

CELSIUS Talk: Optimising district heating systems at the building level

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Smart Energy Management: Online interactive actual energy consumption map of Vilnius buildings



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Content

- 1. BEST EXAMPLES OF PUBLIC-PRIVATE-PARTNERSHIP (PPP) IN LITHUANIA**
- 2. EXAMPLES OF INNOVATIVE SOLUTIONS IN PPP – Interactive Actual Energy Consumption Class (AECC) map**
 - 2.1. Energy evaluation issue;**
 - 2.2 AECC as the optimal solution;**
 - 2.3. Examples of Interactive Actual Energy Consumption Class (AECC) map**

Interactive Actual Energy Consumption Class (AECC) map

ENERGY CONSUMPTION IN BUILDINGS CAN BE EVALUATED BY THE HELP OF:

- Energy performance **certificate**;
- Energy **audit**;
- According to **bills** for heating;
- Other scientific methodologies;

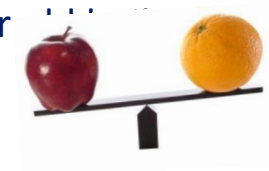
Interactive Actual Energy Consumption Class (AECC) map

ADVANTAGES:

- Better than a nothing (first step forward);

DISADVANTAGES:

- Calculated energy amount is only **theoretical**, for calculations are taken theoretical values and coefficients;
- Time costs – requires to **visit an object**, requires technical **documentation** (for that makes the problem);
- Despite certificate is performed, the building **actually can consume**
- absolutely **different amount of energy**;
- There are cases than a building according to reconstruction Investment plan, which requires energy performance certificate, **consumes 30 % less energy almost now. Why Investment plan?**



Interactive Actual Energy Consumption Class (AECC) map

ENERGY AUDIT

Regulation: Order to perform audits – order of Economy Minister of LR, 29-04-2008, “**Methodology to perform energy** and cold water **audits** in public buildings”;

- **Objectives** – to evaluate state of building constructions and engineering systems, to define measures for energy/water consumption decrement. Etc.;
- **Audit performance takes stages:**
 - Data collection;
 - Metering of energetic parameters;
 - Technical analysis of energy, cold water consumption;
 - Formation of energy and water balances;
 - Recalculation of actual energy costs for a standard climatic year conditions;
 - Energy and water saving measures;
 - Economical evaluation, preparation of report, etc.



Interactive Actual Energy Consumption Class (AECC) map

Advantages:

- **Detailed information** about a building and its engineering systems, actual **energy**/water consumption, potential **investments**
- Proper for reconstruction Investment project

Disadvantages:

- Huge **time costs**;
- **Price** – huge time costs leads to high price
- Can be **performed only during heating season** (must be performed metering of temperature, humidity, etc. for not less than two weeks)
- Preparing a report is collected and presented a lot of detailed information about a building, which is required only for an energy audit
- **Impossible** to perform **in a wide scale** – for all city or
- for all country (or it will take few years)



Interactive Actual Energy Consumption Class (AECC) map

BILLS FOR HEATING

Advantages :

- Energy is divided proportionally for every flat

Disadvantages :

- Energy for heating is defined subtracting normative amount for circulation and hot water preparation according to in flats declared amount of hot water
- **Normative heat amount for circulation** is applied for all buildings, but in separate building can differ
- **Amount of declared hot water** differ from total consumed hot water amount in a building, so subtracted heat amount is not precise
- In accordance with the above-presented the energy amount of kWh/m² presented in a bill is **not precise**. This amount of energy **can't be compared with other buildings**, it is influenced by **different** heating seasons **temperatures** and **durations**.



Interactive Actual Energy Consumption Class (AECC) map

Solution?



Interactive Actual Energy Consumption Class (AECC) map

To compare different buildings, various influencing factors must be eliminated

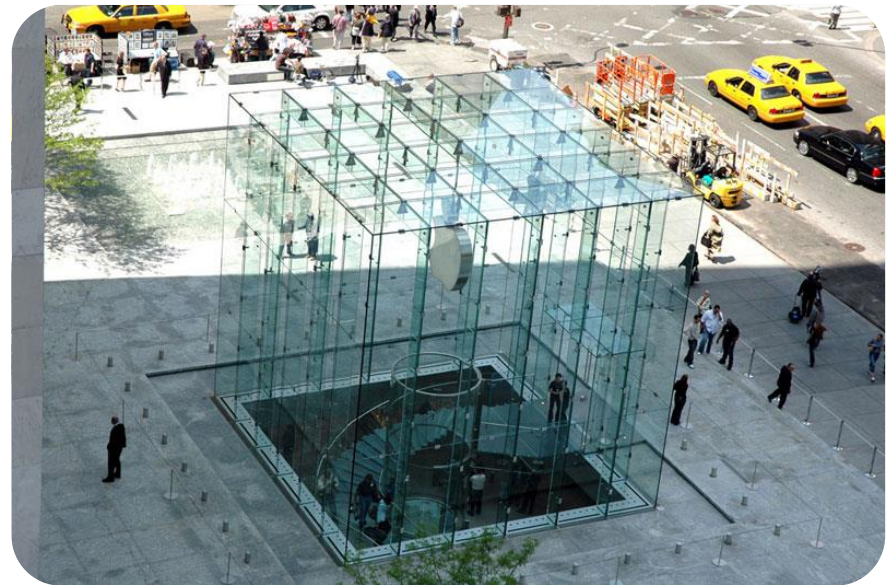
- Areas;
- Hot water consumption;
- Number of days;
- Outside temperature;
- Wind speed ???
- Outside air humidity ???
- Other ???



Interactive Actual Energy Consumption Class (AECC) map

EVALUATION OF ENERGY FOR HEATING

- After influencing **factors** were **eliminated**, finally we got a heat amount to increase **1 m²** of premises temperature by **1° C** per **1 day**;
- According to such criterion can be compared different type of buildings with different heating seasons;



Interactive Actual Energy Consumption Class (AECC) map

Must be defined the separate evaluation criterion, showing actual consumption in a building and which would be comparable

Solution – **Actual Energy Consumption Class (AECC)**

Evaluation principles

- Defined **actual** energy amount for **hot water circulation** and **hot water heating** (not according to declared hot water, not according to normative amount of circulation);
- From total energy amount is subtracted actual energy for hot water heating and circulation. **The actual energy amount for heating is get;**
- Eliminated influence of** different heating seasons **durations** and **temperatures;**
- The result can be **compared** between **different buildings** between **different climatic** conditions and heating seasons;
- Buildings are divided into **15 classes**. **1** – most effective, **15** – worst.

Interactive Actual Energy Consumption Class (AECC) map

ACTUAL ENERGY CONSUMPTION CLASS

No.	Building	AECC
1		1
2		2
3		3
4		4
5		5
6		6
7		7
8	Gedimino av. 100, Vilnius	8
9		9
10		10
11		11
12		12
13		13
14		14
15		15

Best



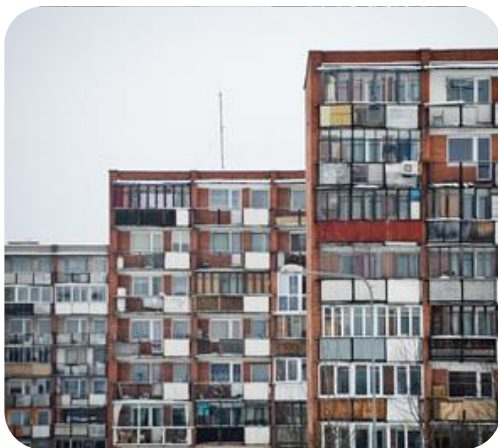
Worst



Interactive Actual Energy Consumption Class (AECC) map

ADVANTAGES OF ACTUAL ENERGY CONSUMPTION CLASS

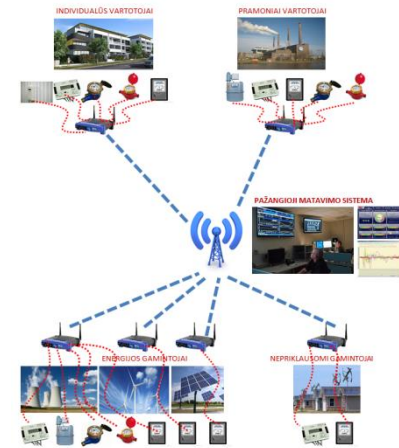
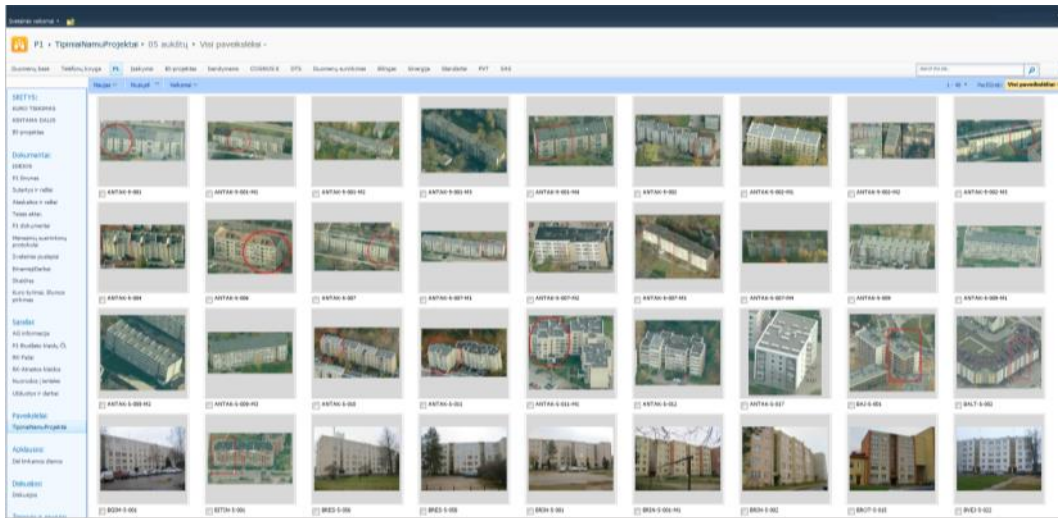
- All **different buildings can be compared** – from smallest to largest;
- Can be compared buildings of the same type. Different types of buildings consumes different amount of energy. Can be analyzed, does a new building consumes too much of energy due to a bad maintenance or does an old building consumes too small amount of energy it should to use, does the **consumption** of building **corresponds to** consumption of **such type of buildings**.



Interactive Actual Energy Consumption Class (AECC) map

Development of AECC was possible due to: **Wireless distant Smart data collection & monitoring system Rubisafe, CRM, COGNOS** and other developed intellectual systems

- Buildings under analysis are divided into **groups** according to the same **project types**: more than **330** projects and **740** modifications.



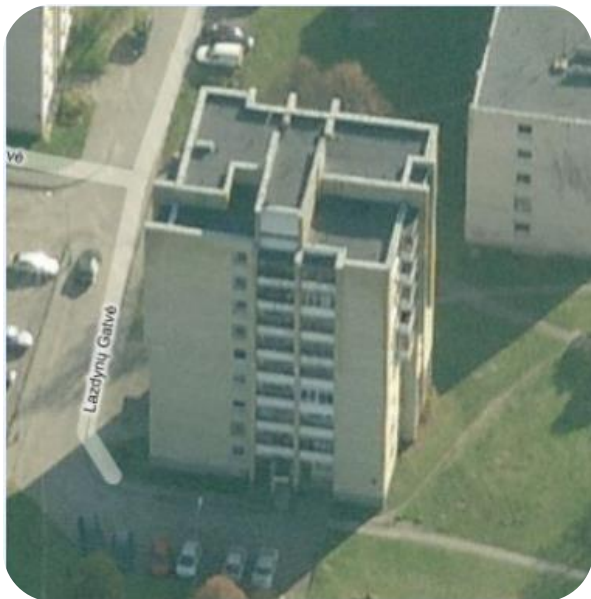
Compare a different types during different heating seasons

- By the help of smart intellectual systems **we know** about our buildings **everything** – from construction type to heating system regime and energy consumption

Interactive Actual Energy Consumption Class (AECC) map

Vilnius according to typical projects:

Total: **330** typical projects and **740** additional modifications of these types



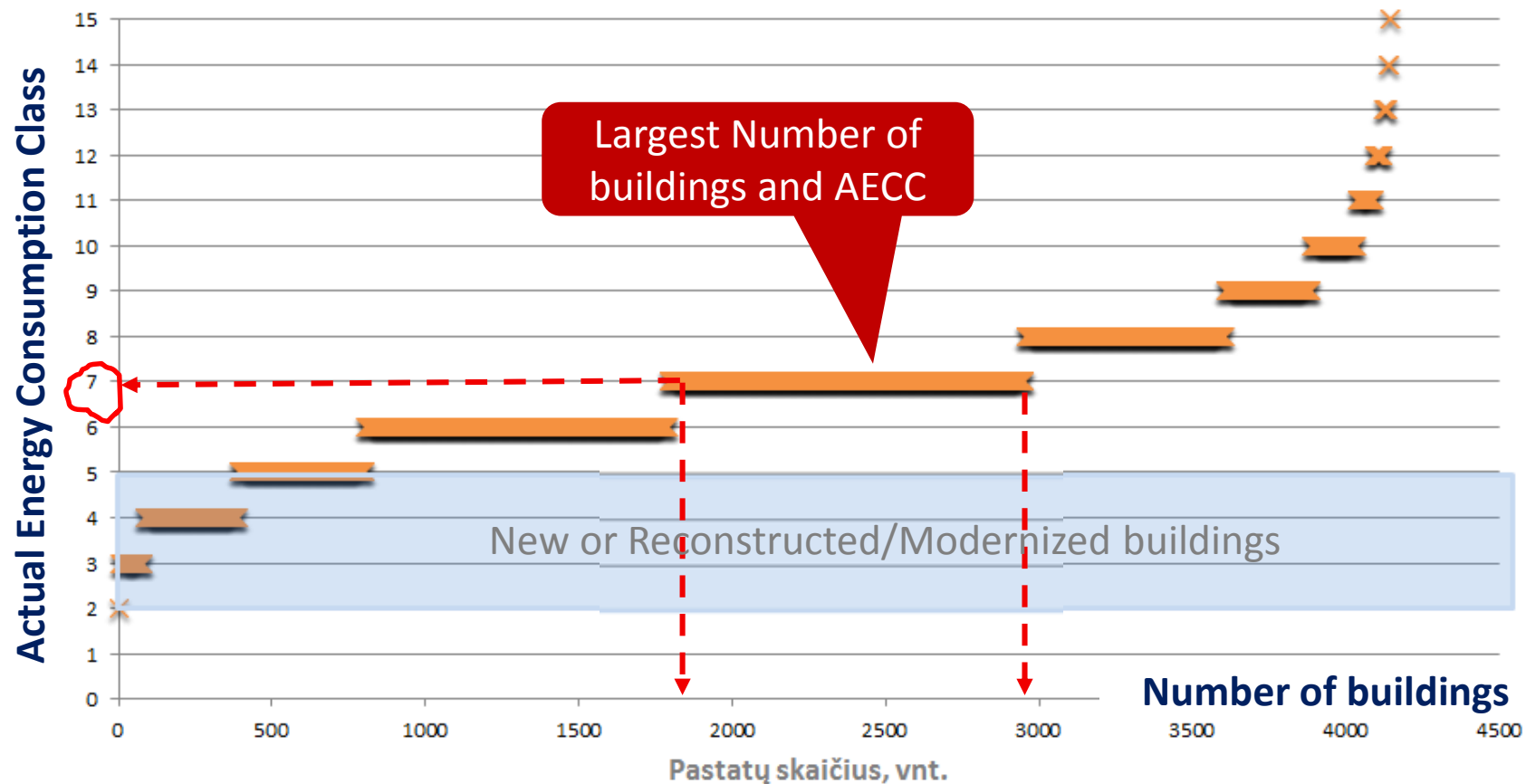
LAISV-9-001-M1



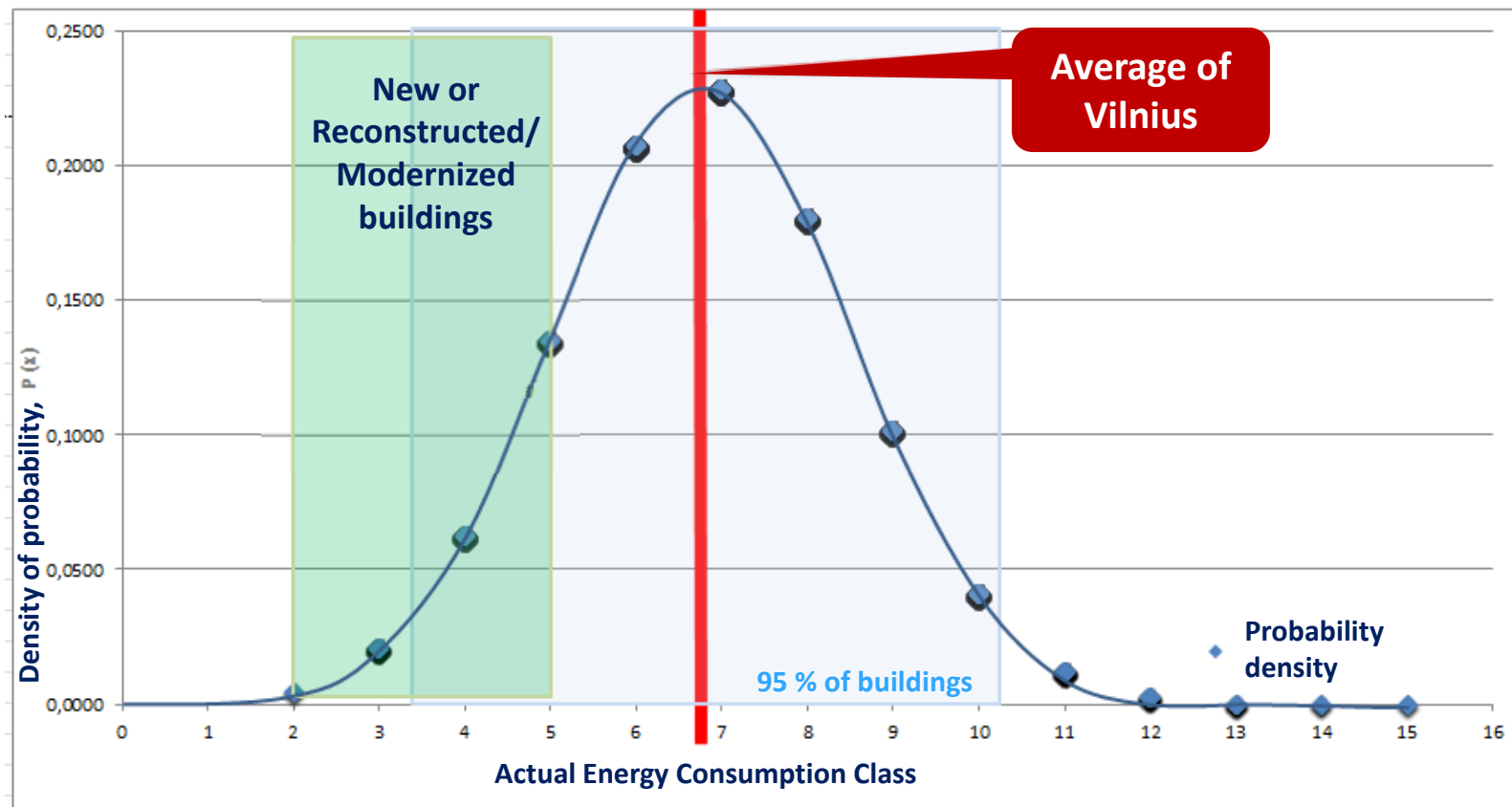
LAISV-9-001-M2

Interactive Actual Energy Consumption Class (AECC) map

ACTUAL ENERGY CONSUMPTION IN BUILDINGS



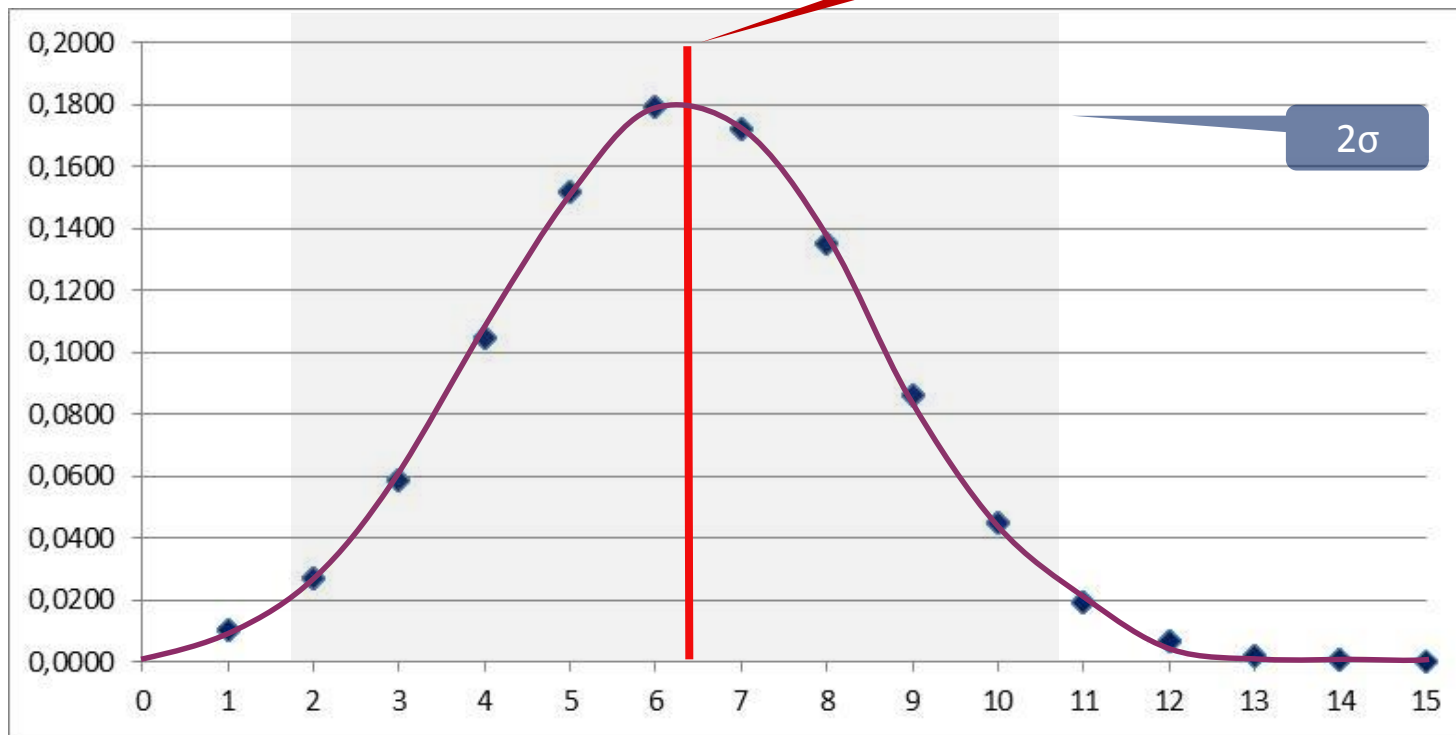
Interactive Actual Energy Consumption Class (AECC) map



Interactive Actual Energy Consumption Class (AECC) map

Multiflat dwelling buildings (all), 2012/2013:

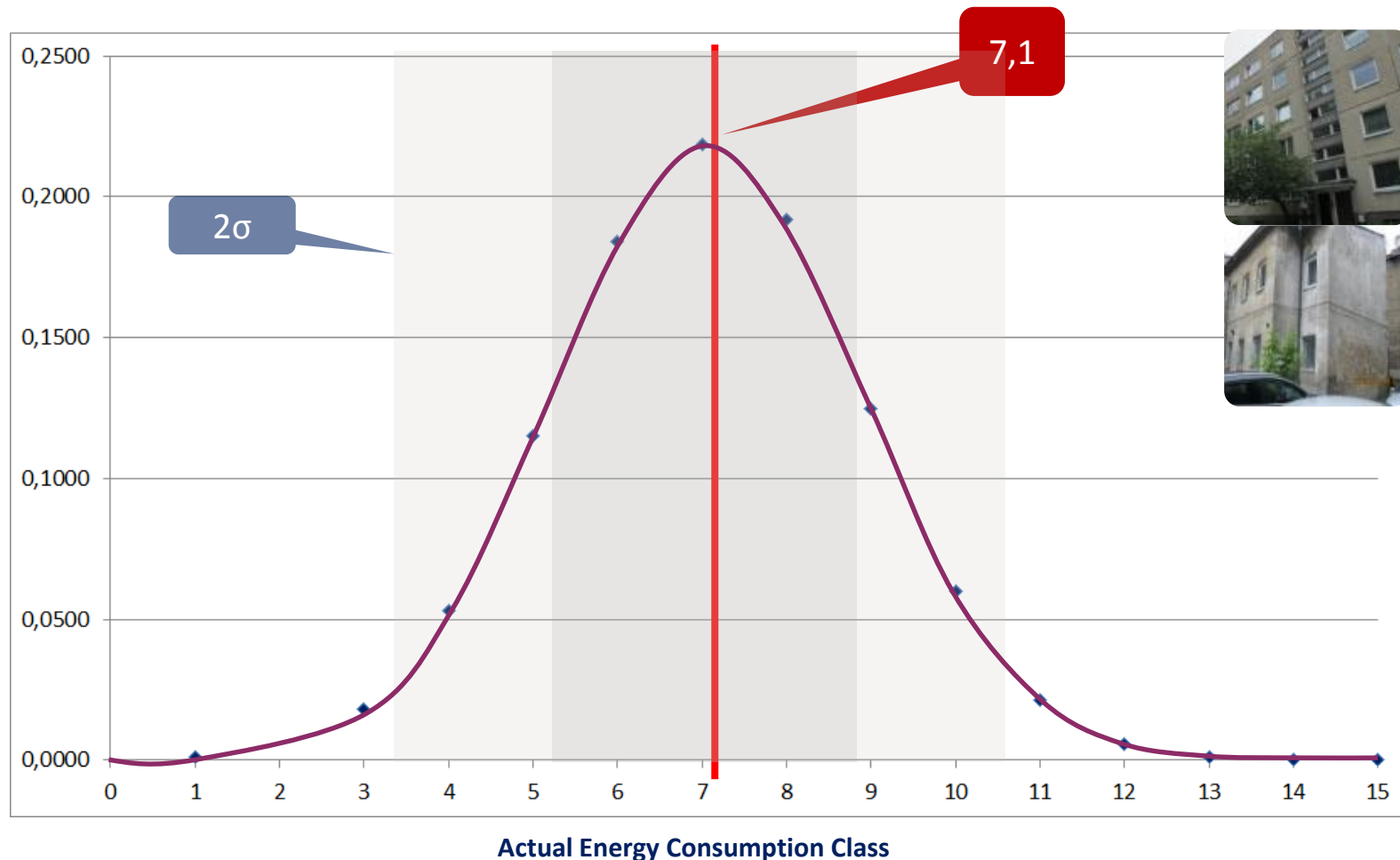
Vilnius multiflat b.
(all) 6,3



Actual Energy Consumption Class

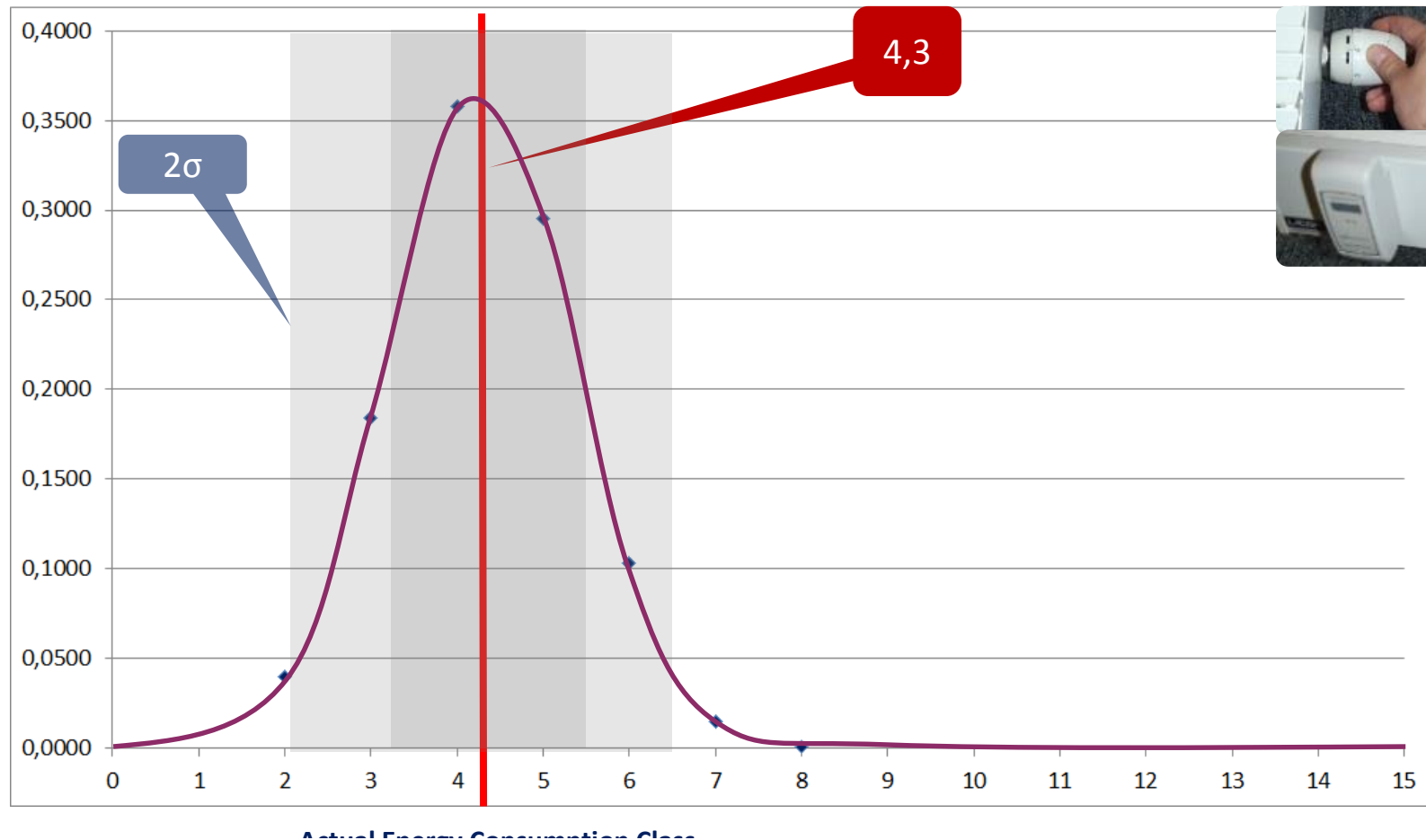
Interactive Actual Energy Consumption Class (AECC) map

Multiflat buildings **until 1992 year, without heat cost allocators, not modernized:**



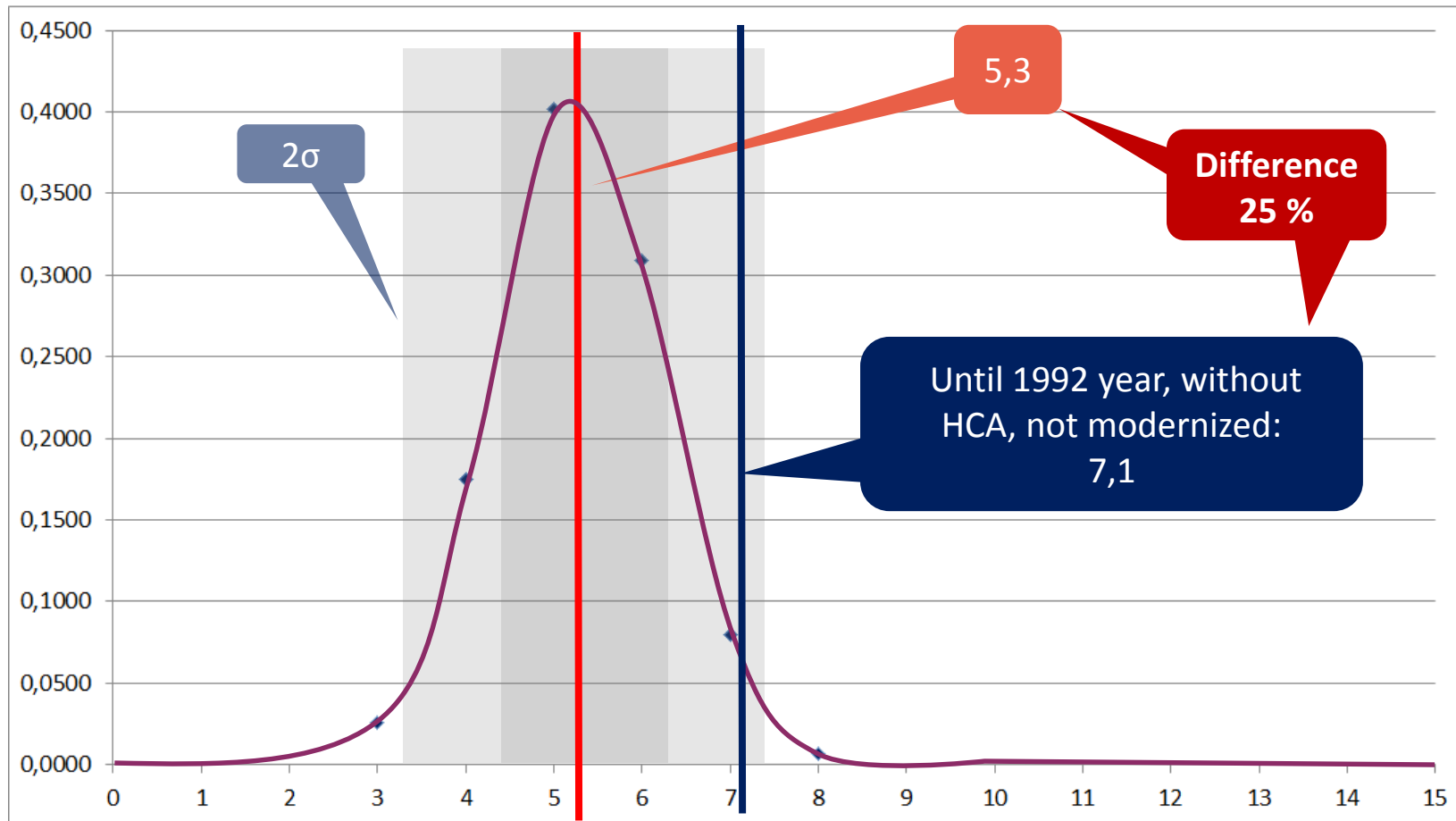
Interactive Actual Energy Consumption Class (AECC) map

All multiflat buildings – **with heat cost allocators, old, modernized, new:**



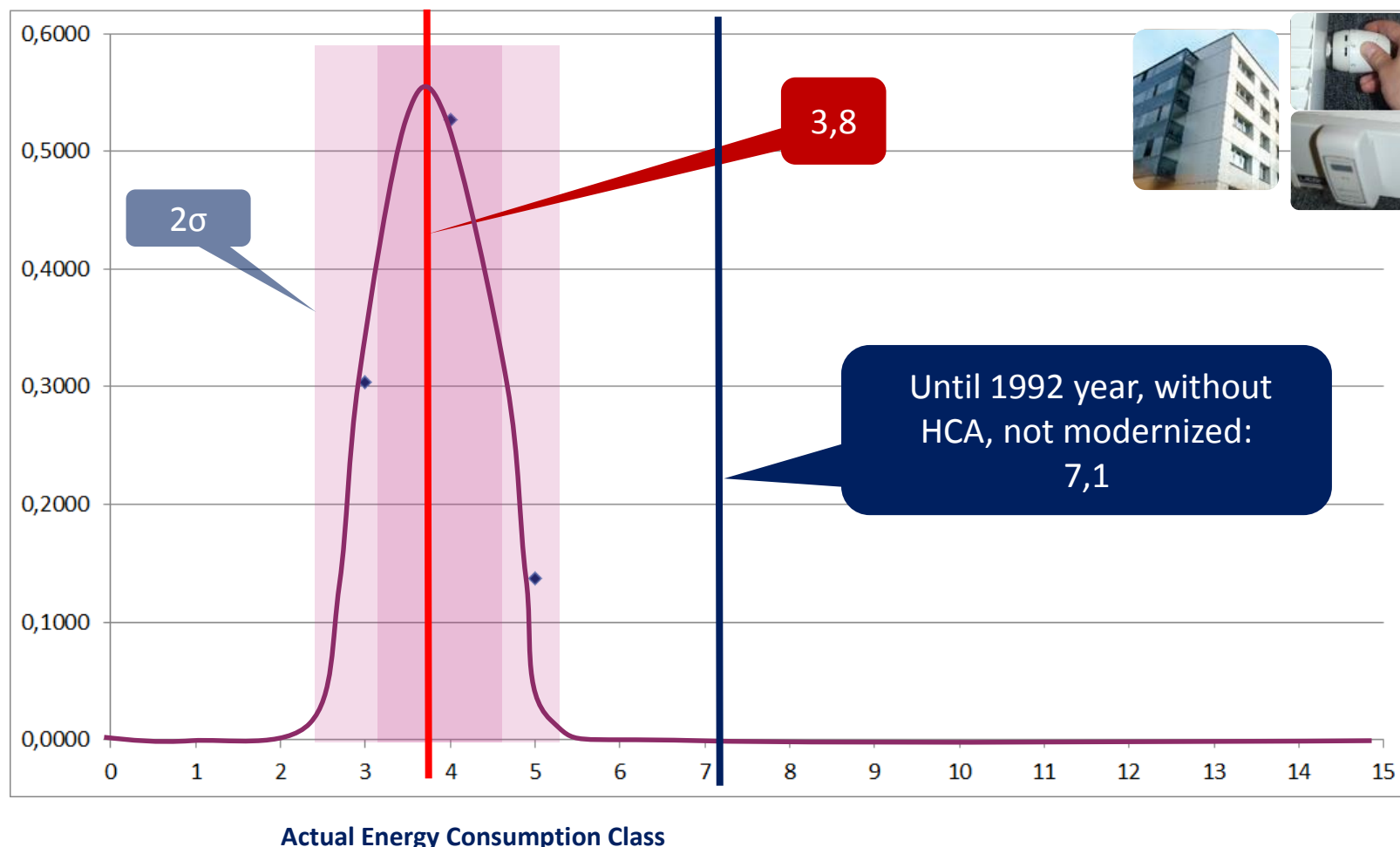
Interactive Actual Energy Consumption Class (AECC) map

Multiflat buildings **until 1992 year, with heat cost allocators (HCA), not modernized:**



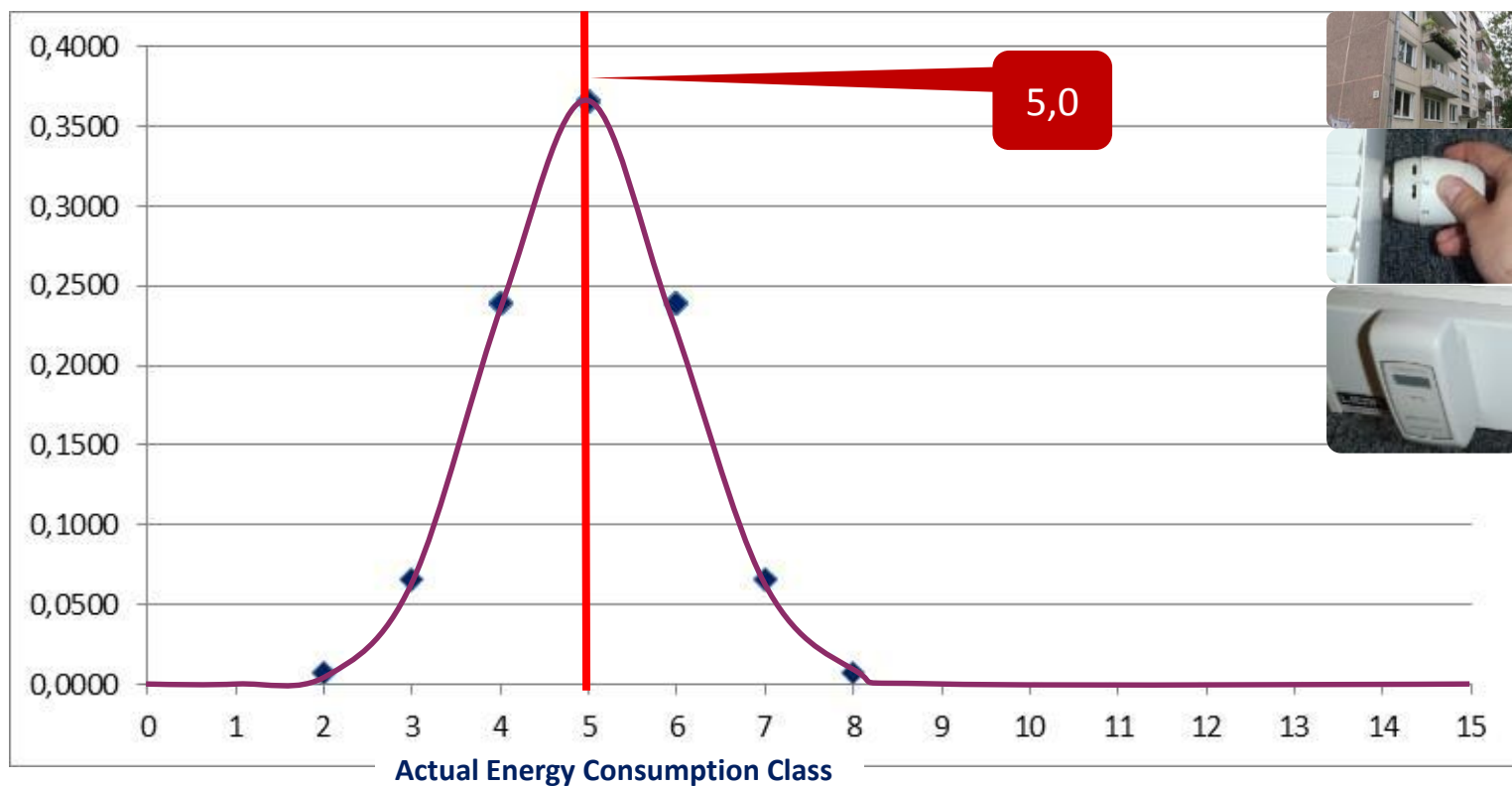
Interactive Actual Energy Consumption Class (AECC) map

New multiflat buildings **with** Heat cost allocators:



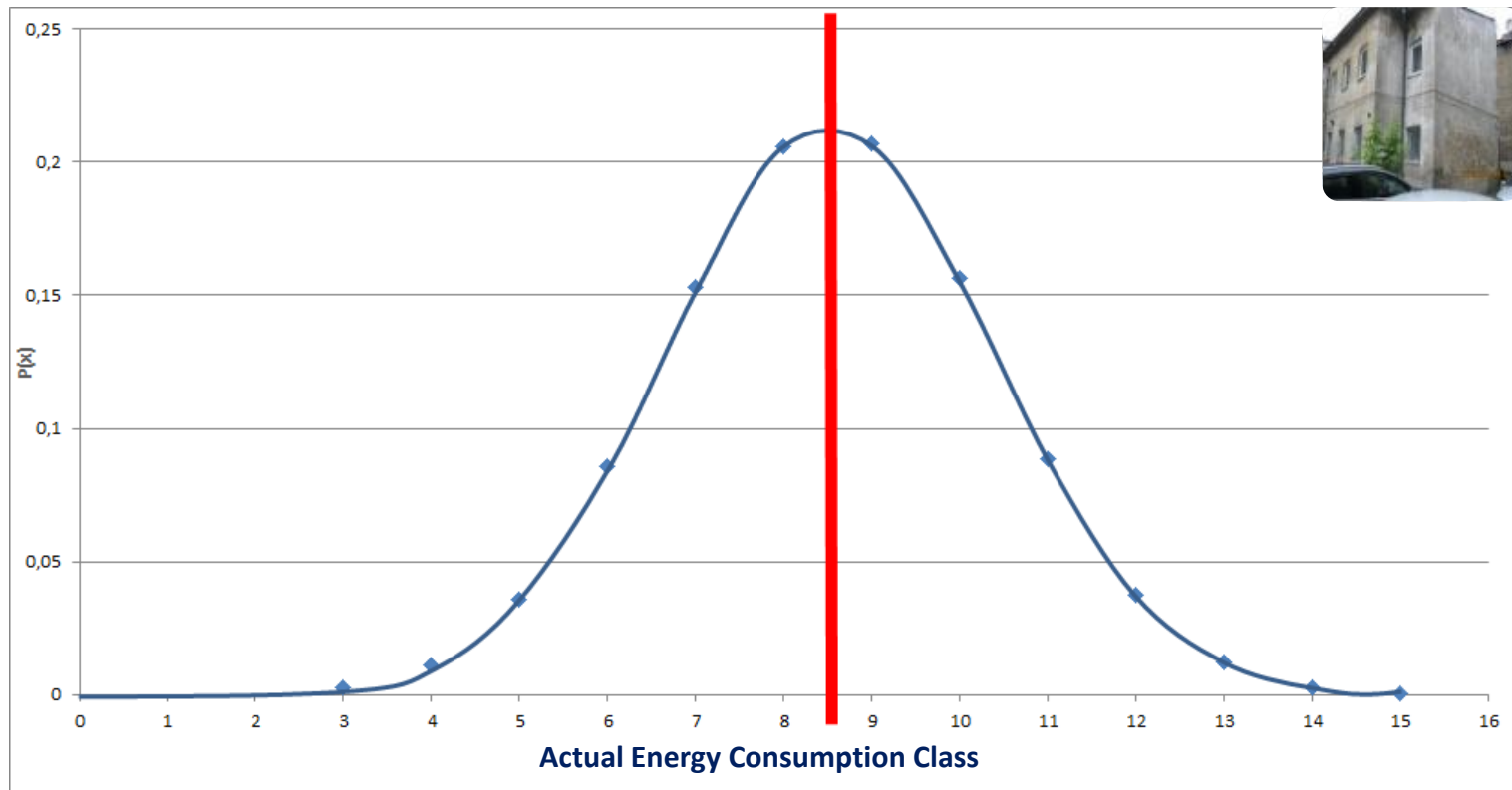
Interactive Actual Energy Consumption Class (AECC) map

Multiflat buildings of 1960-1992 year **with Heat cost allocators consumes ~20-30 % less of heat energy:**



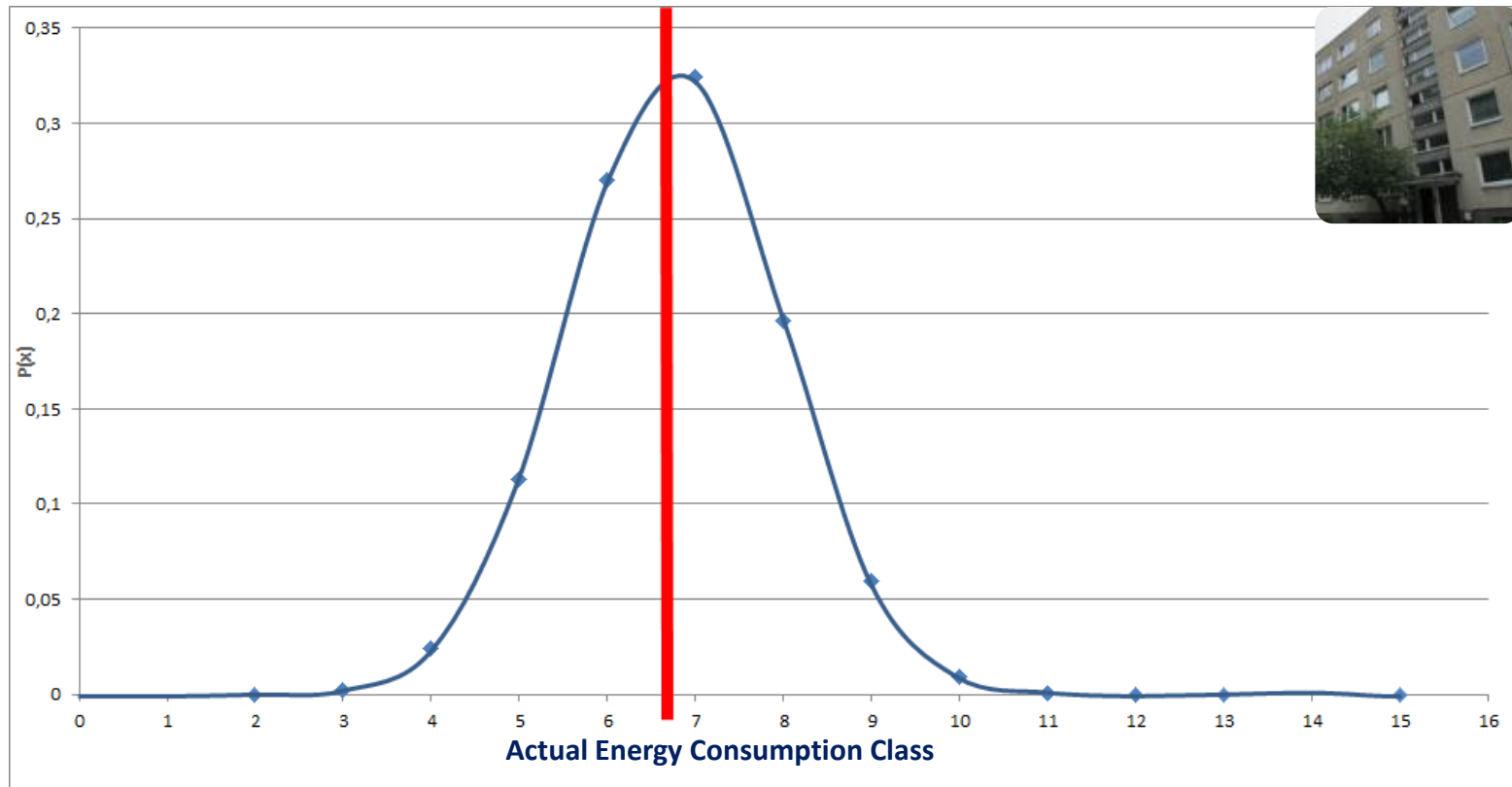
Interactive Actual Energy Consumption Class (AECC) map

Until 1960 year:



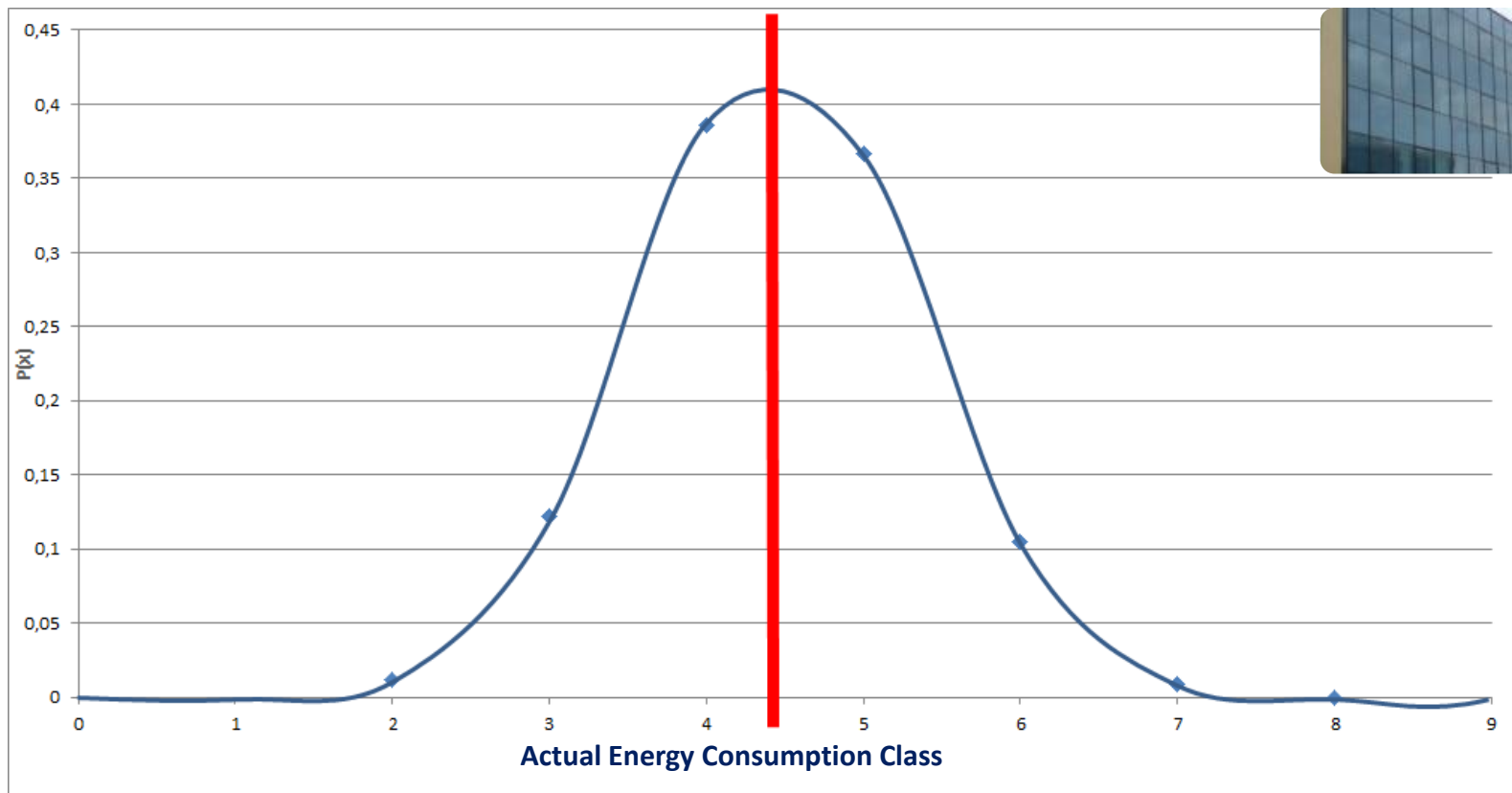
Interactive Actual Energy Consumption Class (AECC) map

1960-1998 year:



Interactive Actual Energy Consumption Class (AECC) map

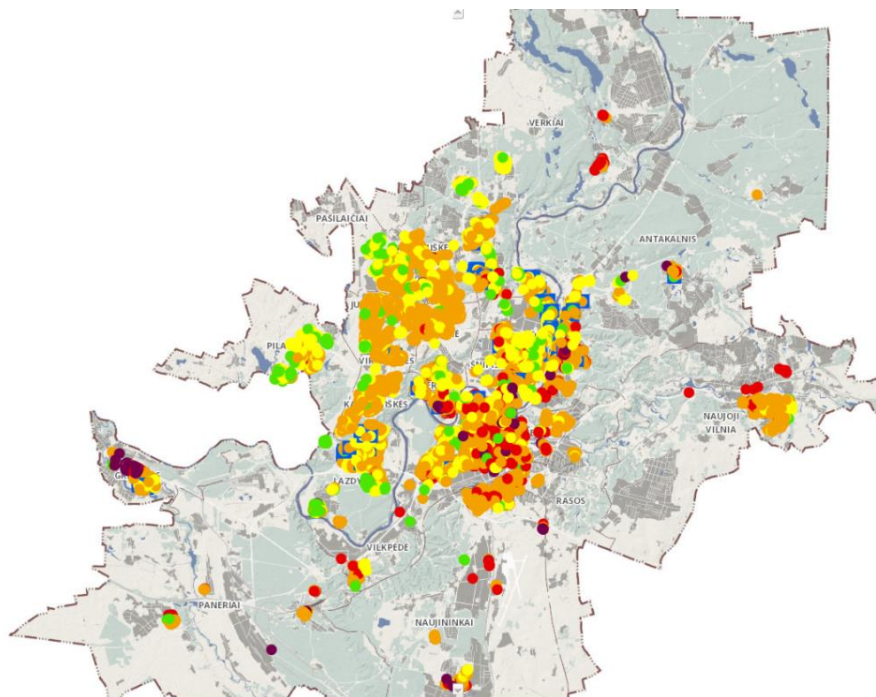
After 1998 year:



Interactive Actual Energy Consumption Class (AECC) map

INTERACTIVE ACTUAL ENERGY CONSUMPTION CLASS MAP

<http://www.vilnius.lt/vmap/t1.php?layershow=siluma>

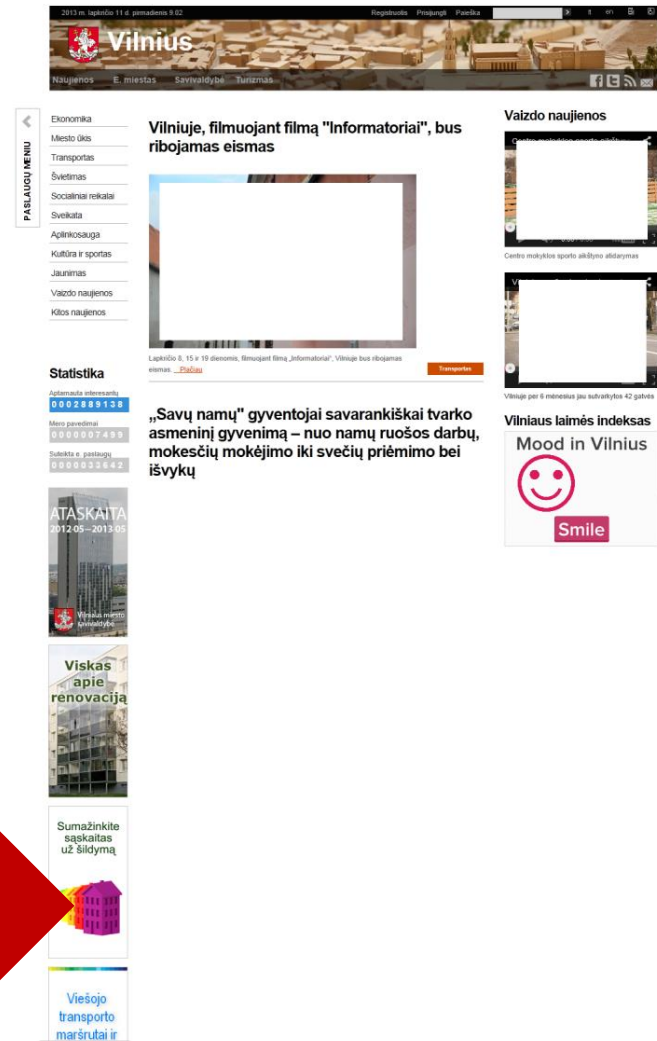


Interactive Actual Energy Consumption Class (AECC) map

Interactive Actual Energy Consumption Class Map.

Vilniaus city municipality page:

- 1. www.vilnius.lt
- 2. Choose an icon: „Sumažinkite sąskaitas už šildymą“



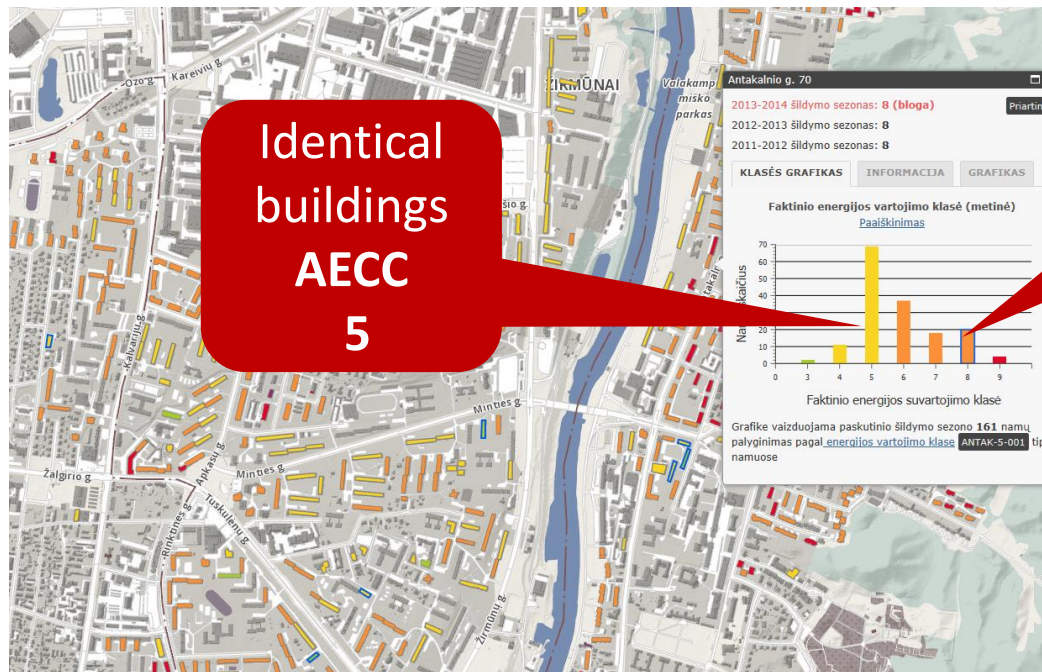
Interactive Actual Energy Consumption Class (AECC) map

City plan – district of multiflat buildings:



Interactive Actual Energy Consumption Class (AECC) map

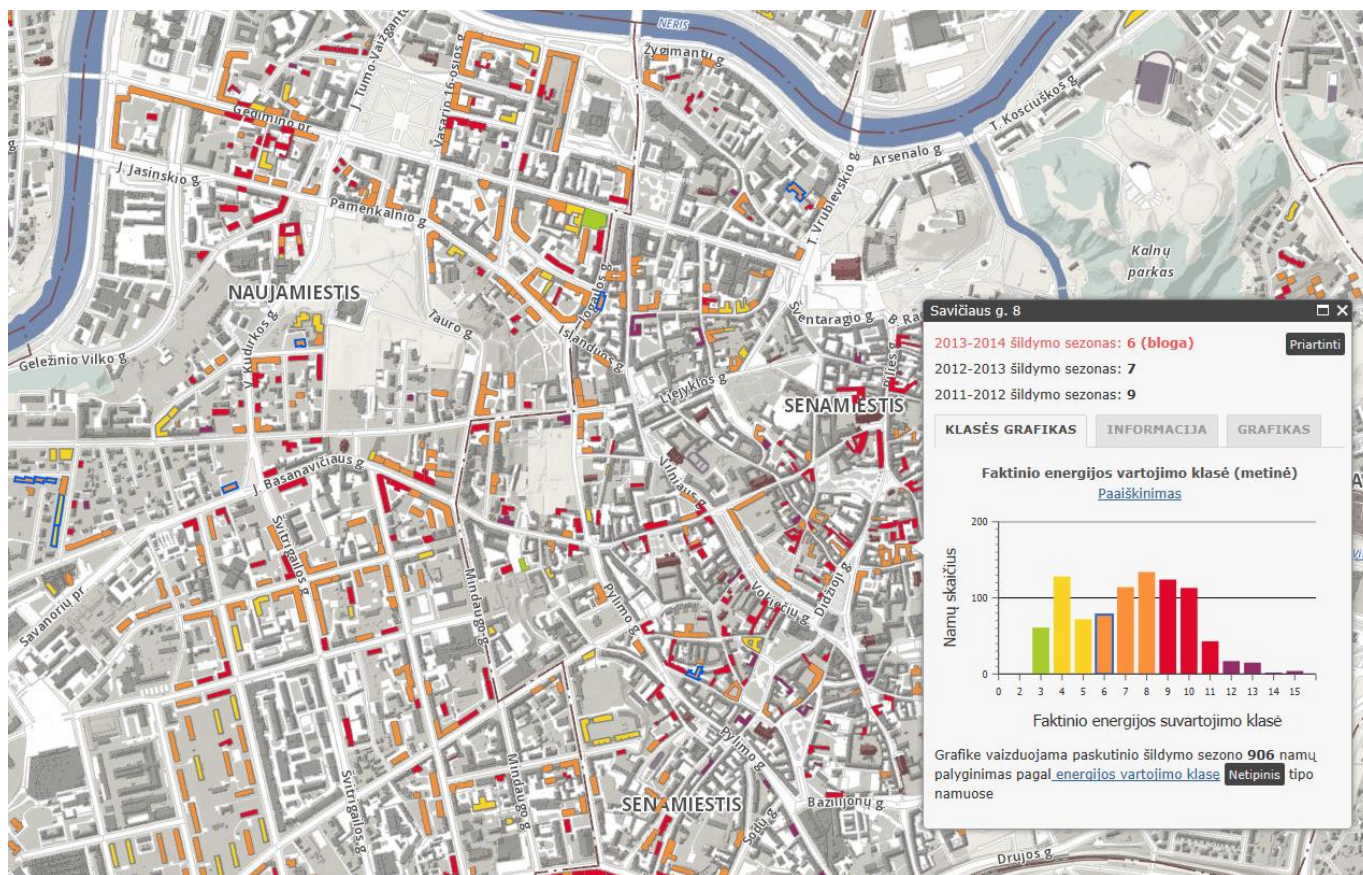
Delegate (return) responsibility for a huge energy bills from heat supply company to a heating systems maintenance company (or building administrator)



- Selected buildings of identical project type
- Selected building has AECC–8, then the largest part of such project type buildings has AECC–5

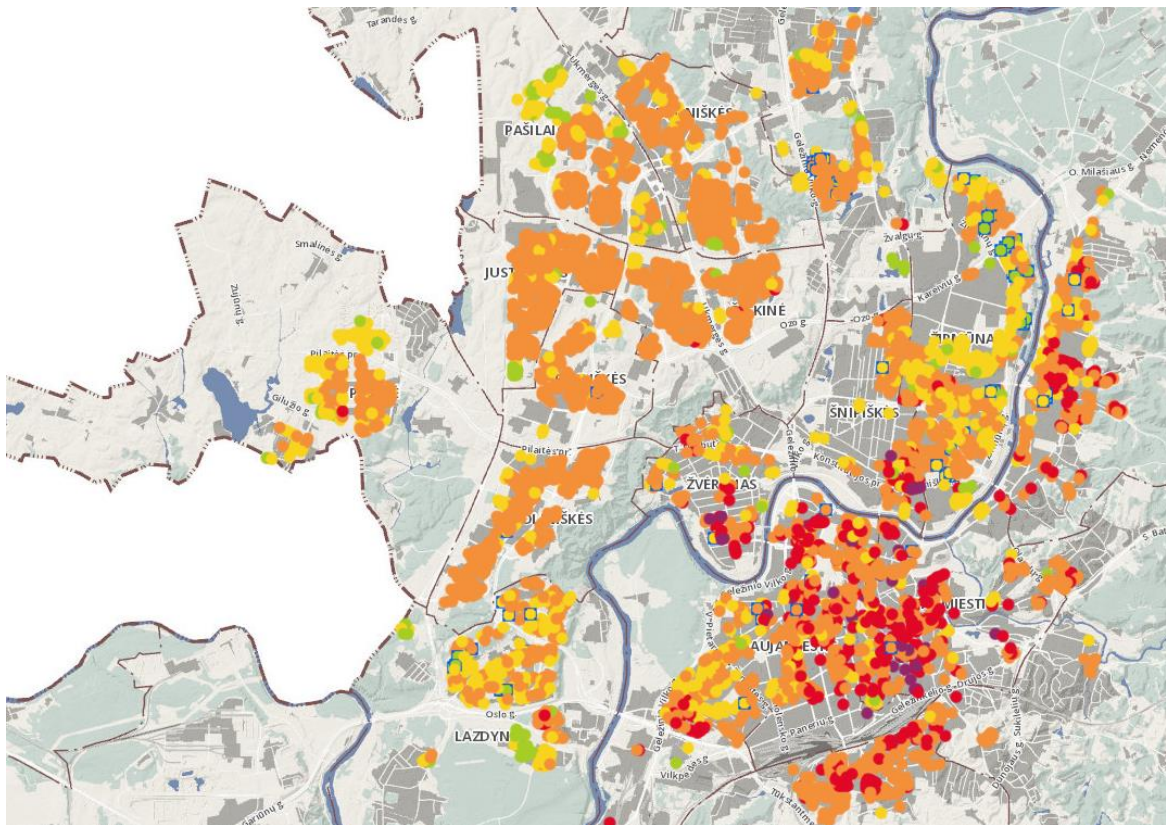
Interactive Actual Energy Consumption Class (AECC) map

Old town view



Interactive Actual Energy Consumption Class (AECC) map

Strategic Energy Efficiency plan for a whole City (reconstruction (insulation), District heating development, etc.):



Interactive Actual Energy Consumption Class (AECC) map

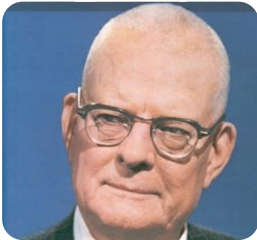
- **AECC – Winner** of “**EUROCITIES 2014**” for Innovation in Energy:

ENERGISING CITIES
Munich 5-8 November
M  **YOU**
MUNICH LOVES YOU
EUROCITIES 2014



- Short film in **YouTube** :
- <https://www.youtube.com/watch?v=KiVII7hqsI0>
- Or find on **Google**: “Interactive Actual Energy Consumption Map”

Interactive Actual Energy Consumption Class (AECC) map



William Edwards Deming (October 14, 1900 – December 20, 1993) was an American statistician, professor, author, lecturer, and consultant

YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE



Interactive Actual Energy Consumption Class (AECC) map

THANK YOU



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