Ekodoma
Sustainable Energy Solutions

Energy efficiency in buildings and impact on heating energy demand in Latvia

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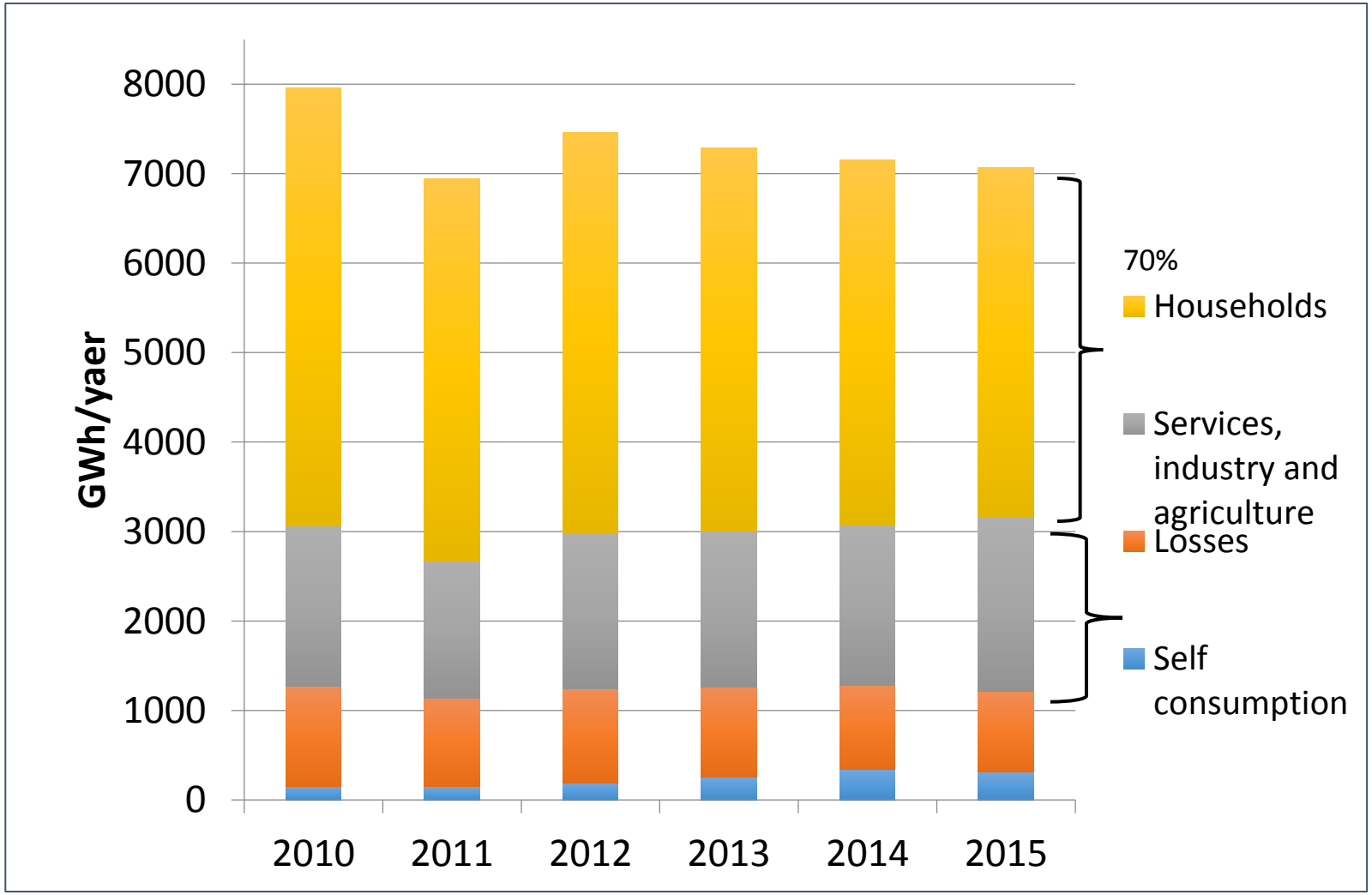
DH consumers

City	GWh/yaer	%
DH total	6 944	100%
Riga	3 484	50%
Daugavpils	467	7%
Jelgava	213	3%
Jēkabpils	89	1%
Jūrmala	164	2%
Liepāja	288	4%
Rēzekne	163	2%
Valmiera	106	2%
Ventspils	217	3%



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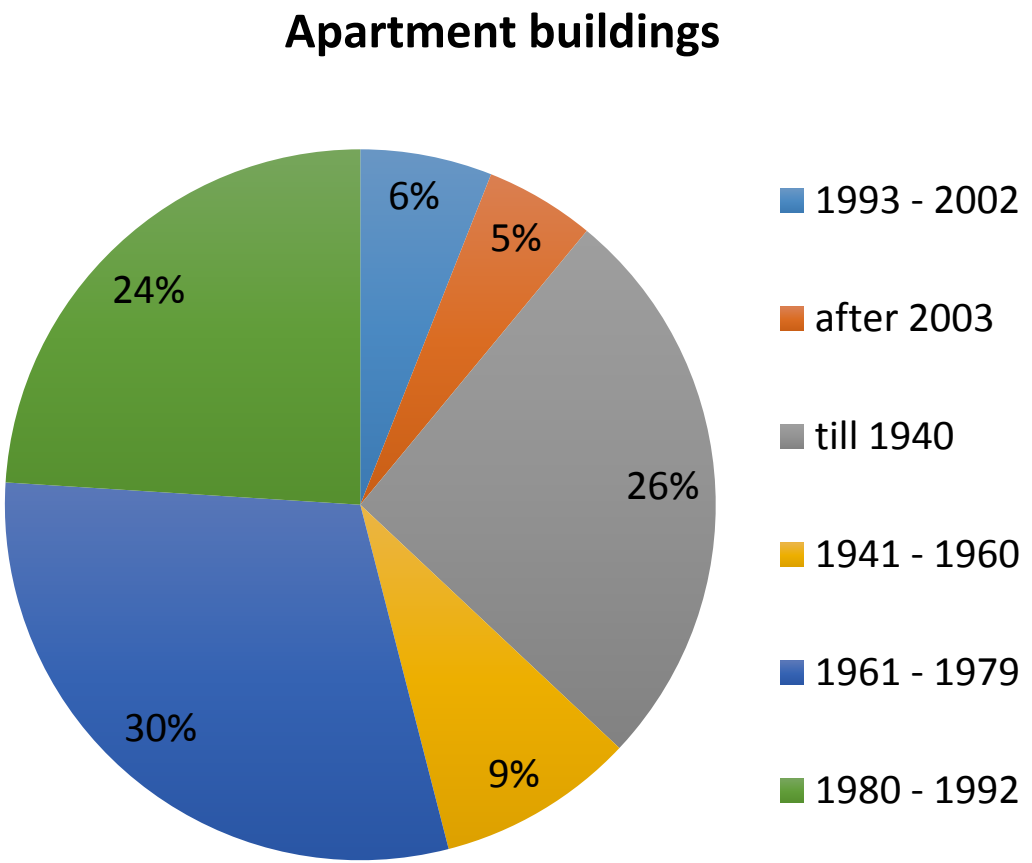
Housing stock

- Both in number of buildings and in terms of area apartment buildings are built in the period from 1941 to 1992
- Relatively few number of buildings constructed after 1992



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Aim of the study

- Inefficient buildings with low indoor comfort and high energy consumption. With in given support and need to renovate a buildings, energy demand will change.

Aim of the study:

- Assess future energy demand for DH in Latvia in 2020 and 2030

Tasks:

- Evaluate different type of buildings and EE potential
- Evaluate investments needed and EE savings
- Evaluate impact on DH energy demand

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Methodology

- Data questionnaires (2012, 2013 and 2014)
  - To all district heating companies located in Latvia
  - To all municipalities
  - To all CHP plant operators in Latvia
- Data from Central Statistical Bureau;
- Data from The State Land Service (buildings area and building types);
- Data from SEAPs, energy audits and SUNSHINE project

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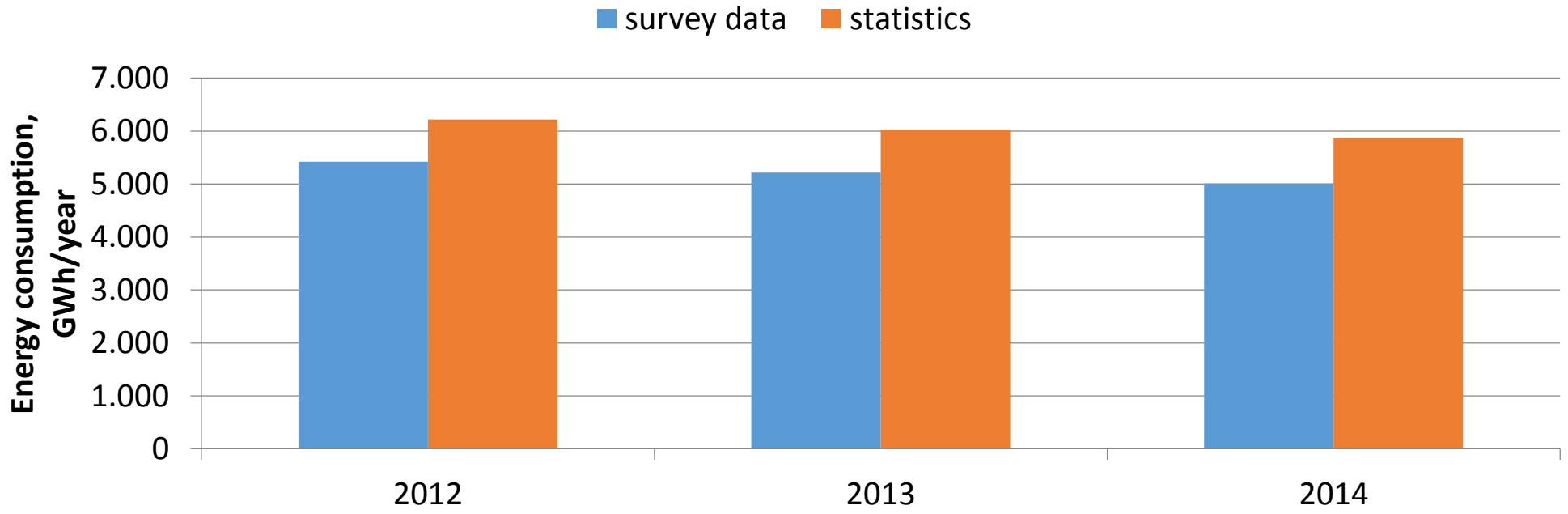
- Received questionnaires for 393 boiler houses with a total installed thermal capacity 4 618 MW (in total 6 065 MW installed).
- Information for more than 500 multi-apartment buildings collated (Sunshine project).
- Data collected contains information on city and municipal level - boiler capacity, fuel and heat consumption, boiler house efficiencies, distribution system efficiencies, age of boilers.



BUILDING INVENTORY

- Analysis of more than 500 multifamily residential buildings
- From more than 10 Latvian municipalities :

- 157 buildings - Series 103
- 12 buildings - Series 104
- 9 buildings - Series 113
- 19 buildings - Series 119
- 50 buildings - Series 316
- 79 buildings - Series 318
- 106 buildings - Series 464
- 47 buildings - Series 467
- 67 buildings - Series 602
- 9 buildings – Czch type project

103

467

316

464

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Deep renovation – building fabric

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- **Thermal insulation of exterior walls** (Thickness 15-20cm)
- **Roof/technical attic thermal insulation** (Thickness 30cm)
- **Basement thermal insulation** (Thickness 10-12cm)
- **Replacement of window** (U-value 1.1 W/m²K)
- **Replacement of doors** (U-value 1.4-1.6 W/m²K)

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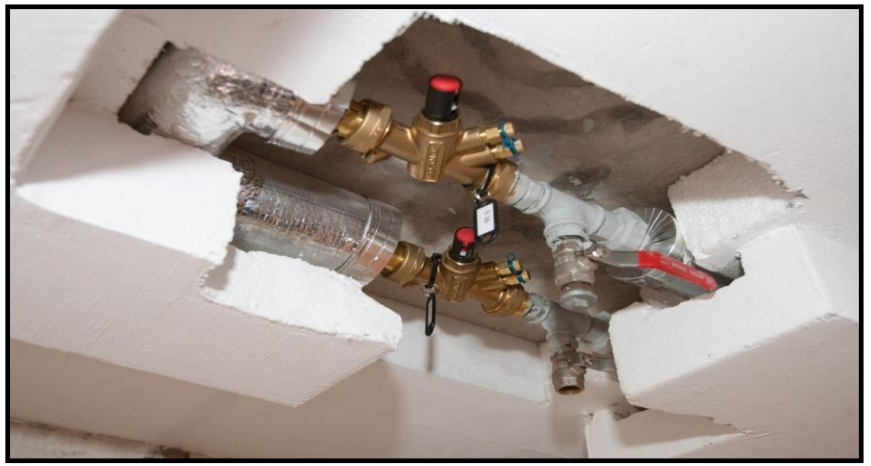
Deep renovation - Heating system

- Retrofit of existing system
- Replacement of distribution pipes
- Replacement radiators
- Installation of TRV
- Installation of balancing valves
- Technical insulation of pipes
- Heat substation
- Suitable automation and control



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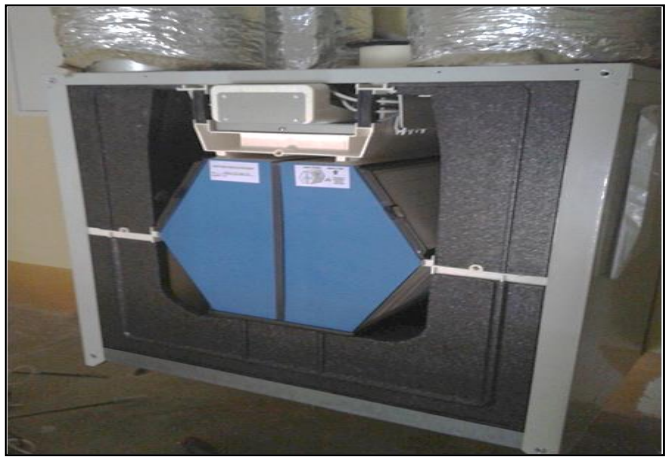
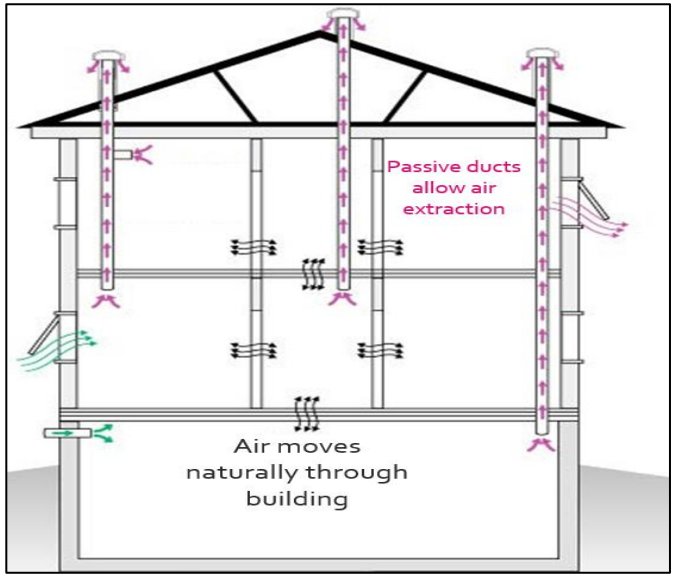
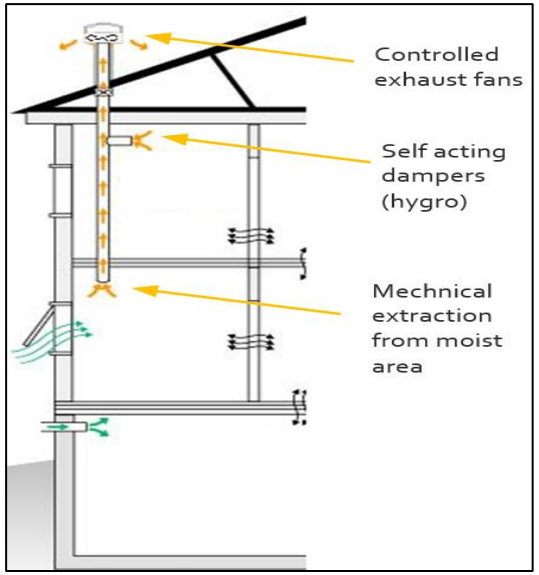
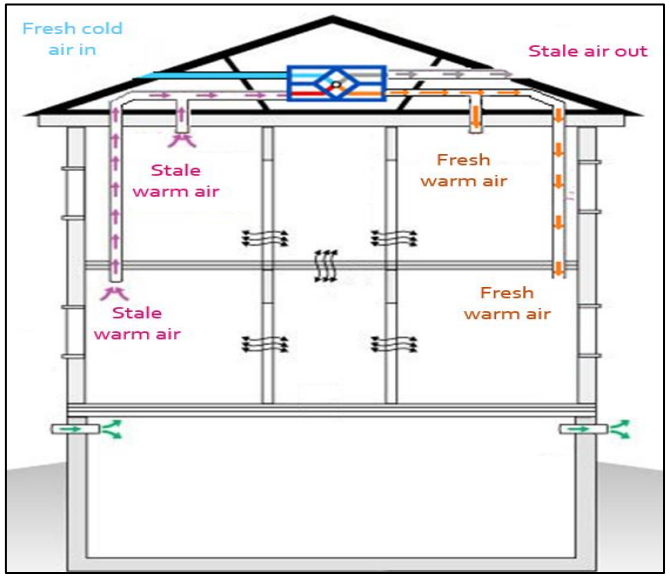
Deep renovation – Ventilation system

- **Guarantee minimum number of air exchange after renovation**
- **Retrofit a mechanical ventilation system**
  - Extraction
  - Mechanical ventilation with heat recovery









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Deep renovation – structural/aestetical repairs

- Roof
- Foundation walls
- Staircases
- Entrance
- Balconies
- Rainwater collection
- Sewarage, etc...

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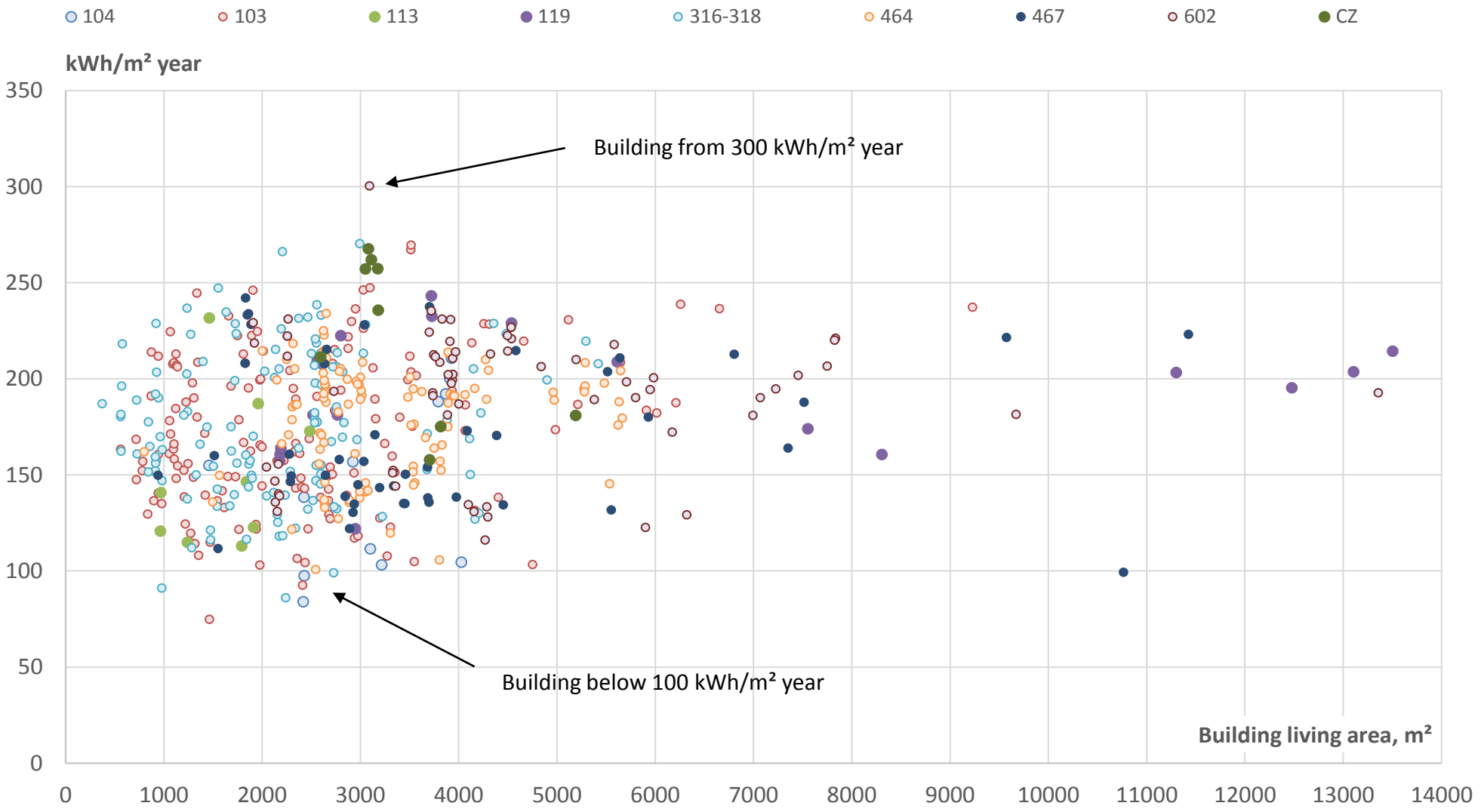
Ex-ante specific energy consumption



INVESTMENT COST

- For each building investment costs for a deep renovation have been calculated:
  - Building fabric
  - Heating system
  - Domestic hot water system
  - Ventilation system
- In general:
  - Smaller buildings need higher specific investment costs
    - The fix/variable costs ratio improves with building size
      - For example: a 2000m² 9-storey building has the same investment cost for the roof as a 1100m² 5-storey building
  - The renovation of 103-series buildings is typically more expensive
    - About 15-20% compared to 464- series and 602-series buildings
    - Weathering of exterior walls
    - Complex facades

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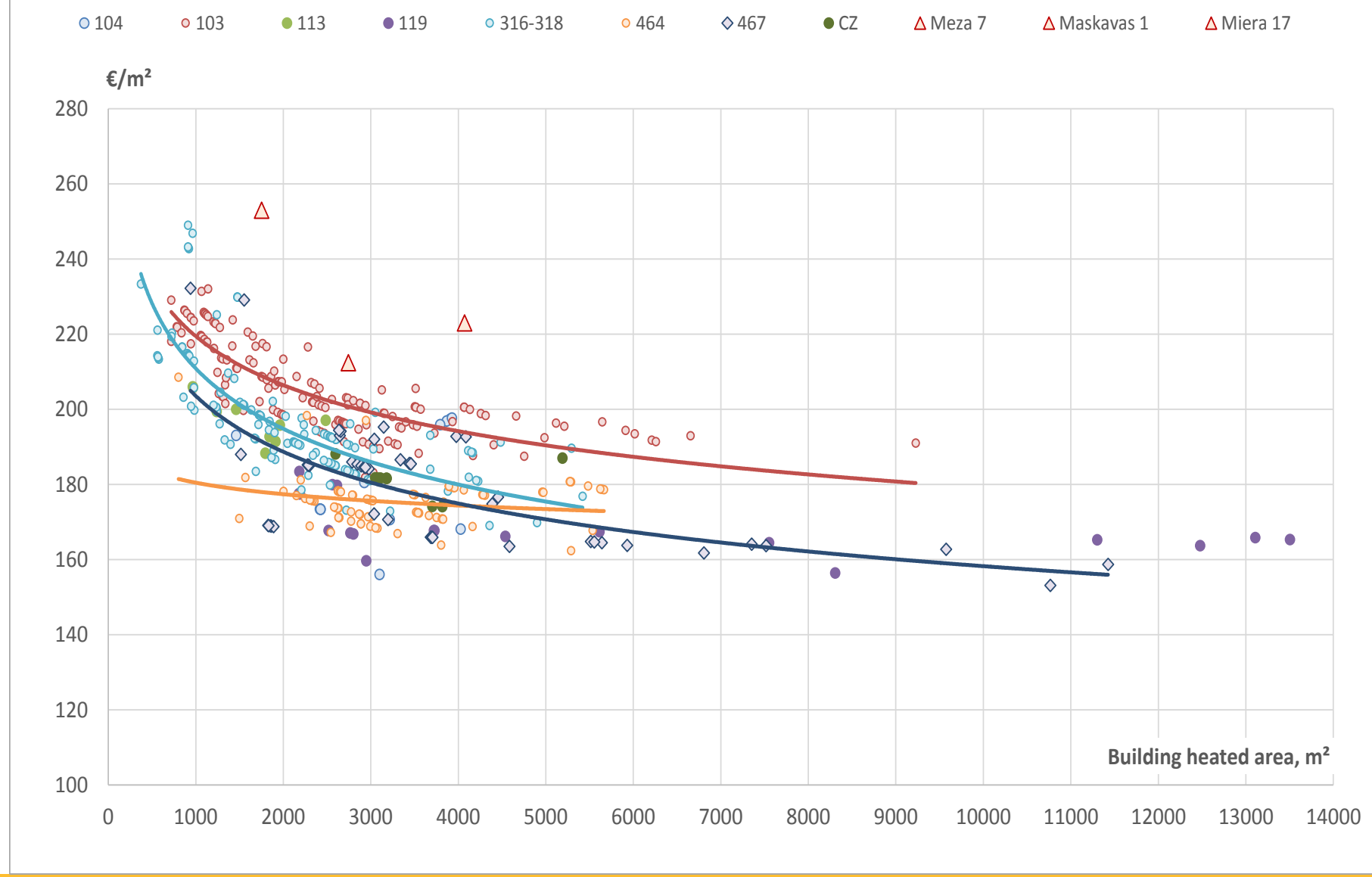
Specific investment costs for deep renovation of residential buildings vs building area

[Source: LABEEF - Latvian Baltic Energy Efficiency Fund]



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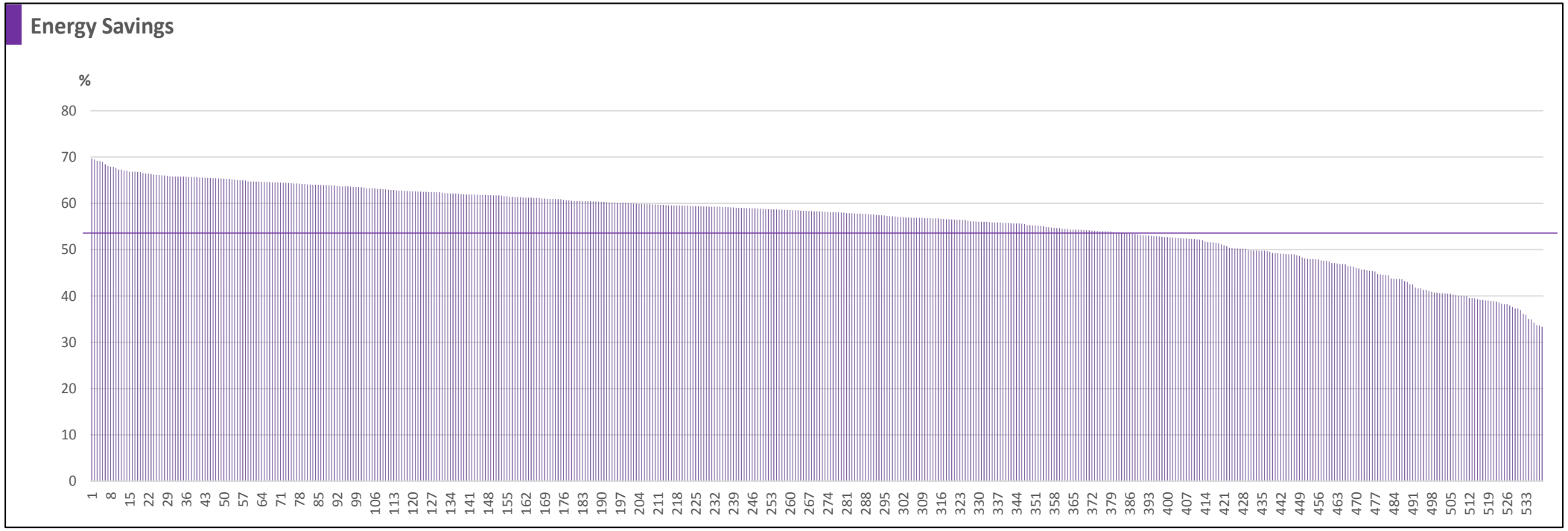
ENERGY SAVINGS

- On average deep renovation saves 55% energy
- A consumption below 70 kWh/m² year (at 21°C) is expected also for small buildings (<1000 m²)



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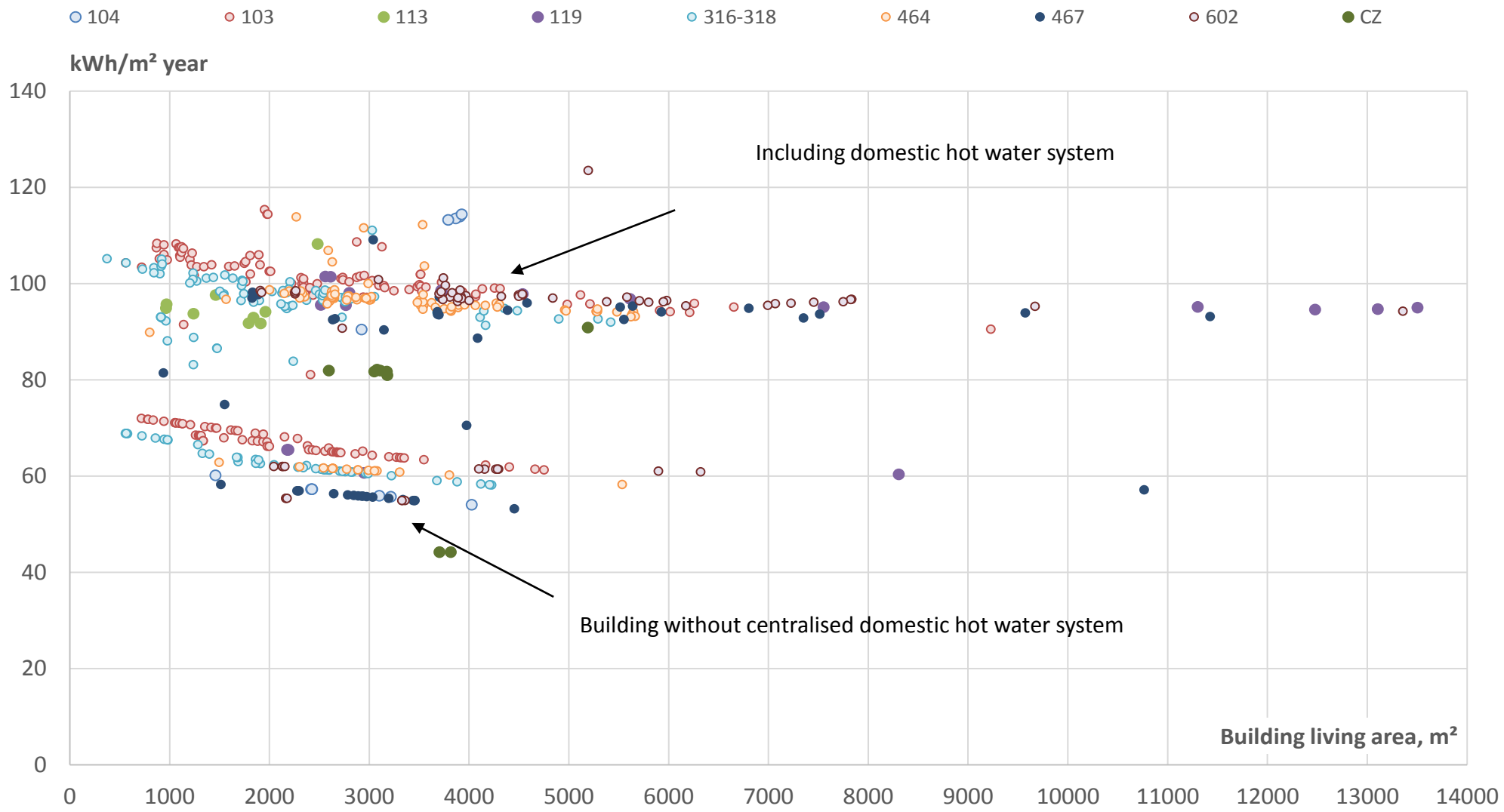
Ex-post specific energy consumption

At indoor temperature T=21°



- In general large buildings need lower investment costs and have better payback periods
- Pannel buildings (like 602, 464 and 467) need lower investment costs compared to 103 series
- Large energy saving potential from deep renovation:
  - Ex post energy consumption tyoically below 70kWh/m² year
  - Energy saving at the level of 50-60%

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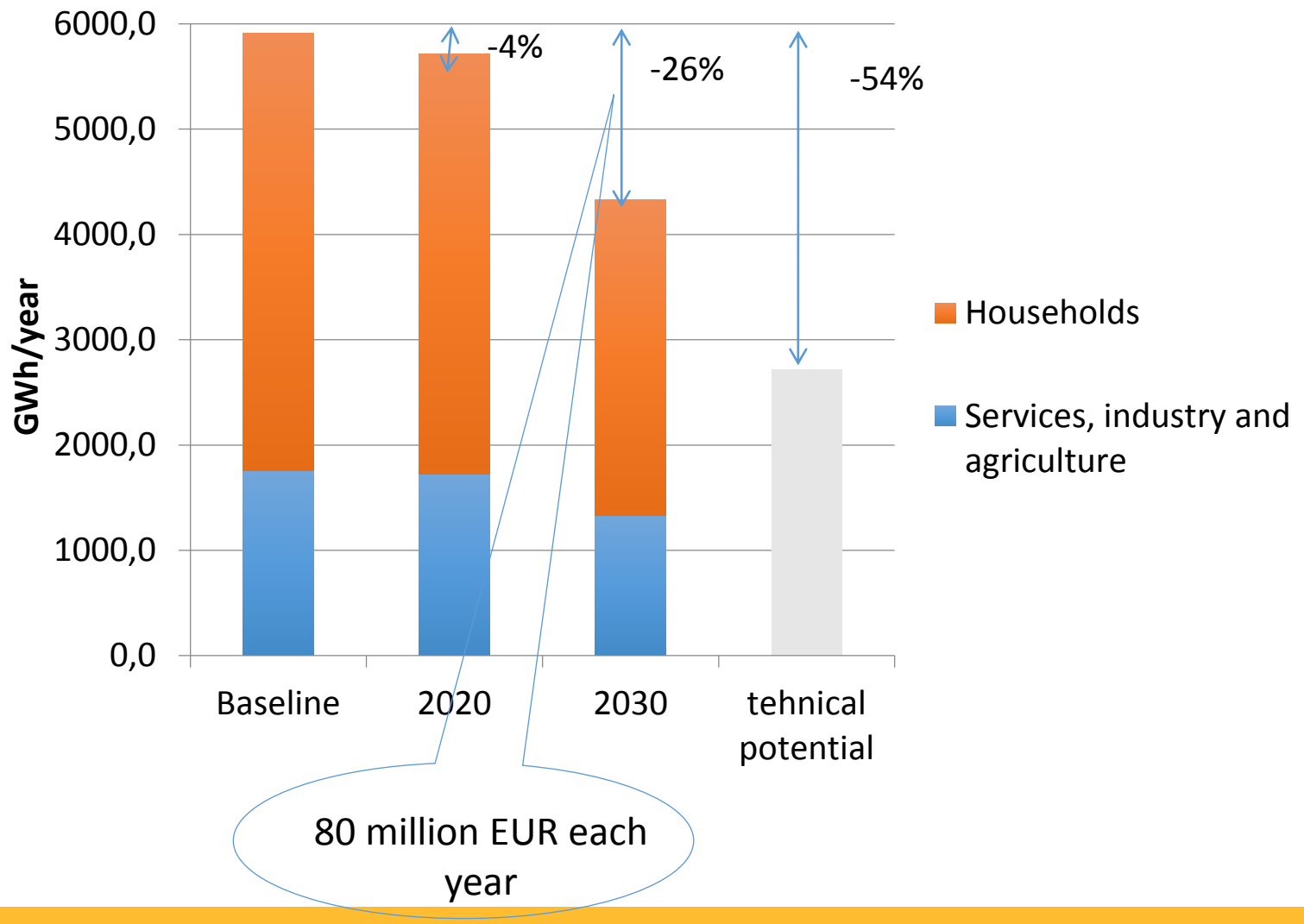
Planned investments in EE

Sectors	Investments, million EUR
EE for industry	109
EE for apartment buildings	332
EE for governmental buildings	135
EE for district heating	133
Total:	**708** million EUR



Results and Discussion

- Very often in energy planning existing energy demand or even growth-oriented demand is foreseen. However in Latvia there is gradual reduction in energy demand and depending from investments in energy efficiency energy demand could drop around 25% and decreasing revenue for DH companies
- Future energy demand and heating load will change. (shorter heating seasons and energy efficiency improvements)
- Change of strategy for selling heat to providing energy service (ESCO)

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Results and Discussion

- Average age of the boiler boiler houses and CHP plants is 12 years (2003). Very often boiler houses have new and very old boilers on the same time.
- Comparing the data submitted on boiler efficiency, average efficiency in 2014 was 85%.
- End of the boiler lifetime is one of the main factors choosing to invest in new technologies.
- Given the high proportion of natural gas in DH, fuel switching potential still is high

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Thank you for your attention!

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