Global District Energy in Cities Initiative

ENCOURAGING ENERGY EFFICIENCY BY THE HELP OF BIG DATA MANAGEMENT AND GIS TOOLS

DISTRICT ENERGY IN CITIES

A GLOBAL INITIATIVE TO UNLOCK THE POTENTIAL OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

UN environment

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- **Local Governments** often need more detailed information on the current and future geographical distribution of energy use at the neighbourhood and building levels, as well as on local heat and energy assets and distribution structures.
- This can be achieved through an **Energy Mapping** process that analyses the local conditions, such as sources of **excess heat**, **renewable** heat assets (geothermal and solar), and concentrations of **heat or cooling demand**.
- Taking into account the principles of **Energy Mapping** and some specifics of every country and city, the **Energy Mapping** methodology has been developed and adopted for Cities;
- For the evaluation of actual energy consumption performance the separate evaluation criterion showing actual consumption of a building and being comparable between others has been developed (**Energy Performance Class for District Heating Customers (EP^{Class})**);

- **Energy maps** for district energy can contain, among other variables, data on:
- **Existing and projected energy** consumption by sector, **fuel source** or neighbourhood; the resulting **emissions** and pollution and an understanding of the load profile;
- Present and future **building density** and **type** (residential, commercial, etc.);
- Sources of surplus or **industrial heat** supply;
- **Large energy consumers** and buildings with potential excess heating or cooling capacity (e.g., buildings for events such as a stadium or arena)
- Current networks and potential **network routes**;
- Potential **anchor loads** and their energy consumption;
- **Barriers and opportunities** particular to the location related to local energy sources, distribution, transport, land use, development density and character;
- **Socio-economic** indicators to identify fuel-poor areas that could benefit.

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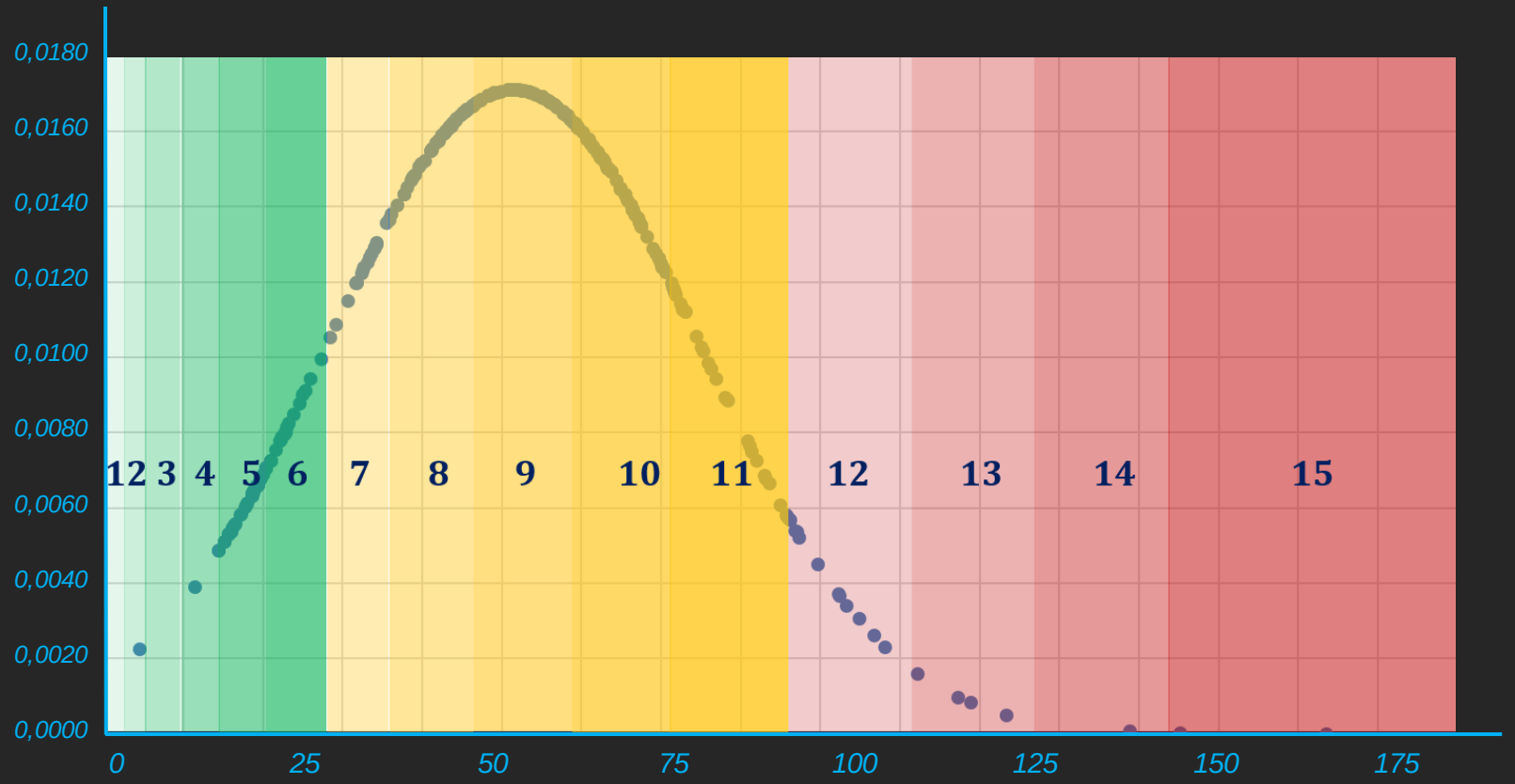
- **Vilnius City case**

BIG DATA STATISTICAL ANALYSIS OF ACTUAL ENERGY PERFORMANCE CLASS FOR GIS APPLICATION



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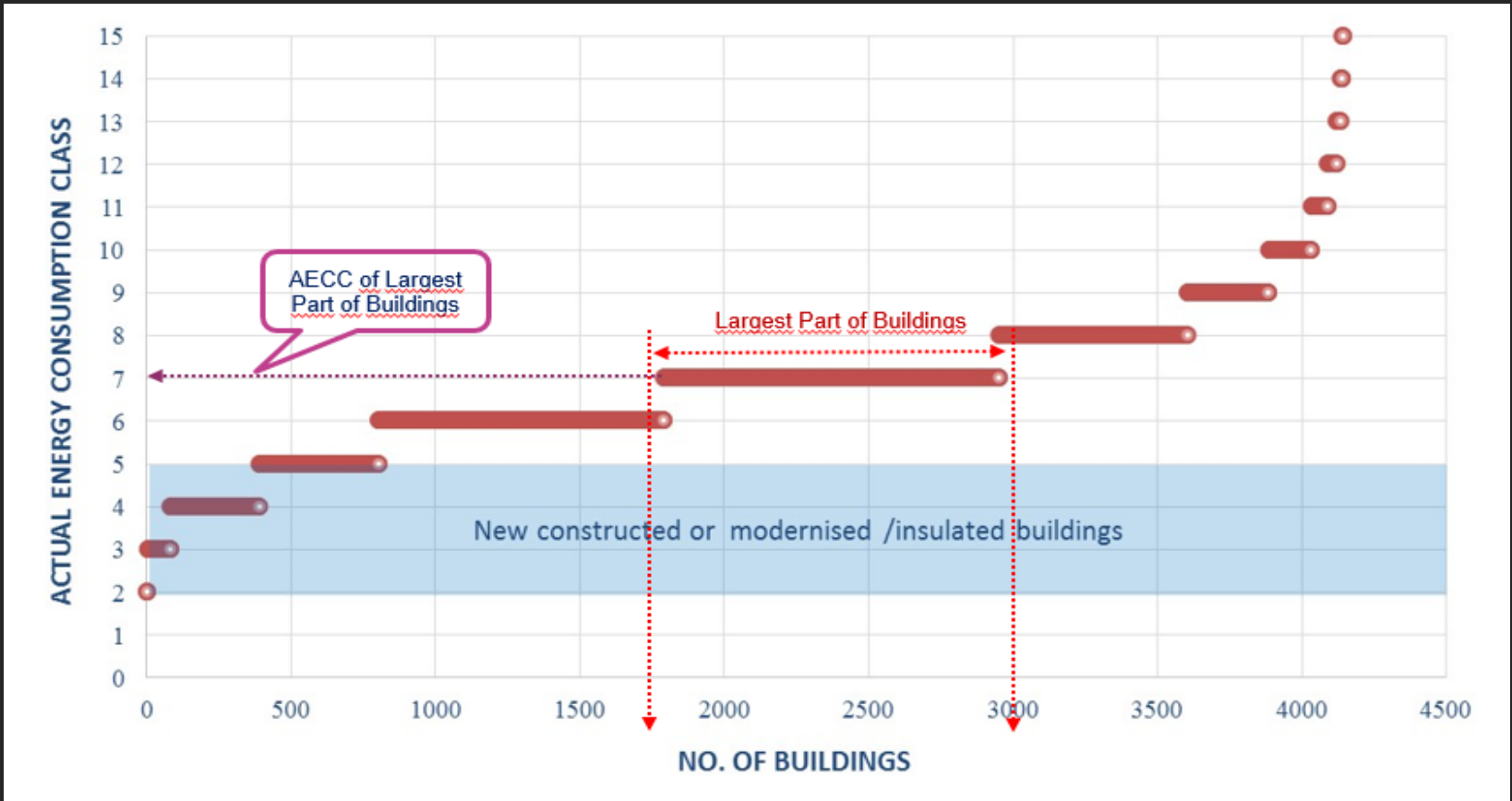


EXAMPLE OF ACTUAL ENERGY PERFORMANCE CLASS FOR DISTRICT HEATING CUSTOMERS

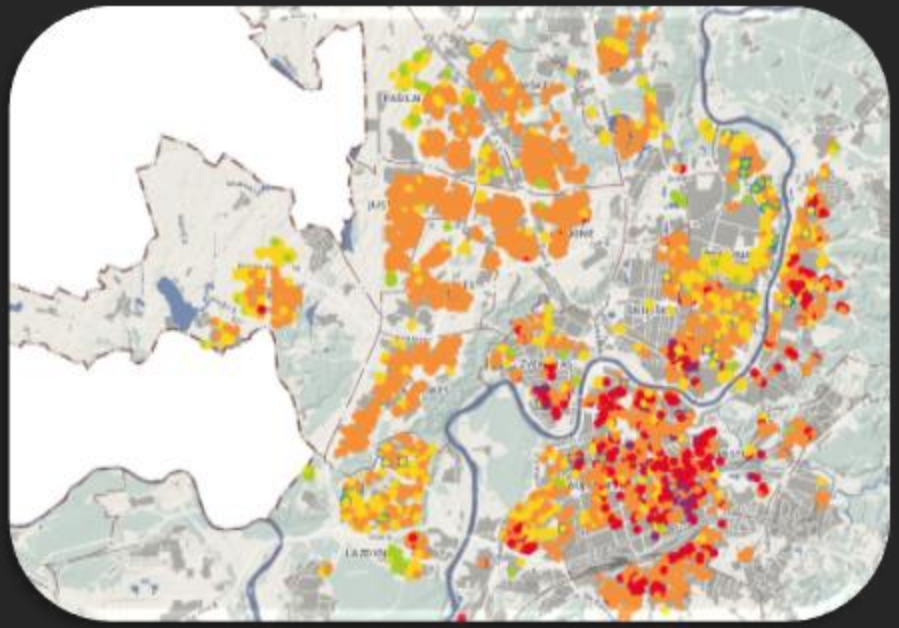
Best

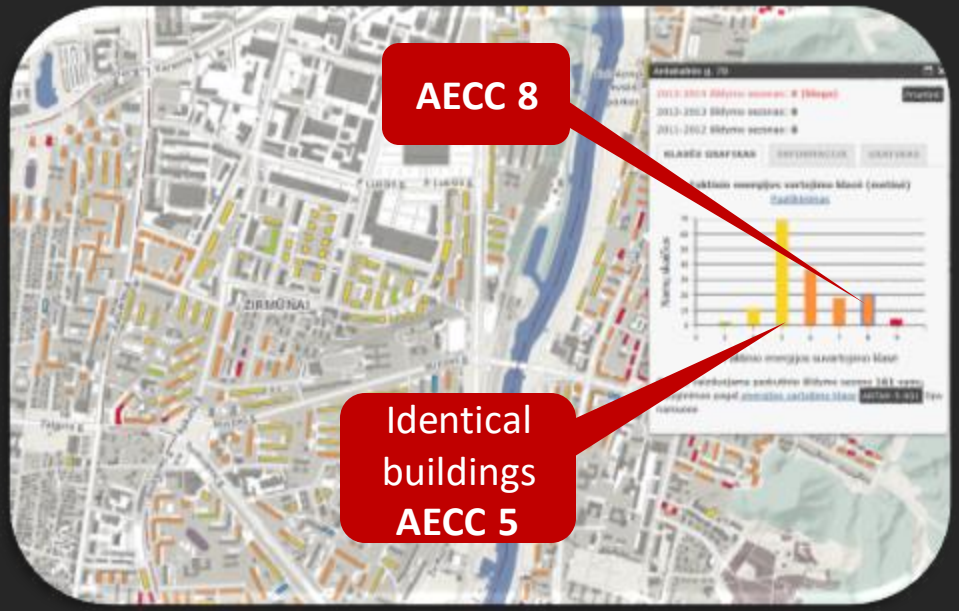
EP^{Class}	Description
0	Zero energy consumption building
1	Low energy consumption
2	Low energy consumption
3	Low energy consumption
4	Low energy consumption
5	Low energy consumption
6	Low energy consumption
7	Average energy consumption
8	Average energy consumption
9	Average energy consumption
10	Average energy consumption
11	Average energy consumption
12	High energy consumption
13	High energy consumption
14	High energy consumption
15	High energy consumption

Worst

ADVANTAGES OF ENERGY MAPPING AND ENERGY PERFORMANCE CLASS

- **Analytical tools** in Energy Map **encourage customers** for Efficient Energy use.
- Showcases of **Refurbished** buildings.
- **Strategic** City Energy development **plan**.

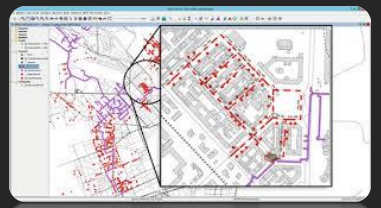




ADVANTAGES OF ENERGY MAPPING AND ENERGY PERFORMANCE CLASS

- **Energy Consumption Efficiency** of all different buildings (Final Customers) can be compared between – from smallest to the largest;

- It encourages **Customers to take an active role in Energy Management**;
- As for better Energy Management engineering systems should be upgraded, it will stipulate the **technical progress and upgrade of HVAC systems inside buildings** - from thermostatic valves, balancing valves, heat substations to the heat and hot water metering for a whole building and individual metering for every final customer (flat), switching from square meters based billing to meter based billing, also it can be useful to Manage and balance District Heating Network grid more efficiently, take a decisions on a DH Network pipes replacement.



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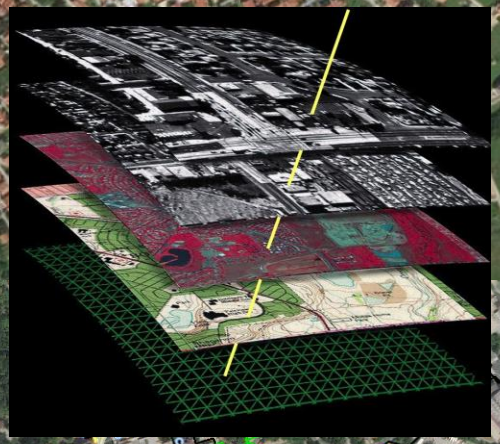
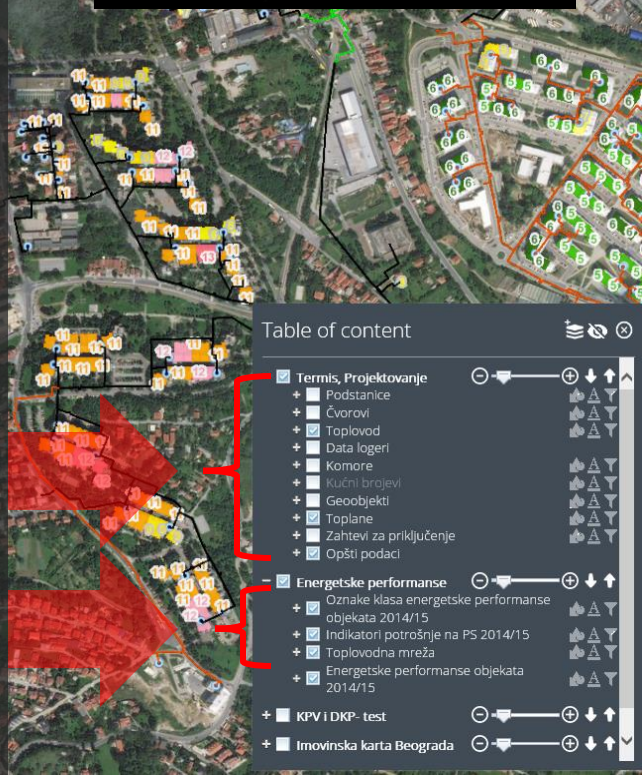
TRANSFERRING KNOWLEDGE OF APPLYING DIGITAL DATA ON A GIS PLATFORM LAYERS

Belgrade case:

- Energy Map for **Belgrade** area has been created.
- Based on a data the **layers on a GIS platform** have been created:
  - District heating **pipe network** and related data;
  - **Energy Performance** of Final Customers (in Colours and Numbers);





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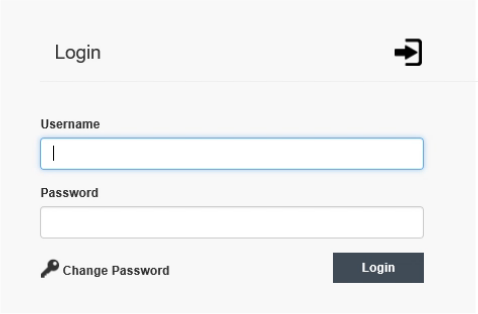

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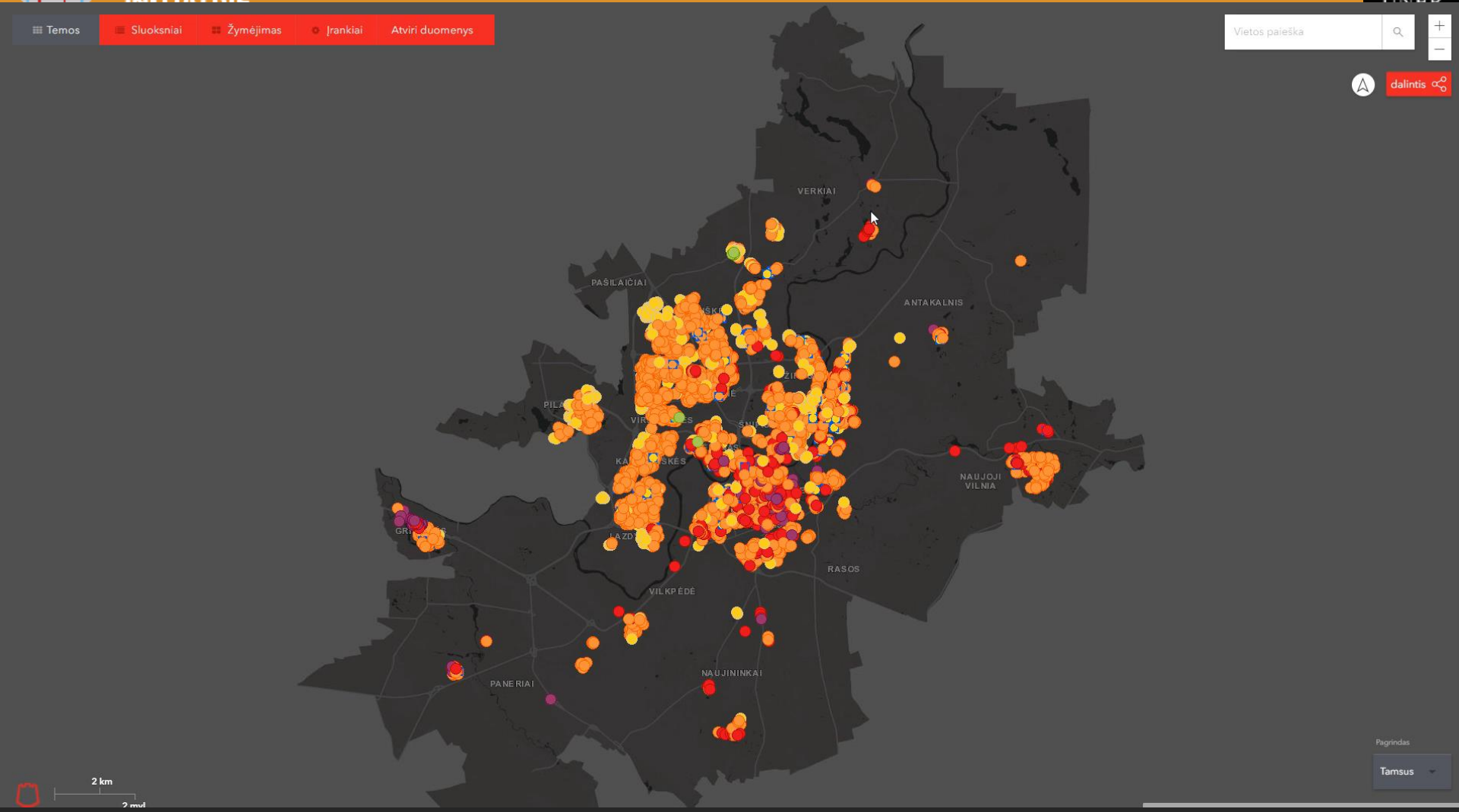
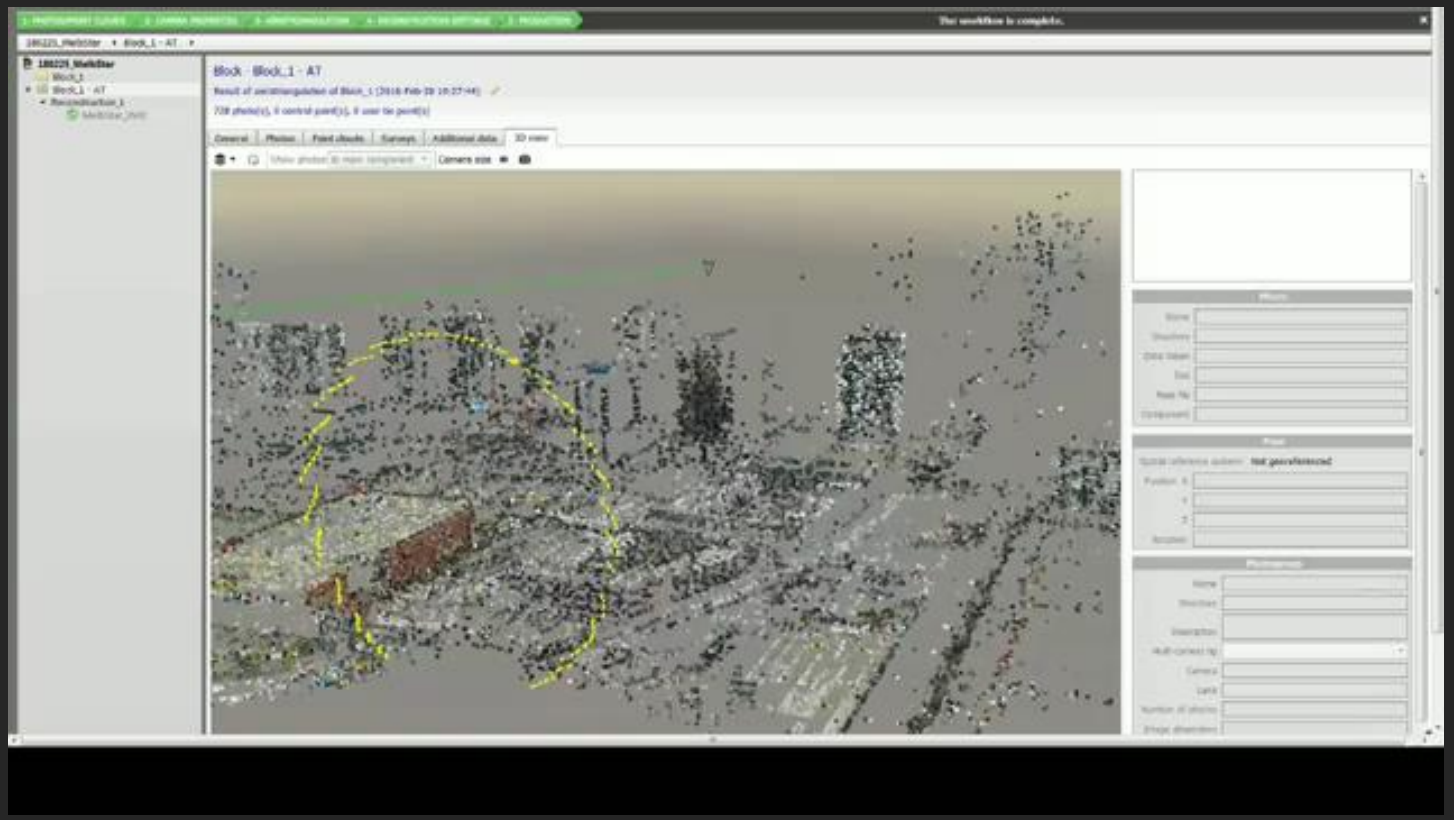


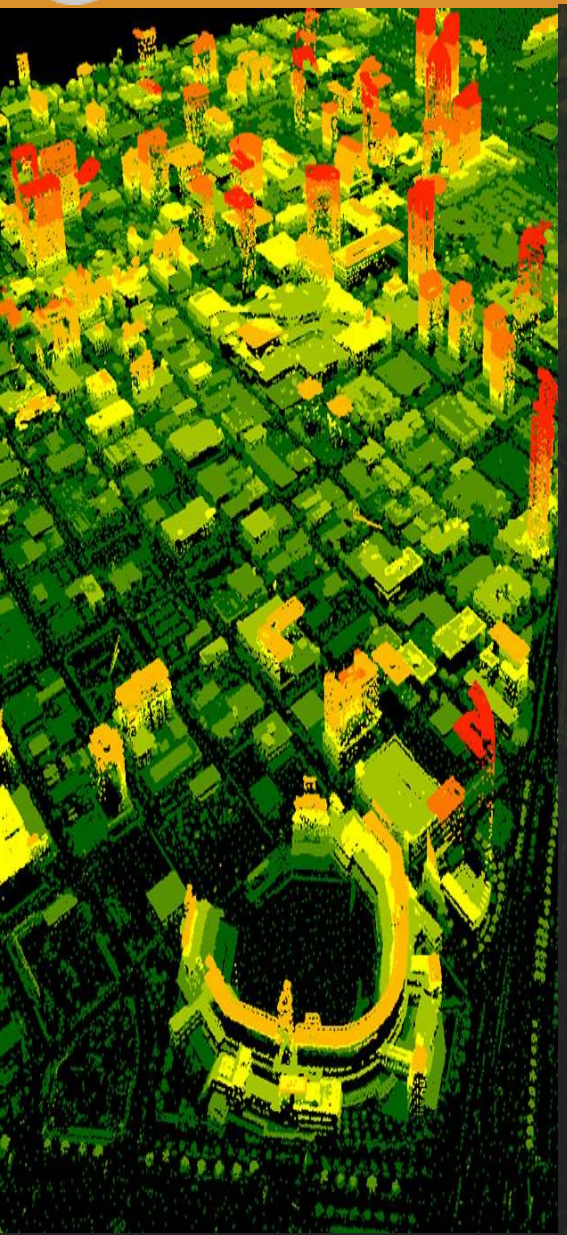
NEXT GENERATION ENERGY MAPPING

- **Photogrammetry** can help city buildings transfer into 3D shapes



NEXT GENERATION 3D ENERGY MAPPING

- **Panevezys** city map digital transfer into 3D



The **major barriers** for **application of GIS and Big data** methods in energy transition projects

- The application of GIS and BIG data methods usually is very important for the strategic city planning what is the role of local **governements/municipalities**. But the local governments usually do not have the **capacities and workforce** to do this, they may not have a **budget** for this activity (the budget for the city sometimes is politically sensitive), some quite small municipalities do not use and **don't have a licence for the GIS**.
- The **private sector** (for example having a concession of District Heating Systems for 30 years in a city or etc.) may have a required experience and capacities but this activity may **be not direct profit orientated**, so the private sector may **lack a motivation** to work on this.

Legal and **organizational practices** to mitigate or **remove** the existing **barriers**

- There are **no any specific restrictions** from the legislation side, so no so many legal barriers.
- **Legal framework improvements** can be used **to facilitate** faster projects implementation (create city strategy including GIS and BIG data in the activity and etc.). The optimal solution would be to **engage the public and private sector** to have **common goals** leading to a certain implementation project. In energy transition process these applications should be very well orientated to the final consumer level - well **disseminated and open source**.

The **role institutions and utilities** play nowadays in creation and share of **geo-spatial and Big data**

- The **utility companies are the main workforce** and competence centres and **institutions are like platforms for the realisation** and dissemination publically.

The **balance** between **Open access** and **Personal data protection policies** with regards to energy-related data

- The **personal data** are the data of certain **final customer** as his name, address or amount of consumed data.
- The GIS and BIG Data can be presented in such way that this information **would not be necessary presented**. In a Vilnius City case this issue has facilitated to develop **special actual energy consumption methodology** and final results are special normalised indices for the buildings (not final consumer), so **no personal data presented**. We do not have to go to the final consumer/apartment level data, as the main criterion is a building. Inside building, every consumer can increase/decrease heat consumption according to his needs by the help of thermostatic valves/automatics and to see impact on the heat meter. if no apartment level heat meters installed, also there is no necessity to go to apartment level private data. Also we can go deeper to the data of every room but there is no necessity for that.

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THANK YOU