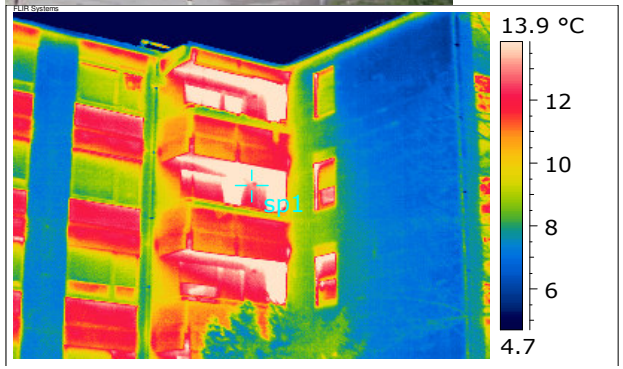




Practical case: Before - Steletova 8, Ljubljana, 1.800 m^2, 60 flats

Before

- Wall 17 cm concrete + 5 cm TI
- Ceiling 8 cm TI
- Windows U=2,7 W/m2K
- Q_{NH} = 75-85 kWh/m2a



Planning passive standard renovation

- additional thermal insulation (15 cm)
- Windows PVC Uw=1,5W/m2K
- adjustment of heating system
- mechanical ventilation, 75% heat recovery
- target Q_{NH} 5 kWh/m2a
- Simpified calculation of energy demand; no scenarios, investment costs estimated, lowest prize tender for execution of works selected

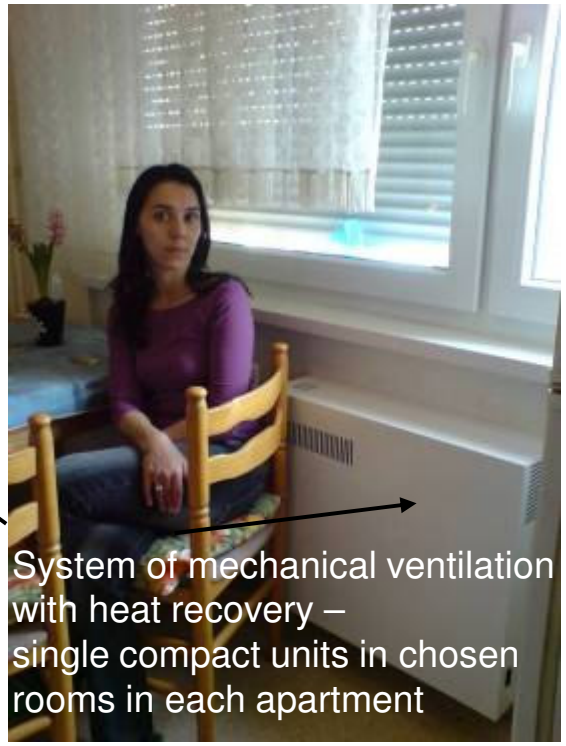
A	**25-40 kWh/m2**
B	**40-55 kWh/m2**
C	**55-70 kWh/m2**
D	**75-85 kWh/m2**

	<25 kWh/m2
A	**25-40 kWh/m2**
B	**40-55 kWh/m2**
C	**55-75 kWh/m2**

After renovation (2006/2007)

After renovation: Facade East

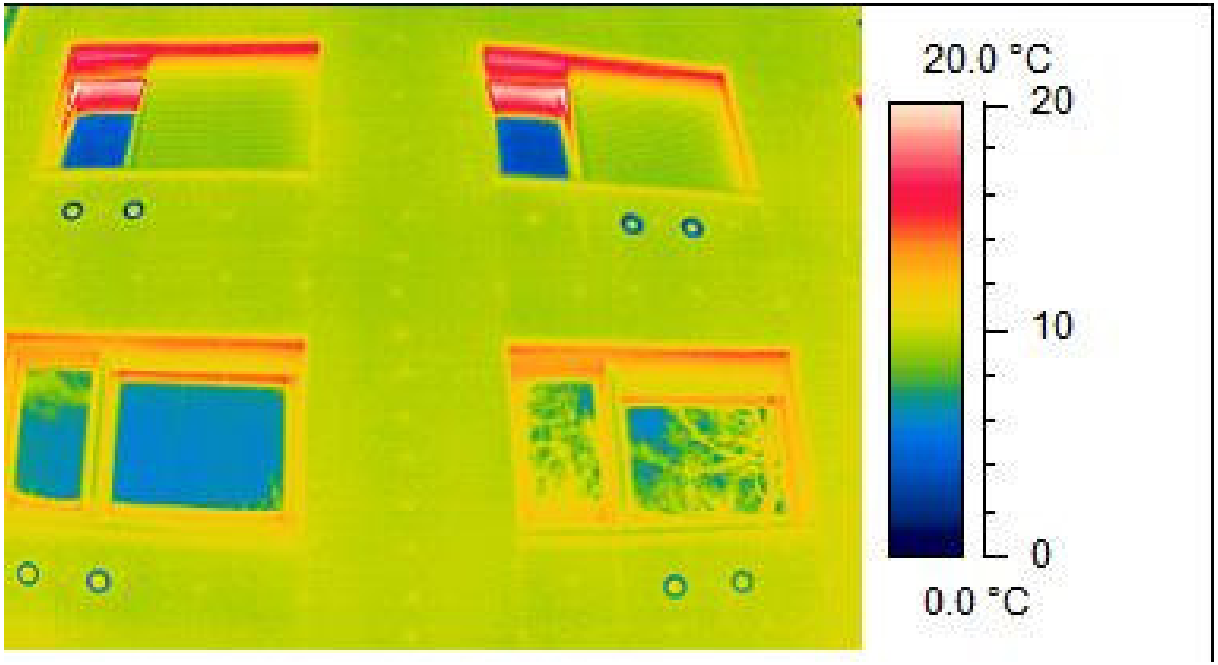
After renovation: Facade West

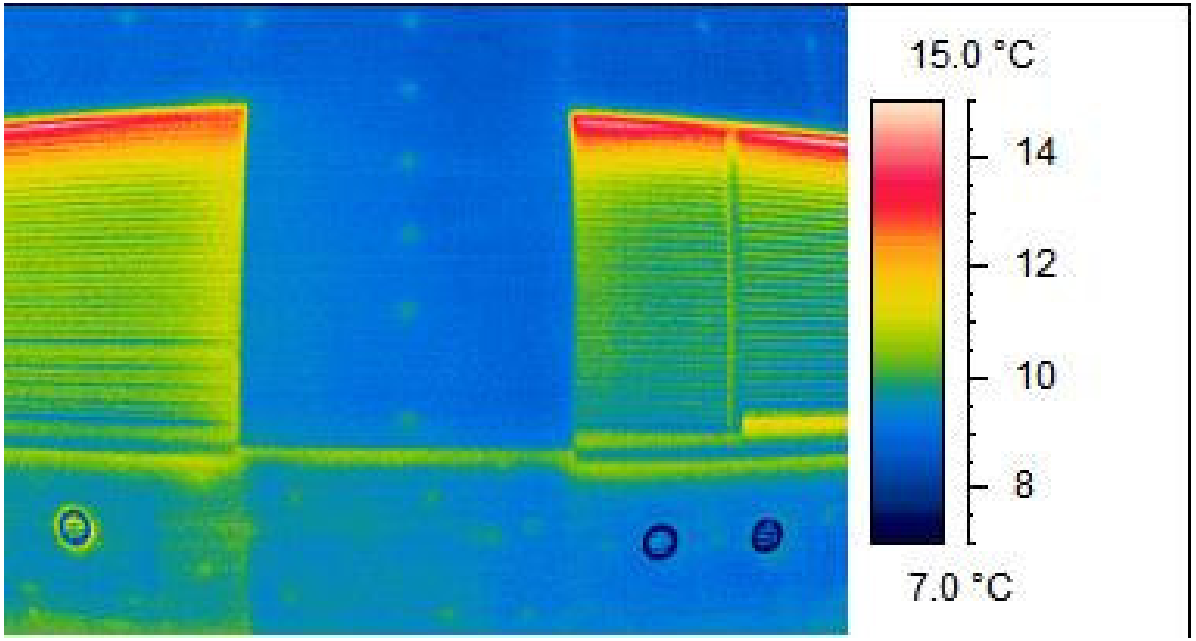


System of mechanical ventilation with heat recovery –
single compact units in chosen rooms in each apartment

Benefits

- Thermal comfort?
- Energy (cost) savings?
- Users' habits...


20.0 °C
20
10
0
0.0 °C


15.0 °C
14
12
10
8
7.0 °C

Was the renovation succes or failure?

Energy savings are bellow expectations (costs reduction only 20%)

Reasons

- energy calculation – over estimated savings?
- Users' behaviour – cause bigger losses than expected

Doubts about mechanical ventilation with heat recovery

Future practice?

Questions

Would detailed energy simulation and **LCC-based** selection of renovation scenario give a different recommendation to decison-makers?

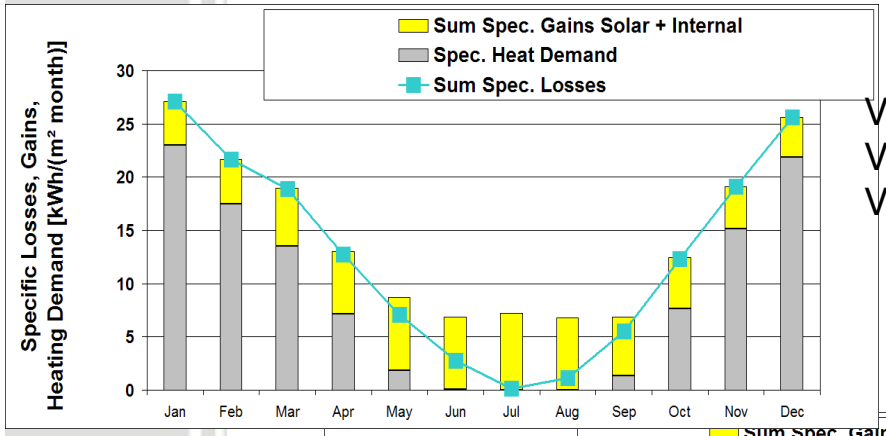
What is the influence of energy calculation quality and users behavior to LCC of renovation scenarios?

Current position of LCC in Slovenia

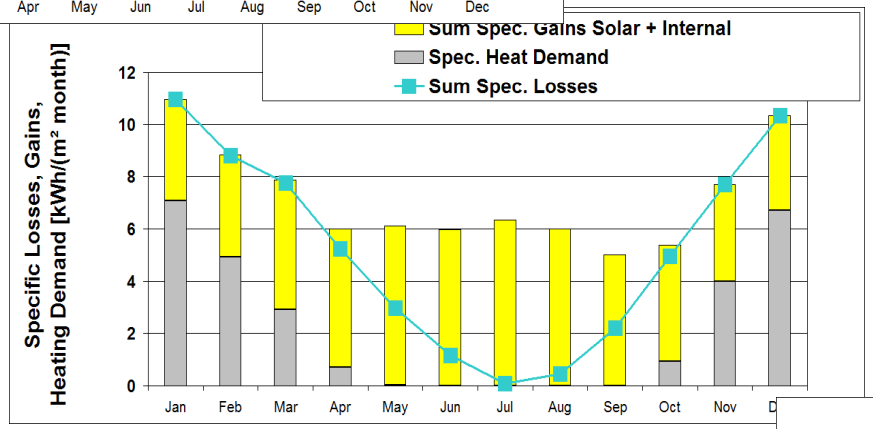
Growing interest for LCC due to:

- **EPBD & Recast EPBD** – LCC thinking is more and more integrated in min. requirements, cost effectiveness of recommended measures in EPC; required in regulation for feasibility studies of AES;
- **Green public procurement** ("the economically most viable offer based on more comprehensive criteria" can be selected – impact of these criteria (incl. LCC) is up to 60%
- **PPP** – many projects already started...
- **Limited experiences with LCC** at a building level (building concept alternatives were traditionally not analysed as a part of investment programme – but the savings are promissing)
- Public sector is in focus of national EEAP (ESD):
  - Priority - renovation of social housing including demonstration projects
  - Our aim to demonstrate the dimensions of LCC based planning of renovation scenarios

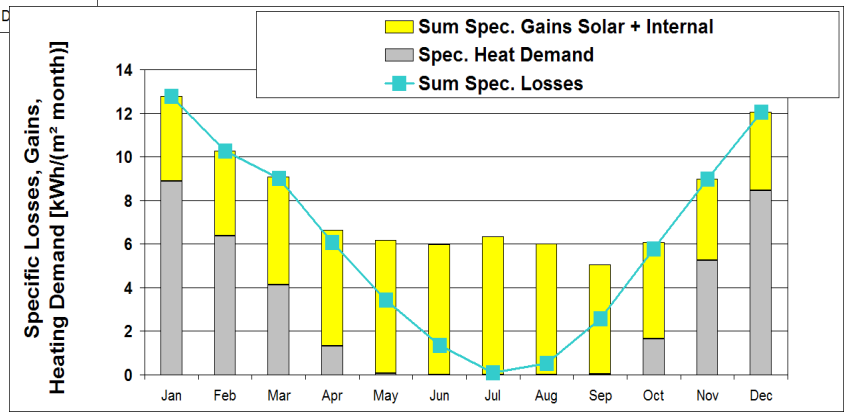
Energy calculation and Level 2 LCC at system level
Steletova, Ljubljana – in progress



VAR0-before renovation
VAR1-after renovation with ventilation & heat recovery
VAR2-after renovation, inadequate user habits – open windows



108 kWh/m2a	before (calc. PHPP)
27 kWh/m2a	as planned (PHPP)
36 kWh/m2a	actual (PHPP)



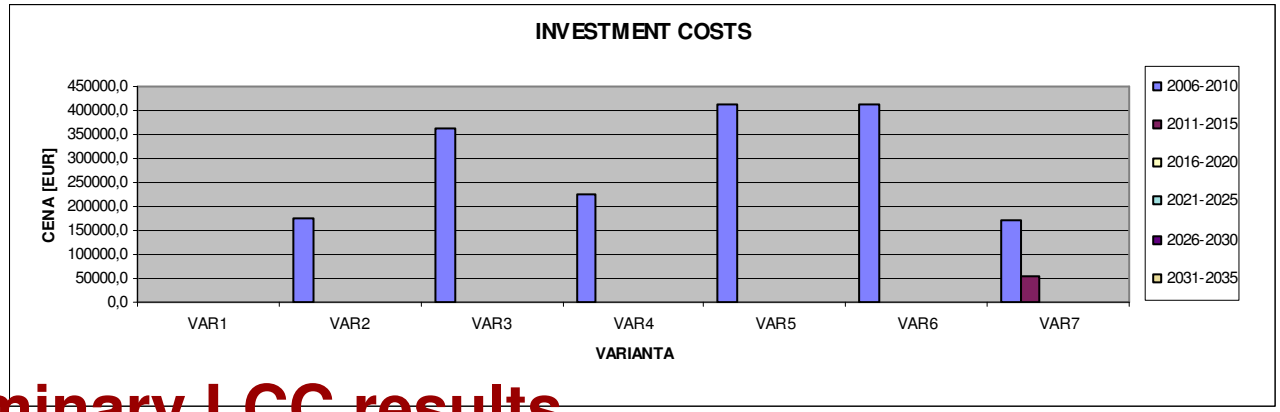
LCC calculation assumptions

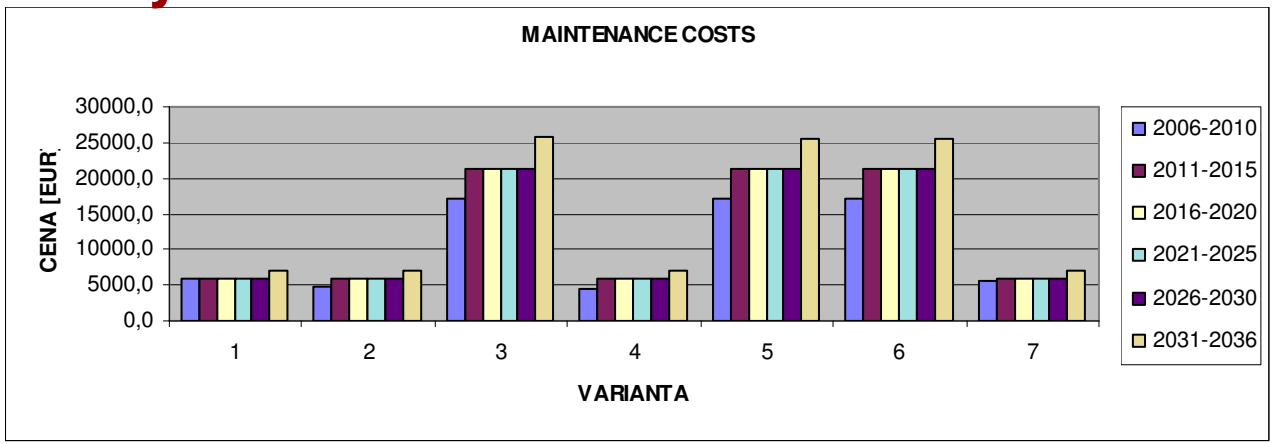
SCENARIOS:
-VAR1: existing situation + only maintenance (theoretical)
-VAR2: existing situation; replaced windows and facade (no energy improvement)
-VAR3: VAR2 + mechanical ventilation with heat recovery
-VAR4: renovation (windows and wall TI) no mech. ventilation
-VAR5: renovation (windows and wall TI) + mech. ventilation
-VAR6: renovation (windows and wall TI) + mech. ventilation
+ bad users' habits (uncotrolled ventilation)
-VAR7: as usual: windows replaced in 10 years, no TI of walls
(investment, operational costs, maintenance, replacement, repair cost

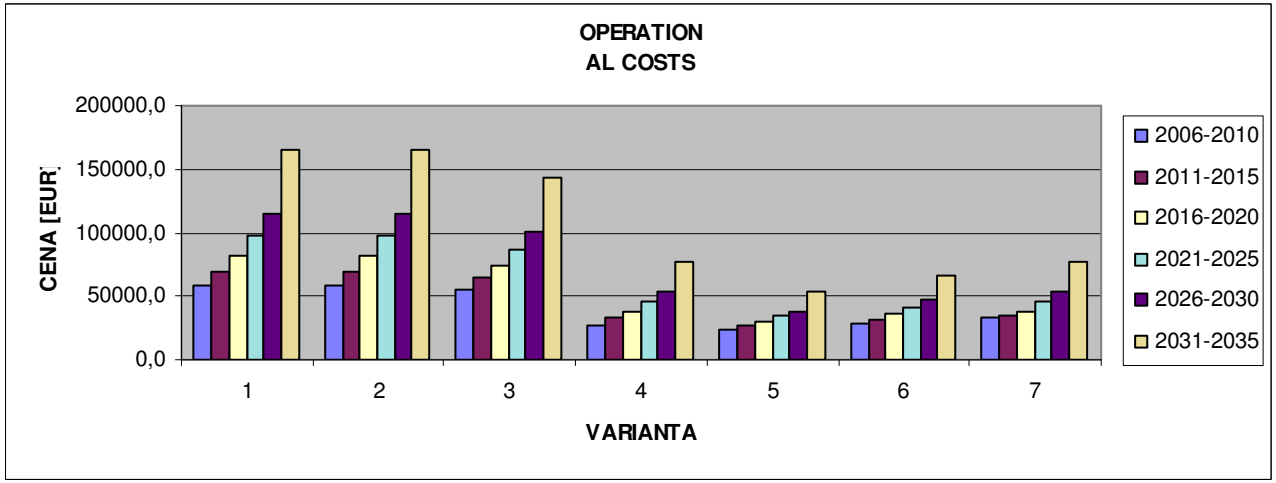
Price heating [€/kWh]
0,03175
Increase of energy price
6,0%
Interest rate
2,5%
Inflation
2,5%

Q **(kWh)**	
1	**332.361**
2	**332.361**
3	**266.547**
4	**154.663**
5	**85.558**
6	**111.884**
7	**197.442**

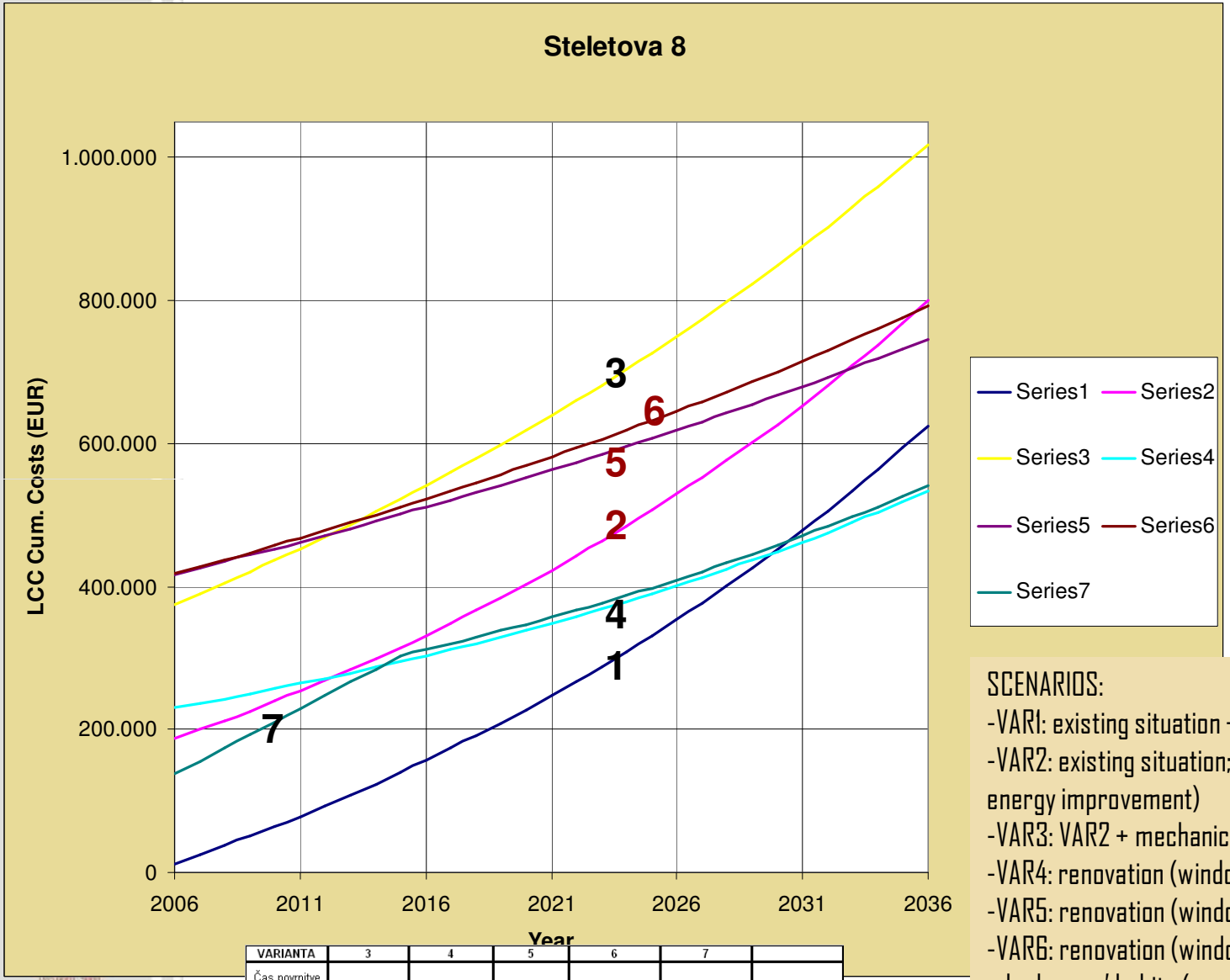
Preliminary LCC results







Preliminary LCC results



VARIANTA	3	4	5	6	7	
Čas povrnitve investicije- glede na VAR2	/	8	27	29	/	
Prihranek v 30-ih letih glede na osnovno varianto [€]	- 218.526 €	266.756 €	54.055 €	7.454 €	258.575 €	

To do:

Consider actual investment instead of pre-calculated one

SCENARIOS:
-VAR1: existing situation + only maintenance (theoretical)
-VAR2: existing situation; replaced windows and facade (no energy improvement)
-VAR3: VAR2 + mechanical ventilation with heat recovery
-VAR4: renovation (windows and wall TI) no mech. ventilation
-VAR5: renovation (windows and wall TI) + mech. ventilation
-VAR6: renovation (windows and wall TI) + mech. ventilation + bad users' habits (uncotrolled ventilation)
-VAR7: as ussual: windows replaced in 10 years, no TI of walls

ClearSupport “targets”:

(current activities by ZRMK)

Montenegro

Kosovo

FYR Macedonia

Bulgaria

…..

Bulgaria - facts:

Post-WW2 period: migration from villages to cities

-> social problems; construction of panel-type concrete multi-storey buildings

Period 1960 – 1995:
18.900 panel dwelling buildings with 707.441 dwellings (>25% of the population)

Beginning of 1990s: privatisation;
97% of the housing stock now private-owned

National Programme for Refurbishment of Dwelling Buildings in Bulgaria:

20% of the costs of the refurbishment of 684.676 dwellings in big residential buildings erected with reinforced concrete panels to be subsidized by the state.

Important:

Refurbishment should include the implementation of energy saving measures.

-> need for guidance, expert support, definition of appropriate measures, trusted calculation procedures

FYR Macedonia - facts:

Post-WW2 period:
intensive urban development;
>85% of the present housing stock built.

1950s, early 1960s (25-30%):
in need of comprehensive reconstruction.

Later periods:
in a relatively good condition (construction – seismic characteristics!), but inadequate thermal characteristics

Present state:
99% privatised (almost 700.000 dwellings)
83% occupied

Approx. 60% of the building stock:
1- or 2-storey single or double-family houses

The tendency:
to live in a new appartment (-> surplus created!)
in a town
<- negligence of maintenance of older buildings

Outcome:
unnecessary condensation and overpopulation of existing urban areas.

Problems:
- incapacitation of the possibility to grow financial resources for maintenance and refurbishment (effect of privatisation);
- uncontrolled and unskilled DIY constructional interventions by homeowners.

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Thank you for your attention!

Sources:

JSS MOL, E-NET.si, IMOS

EIE LCC DATA

EIE EI-Education

M Mirtic, diploma 2009

S Trpevski, COST C16, 2007

ISO 9001: 2000
Q-612