GIS MAP OF 5GDHC AGENTS AND POTENTIAL FOR THE BALTIC REGION

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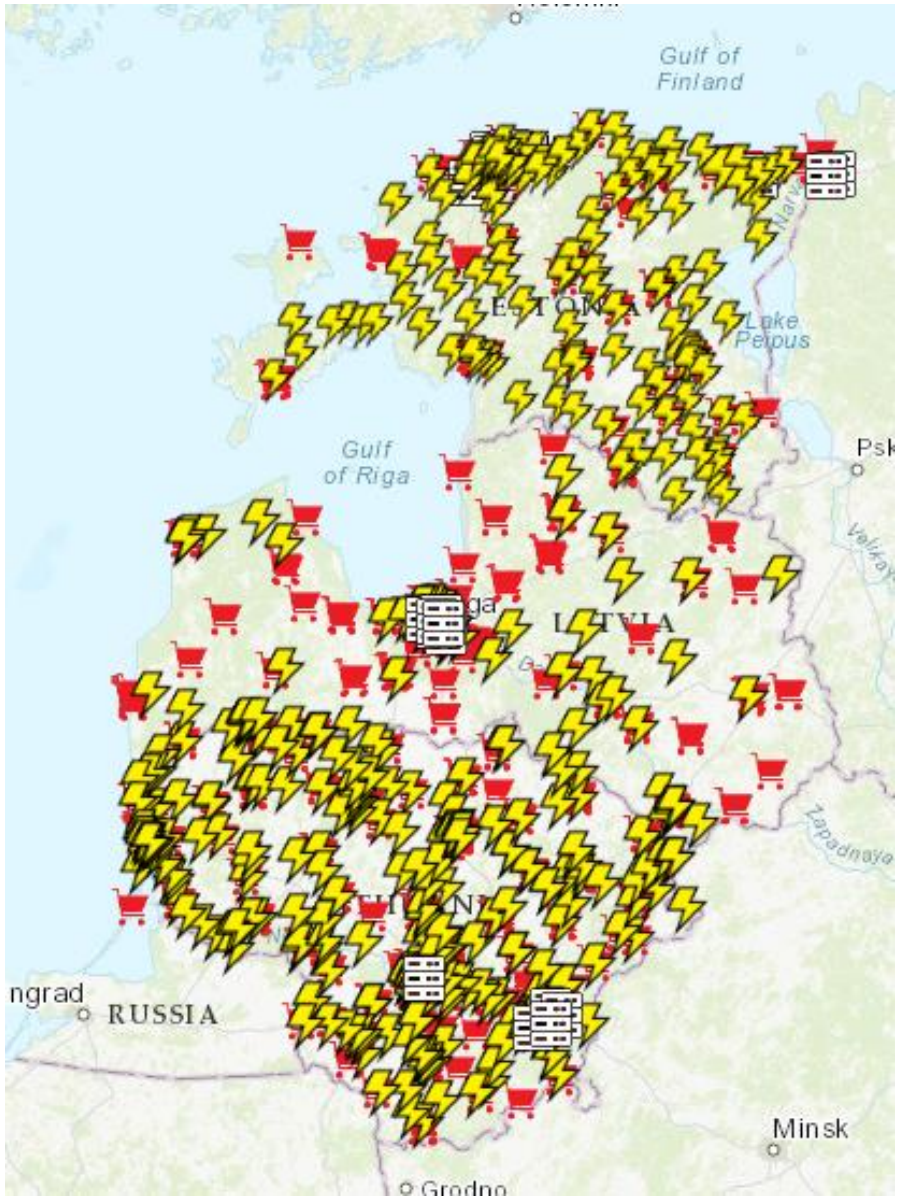
GIS MAP OF POTENTIAL 5GDHC AGENTS

- Covers all Baltic States
  - Estonia
  - Latvia
  - Lithuania
- Includes
  - Retail stores
    - Only bigger shopping malls
  - Electrical transformers
    - 110 kV, 330 kV
  - Data centres
  - Local DH networks

- Map is openly available for everyone
- Link is available in our project report



TAL TECH

DEVELOPMENT OF THE MAP

- One of the Agent-GIS project tasks was to create **a high-resolution GIS database** for digital mapping of 5GDHC agents
- **Identification and mapping** of possible available 5GDHC agents was the key activity to estimate technical potential of 5GDHC
- All potential 5GDHC agents and their locations were collected to a database where they were **divided by their source and excess heat potential**.
- Data collected during the research gave possibility to update the interactive map, created during previous project “Heat pump potential in the Baltic States”
- Layers with data regarding three 5th generation district heating and cooling agents have been added to previous layers

TAL TECH

DATA COLLECTION

- For data collection national databases and public information was used
- Retail stores
  - Main store chains in Baltics – Selver, Rimi, Maxima, K-Rauta, DEPO, …
  - Bigger shopping centres
  1. For excess heat estimation shops' addresses were collected
  2. National construction registers were used for surface area data
  3. Excess heat potential = calculations according to surface area

- Electric substations
  - Location - data from electricity distribution companies
  - Excess heat potential = calculations according to nominal voltage (110 kV, 330 kV)

- Data centres
  - Not much information was available
  - Excess heat potential was estimated according to electricity consumption

TAL TECH

RETAIL STORES

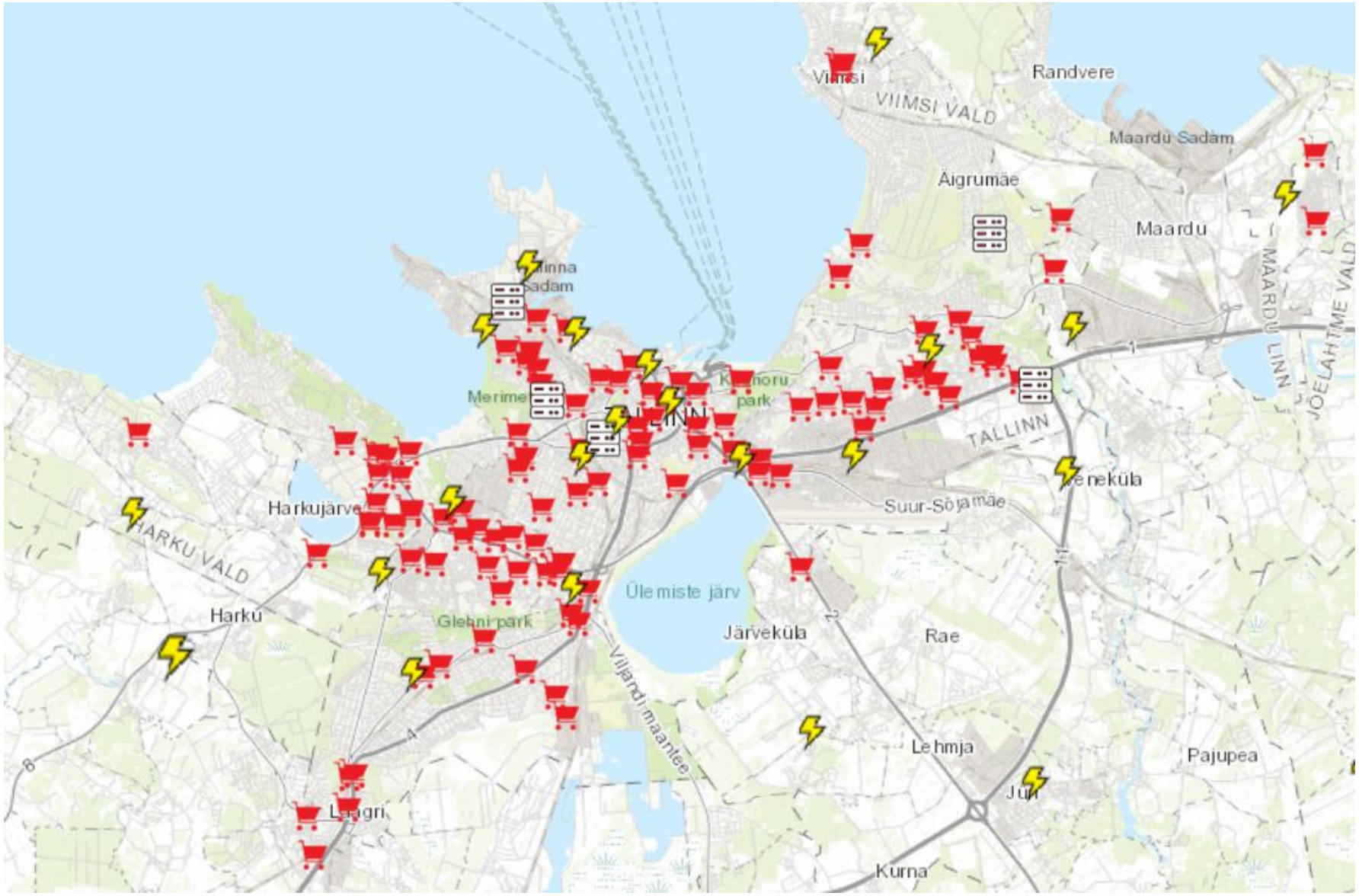
- Play a significant role in the development of new 5GDHC projects
- Potential low-grade heat sources
- Retail stores and other public service buildings **have large cooling systems for ventilation** and that creates stream of urban excess heat
- Normally the temperature of retail stores excess heat flow is **between 30-40°C**
- The heat recovery should be based on heat pump unit that is connected to the **condensation circuit of the cooling generation unit.**
- The heat pump captures the heat that is rejected by the chillers and thermally upgrades it then

Example of data you can find on the map

Marienthali Selver (ärihoone)	
OBJECTID	62
City	Tallinn
Name	Marienthali Selver (ärihoone)
Address	Mustamäe tee 16
Total_m2	20050
year	2008
Y	59,422660
X	24,697343
Excess_heat_potential_MWh	11138,457852
Source	EHR
MW/M2	

RETAIL STORES

- In bigger cities retail stores have very good potential for 5GDHC
- Tallinn has very many



ELECTRIC SUBSTATIONS

- Excess heat from electrical transformers is **available at 30°C continuously throughout the year**
- Excess heat in electric substations is generated because of **power losses in the substation**.
- Old electric transformers contained a lot of mineral oil that is used for transformer cooling.
- It is suggested that the radiator in the substation that is used for cooling should be replaced with a heat exchanger that is coupled to the DH network or a heat pump
- Therefore – heat load is crucial for substation cooling

Example of data you can find on the map

DATA CENTRES

- Data centres consist of data halls, or buildings, containing rows of IT server racks
- **Air-cooling**
- **Water-cooling**
- Continuous excess heat load all year round
- The air leaving the hot aisles often has **temperatures of about 25-40 °C**
- Different ways to utilise surplus heat
- The barriers are mainly non-technical problems, more related to lack of information and profitable business models

Example of data you can find on the map

Tallinn TVTower DC	
OBJECTID	9
Estonia	Tallinn TVTower DC
COL_B	Kloostrimetsa tee 58a, 15026, Tallinn, Estonia
Y	59,471242
X	24,887665
MW	6,400000
comments	air cooled, water cooled, backup systems with air conditioners
Racks	0
m2	
Electricity, MWh	56064
from m2	
from racks	0
assumed, el,MWh	56064
Excess heat, MWh	36441,6
COL_N	
COL_O	
COL_P	assumed, el,MWh
COL_Q	Excess heat, MWh
COL_R	GWh
COL_S	TJ

EXCESS HEAT POTENTIAL

- Retail stores have the biggest usable excess heat potential
- Overall average
  - 0.56 MWh/m^2 for Estonia
  - 0.55 MWh/m^2 for Latvia
  - 0.47 MWh/m^2 for Lithuania

	Estonia		Latvia		Lithuania	
	total (MWh)	within DH (MWh)	total (MWh)	within DH (MWh)	total (MWh)	within DH (MWh)
Retail stores	1,050,693	991,307	887,354	795,414	1,285,050	1,157,938
Electrical Transformers	212,160	86,000	285,040	202,480	410,960	114,560
Data centres	107,081		53,271		30,903	

LOCATION OF THE AGENTS

- Not only heat potential is not enough
- **Location is very important – there must be consumers!**
- It is not feasible to transport excess heat to long distances
- As a conclusion can be said about that **retail stores are the most available agents** as they are normally located near heat and cooling consumers
- Data centres and electric substations are more often located further away from populated districts

Substation in „the middle of nowhere"

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