

Helsinki's energy data into 3D City Model

Petteri Huuska



Helsinki

A long planned dream

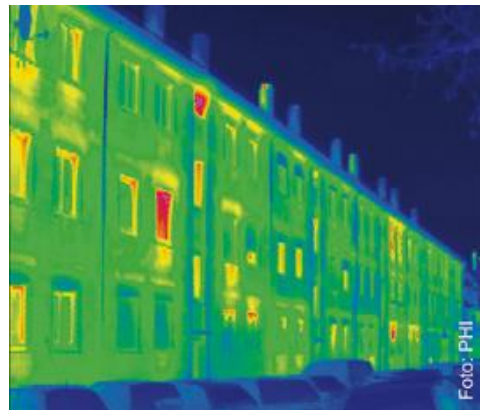
- The wake-up call came from Turku Nordic Solutions-conference (2011), inspirational presentation by Odense (2D heat map)
- Realization what open energy data can offer:
 - support building owner's interest on the performance of their buildings and to see the potentials
 - To support cleantech businesses possibilities to develop needed services and see the potentials where they can help best
 - To ease city and climate planning and energy advising (visuality helps decision-making)
- Helsinki has been in forefront in open data (HRI) and has a huge amount of data -> why don't we do the same or more?



Collection of ideas starts



- NY, energy by blocks <http://sel-columbia.github.io/nycenergy/>



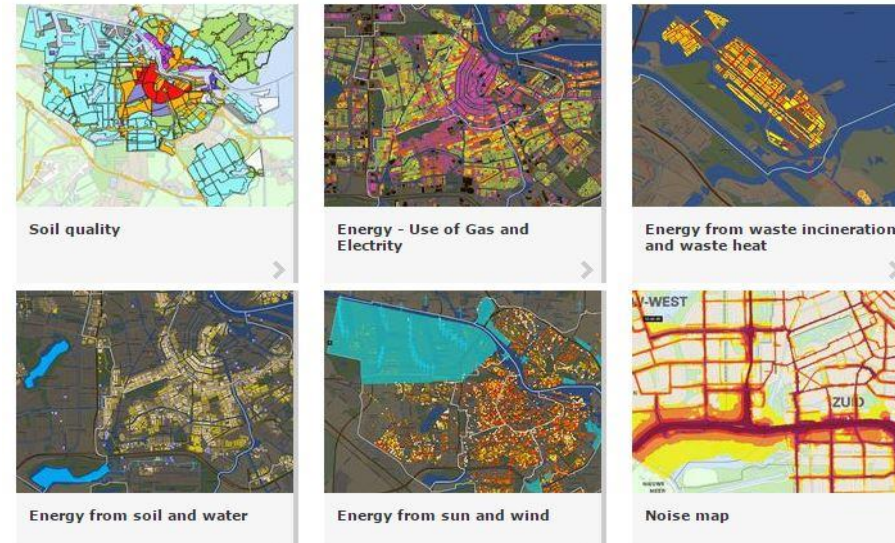
- Frankfurt, thermal loss of facades

Helsinki

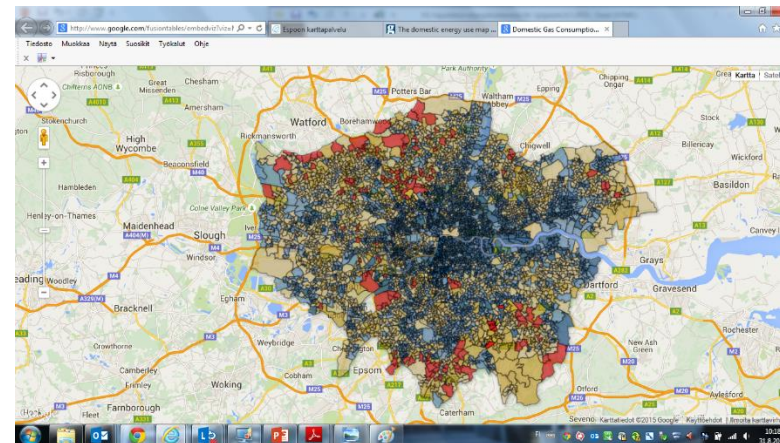
2.3.2018

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Environment, Climate & Energy



Amsterdam, <http://maps.amsterdam.nl/>



London, Natural gas consumption

Studied contents of energy data for the energy and climate atlas

Energy consumption

Energy consumption in public buildings

Energy consumption of city-owned apartment buildings

Energy consumption of blocks

Calculated energy consumption of buildings

Energy audits

Energy audits of public buildings

Energy certificates

Energy class of buildings

Energy efficiency potential

Cost efficiency on energy renovation

Renewable energy production

Installed solar panels

Solar power potential

Installed ground heating systems

Ground heating potential

Small scale wind power potential

Heat loss

Heat loss of roofs

Heat loss of facades

Large scale waste heat

Building data

Heating modes

Basic data (m2, m3, materials)

Renovation history of buildings

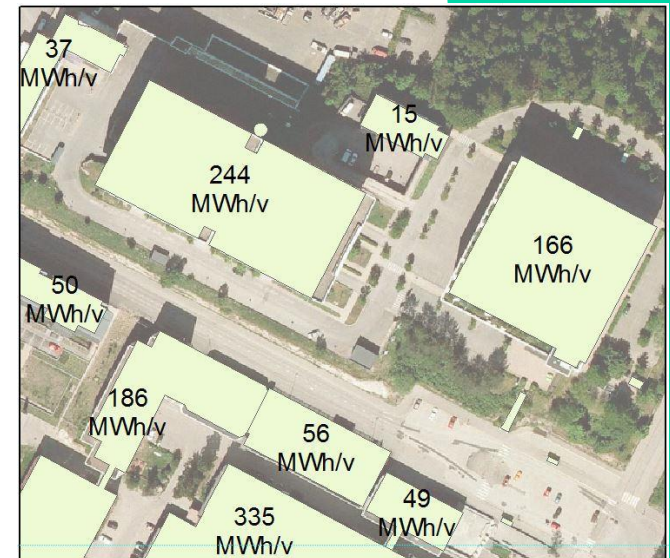
Renovation needs of buildings

SME's are interviewed

- Urban facts department organised an interview for Cleantect SME*s on their needs
- most important would be real energy consumption of buildings to estimate directly energy efficiency potential
- both long term historical data and very short term data was seen useful
- also laser scanning of buildings was seen useful (structure of building)
- renovation history was seen useful, which are valid in coming years
- also contact details of building owners seen useful

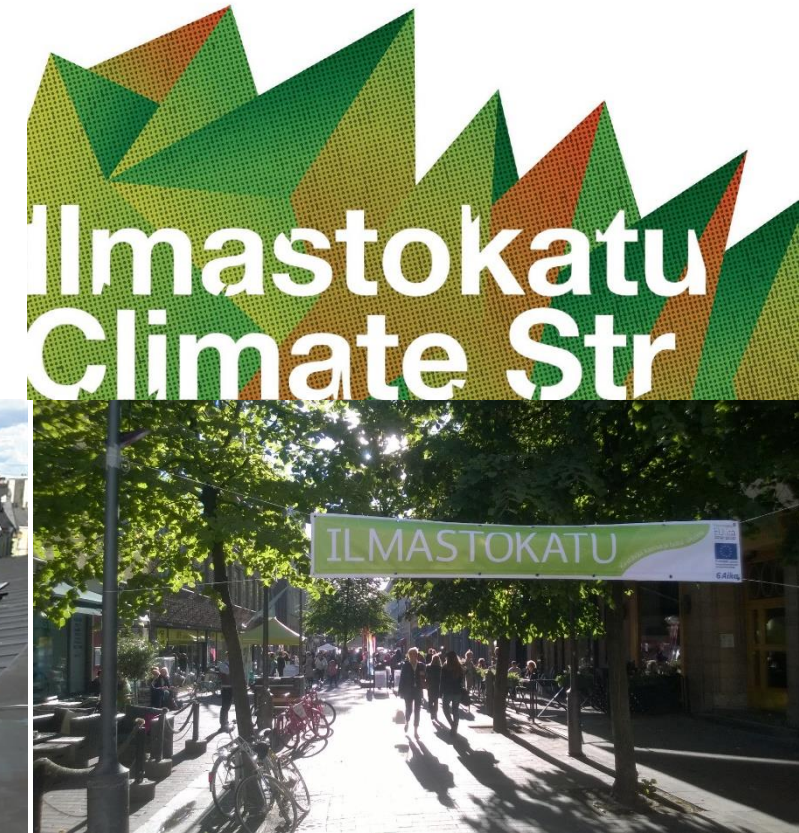
Collection of data starts

- In Decumanus EU–project several new datasets were developed, was led by HSY
 - Thermal mapping of roofs was done in spring 2015 (Odense model)
 - Over 100 volunteers were measuring temperatures at their homes to calibrate temperatures
 - Interpretation of colours needs a key-tool, as it depends on material, slope and temperature in attic
 - HSY is easing the interpretation of visualization kartta.hsy.fi
 - Unluckily the 2D-data did not fit directly to 3D model, but the experience is useful (facades)
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- Also solar energy potential was studied in decumanus
 - The data is also on in 3D-model (in 2D)



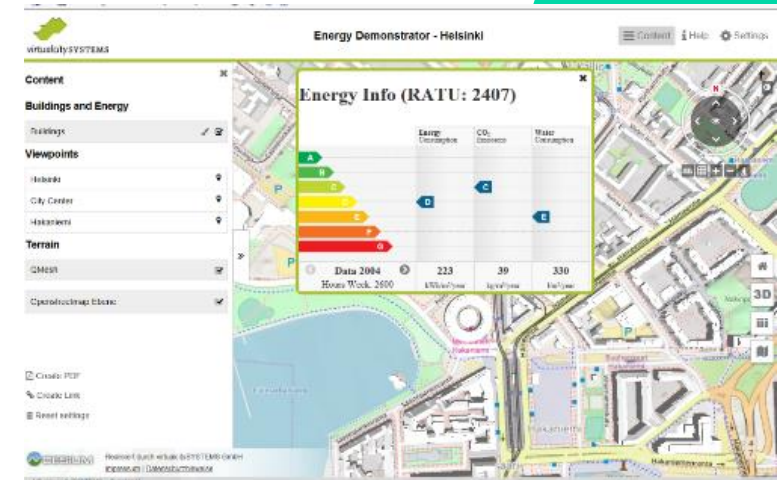
Data piloted in Climate Street

- Climate Street (2014-2016) was a testbed with aim to create the city of the future that is low carbon and adapted to climate change
- The solutions were developed and experimented in cooperation businesses, real estate owners, residents and the city administration
- Energy consumption of street and buildings, solar and waste heat potential, thermal mapping of facades, renovation history and visual service



Collection of data continues

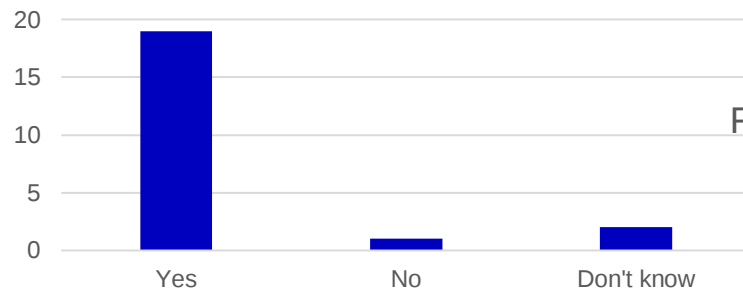
- City's Facta building registry was used, all basic data
- National Energy certificates from ARA registry
 - Not all buildings could be mapped with address (needs ID)
- Metropolia student collected renovation history from registry
 - Not all renovations need permit -> not always data
- Other Metropolia student collected waste heat data on buildings
 - General potential found, building-level needs further studies
- As a part of mySMARTLife –project VTT produced several datasets
 - Calculative energy consumption of buildings
 - Energy renovation potential and costs efficiency of 70-80's buildings
- City-owned HEKA Ltd. rental apartments gave district heating, property el and water consumption 2015 and 2016 by building level
 - In some cases data was generalized (if one meter for 5 buildings)



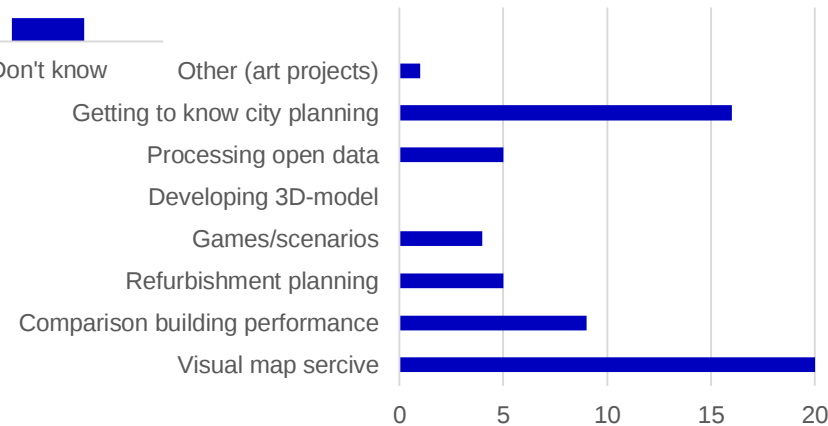
Citizen views are studied

- Questionnaire prepared by climate KIC Pioneers in environmental services
- Piloted in Lähiöfest2017 (suburb-week) event in Haaga's school
- Included presentation with computer and prints of visualization

From your experience / from what you have seen now, would you use it again / in the future?



For what purposes would you use the 3D City Model?



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Helsinki-3D-City-Model

The City of Helsinki has commissioned two next-generation 3D-City Models in May 2017: a smart, semantic city information model and a visually high-quality reality mesh model.

Please take some time to respond to the following survey regarding the Helsinki 3D City Models. The questionnaire is anonymous, provides 9 questions and a few minutes of completion time. Your opinion and experience are very important to improve the 3D City Models and adapt them to Helsinki citizen's wishes!

- How many times have you accessed the 3D-City Model at <https://kartta.hel.fi/3d/>?
☐ Sometimes ☐ Few times ☐ One time ☐ Never
- If YES, is the 3D-City Model easy to understand and easy to handle?
☐ Yes ☐ No ☐ Don't know
 If NO, why?
- From your experience / from what you have seen now, would you use it again / in the future?
☐ Yes ☐ No ☐ Don't know
- For what purposes would you use the 3D-City Model? Up to two answers!
☐ General information / Looking around in the city ☐ Implementation of business ideas / purposes
☐ Comparison of building background & performance ☐ Usage and processing of open data
☐ Planning basis of private refurbishments ☐ Learn more on urban planning and public actions
☐ Playing games / Visualizing future scenarios ☐ Other:
- Would you like to compare your building's performance with the performance of other...?
☐ Public buildings ☐ Private buildings ☐ Both ☐ None
- What information would you like to visualize in the 3D-City Model in order to take actions for making your building more energy efficient?
☐ Solar panel energy potential ☐ Energy saving potential
☐ Energy consumption of other buildings ☐ Renewable sources available
☐ I don't want to take actions to save energy ☐ Other:
- On what appliances would you like to use the 3D-City Model? -
☐ Computer ☐ Smartphone ☐ Tablet ☐ Public touchscreen in the city
- Overall how good do you evaluate the 3D-City Model initiative?
☐ Very good ☐ Good ☐ Okay ☐ Bad ☐ Very bad
- Would you tell us something more about you?
 Age: Gender:

Your interest in energy-saving related issues (rate from 1=very poor to 5=very high) 1 2 3 4 5
 Your willingness to implement energy-saving measures in the next 12 months (rate from 1=very poor to 5=very high) 1 2 3 4 5

Thank you for participating!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730287.

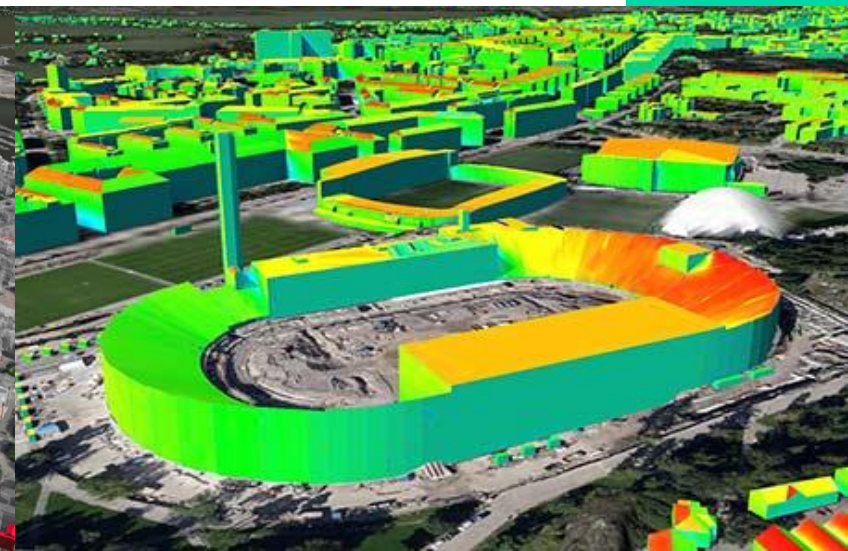


3D energy and climate atlas opened

- The atlas was executed and visualized on Helsinki's 3D city information model, which allows easy utilization and further application of the data
- contains both real and calculated building-specific data
- includes energy-efficiency upgrades, performance classifications, and the energy sources used for heating
- estimated energy consumption of buildings and estimated energy renovation potential and cost effi in typical 70-80's buildings (calculated by the VTT)
- presents building-specific solar energy potential
- a tool for city planners and decision-makers to assess the potential and available resources for energy efficiency improvements
- property owners and managers can use the atlas to assess the property's energy consumption
- A tool for Helsinki in achieving the city's key strategic climate goal to become carbon neutral by 2035

3D energy and climate atlas opened

Data	Source	Will be published	Challenges		
1. Building renovation history	Facta building registry	Feb 2018	Some old data in paper format		
2. Hekan apartment buildings heat, electricity and water consumption	Heka Ltd.	Feb 2018			
3. Energy certificate registry	www.energiatodistusrekisteri.fi	2018?	Building ID's needed		
4. Public service buildings consumption	HEL Buildings and public areas div.	End of 2018	Energy monitoring renewed		
5. Calculated energy consumption of all buildings	VTT	Feb 2018			
6. Calculated energy saving potential in one area (Merihaka)	VTT	Feb 2018			
7. Heat loss images of Helsinki's roofs reanalysis	HSY, kartta.hsy.fi	Feb 2018	Don't fit directly in buildings		
8. Large scale waste heat potential of buildings	Metropolia study	2019	Preliminary study done, needs more accurate info		
9. Solar energy potential and visualization	HSY+3D, kartta.hsy.fi	Feb 2018			
10. Thermal imaging of facades in one neighbourhood (Merihaka)	HEL environmental services	Winter 2018	Right weather needed (cold+dry)		



3D energy and climate atlas opened

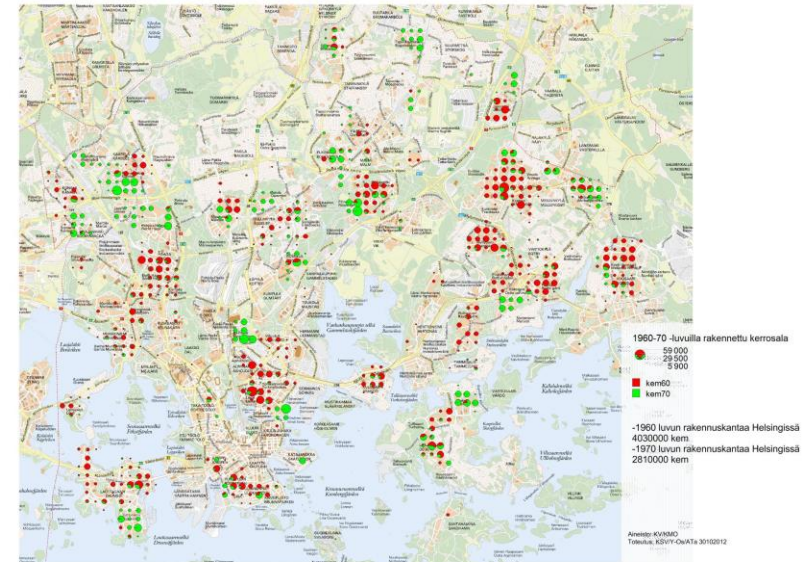
- executed with the CityGML city information model
- can be used for advanced city analyses and simulations
- covers entire city, enables an easy citywide or specific buildings energy survey
- the energy values were determined from the semantic information of each 3D building model and stored as additional attributes, as well as building texture
- Follows Helsinki's principles concerning public data:
 - all data released as open data available freely for the development of new knowledge and applications
 - data found in HRI soon
- The atlas has been produced by the City of Helsinki 3D project and Environmental Services using public energy-information sources
- The atlas is part of the mySMARTLife project, in which Helsinki develops smart commercial-scale solutions to cut urban carbon dioxide emissions together with other European cities
- <https://www.youtube.com/watch?v=3HPxlqKrjzU> (Virtual City Systems)

This is just a beginning

- Feedback will be gathered until fall 2018
- New datasets are under development (geothermal heat potential)
- Climate adaptation –related datasets developed (flooding etc.)
- New directive concerning myData may ease giving out the actual data of building owners
- More interactive features are studied



Helsinki



Thank You!

Helsinki's climate work www.stadinilmasto.fi –pages. Order also newsletter! (in Finnish)

Twitter: [@stadinilmasto](https://twitter.com/stadinilmasto), [@ilmastokumppani](https://twitter.com/ilmastokumppani)

