

PLANHEAT VALIDATION CITIES

CITY OF VELIKA GORICA (GVG), CROATIA

Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (UNIZAG FSB)



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PLANHEATPartner Presentation

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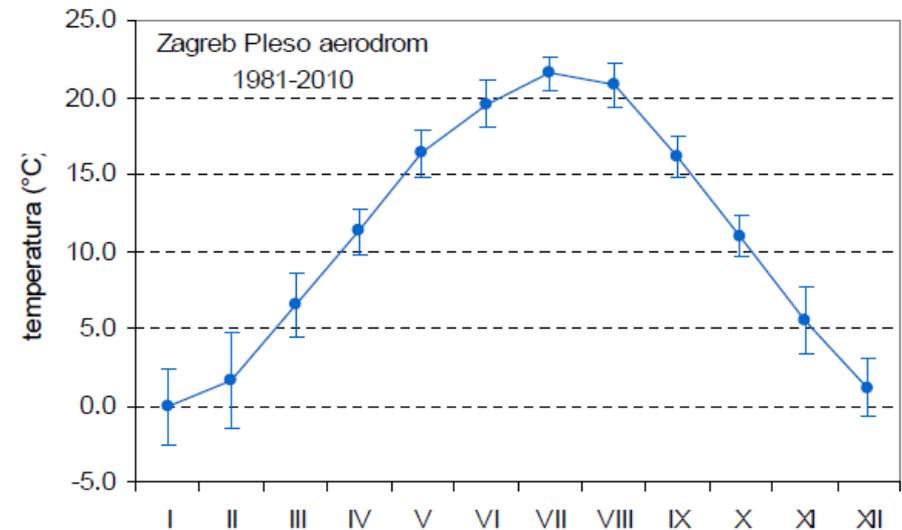
GENERAL INFORMATION

- The City of Velika Gorica is the **6th largest city** in the Republic of Croatia, with its **63.517 inhabitants** and 58 settlements. Half of the population lives in the central settlement, Velika Gorica. The city area of 329 sq. km is located just south of Zagreb.
- The climate in the central part of Croatia is **moderate continental**, with quite changing weather conditions during the year, due to the circulation of air masses over the Euro-Asian and African continent.
- During the colder period of the year (autumn, winter), local climate in GVG is moist, foggy, with low circulation of air; during the summer winds are weak, the convective clouds appear often with the possibility of showers. In spring faster moving cyclonal weather types are the main characteristic, which lead to the fast changing weather conditions.



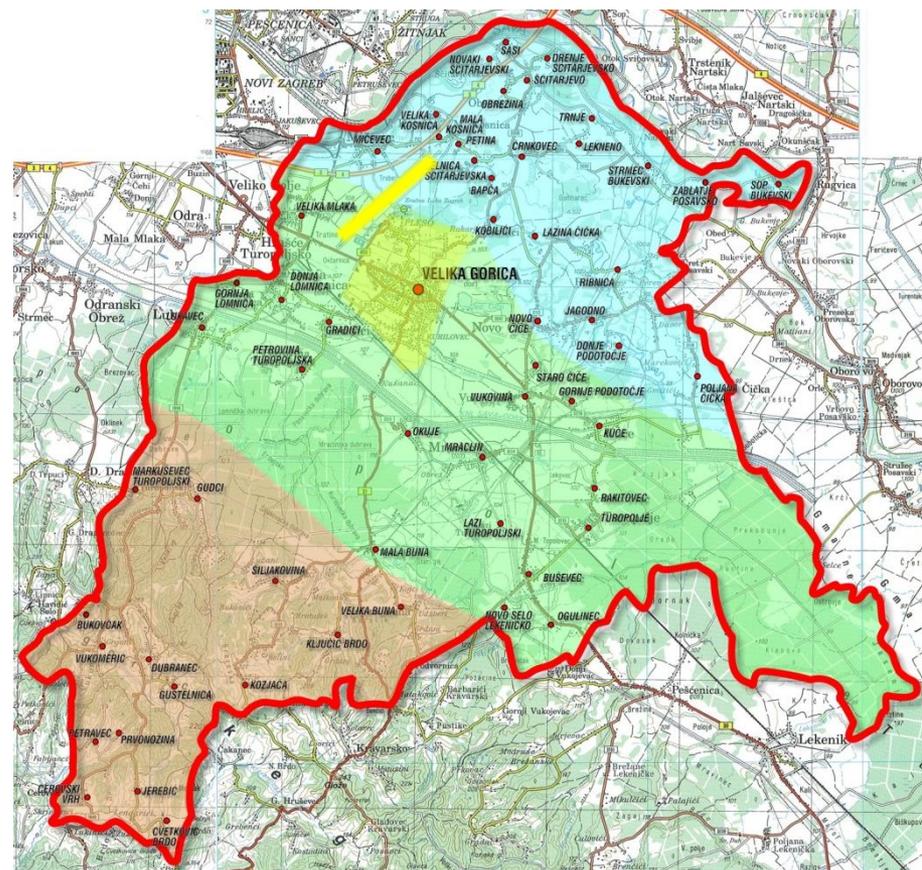
GENERAL INFORMATION

- The temperature maximum is expected in July, with average between **18,8 °C** and **23,4 °C**; the minimum temperature appears usually in January with average between **-6 °C** and **5,6 °C**.
- Yearly average is between **9,5 °C** and **12,4 °C**, and average for 30 year period is **11 °C**.
- Absolute maximum of **38,5 °C** has been recorded in August 2000, and absolute minimum of **-24,1 °C** in January 1985



GENERAL INFORMATION

- The city's territory can be geographically divided into 3 parts: **Posavina** (wet meadows with the influence of the Sava river and high groundwater), **Turopolje** (central and most inhabited part, lowlands with rich agricultural soils) and **Vukomeričke gorice** (hilly southern woodlands, up to 230 m above the sea level)
- Central settlement – **Velika Gorica**  – originated as a village around the road Zagreb – Sisak, mainly built during the 1970 and 1980 as a dormitory for the city of Zagreb, of which it has been an administrative part until the year 1995. Today it has **31.553 inhabitants**.



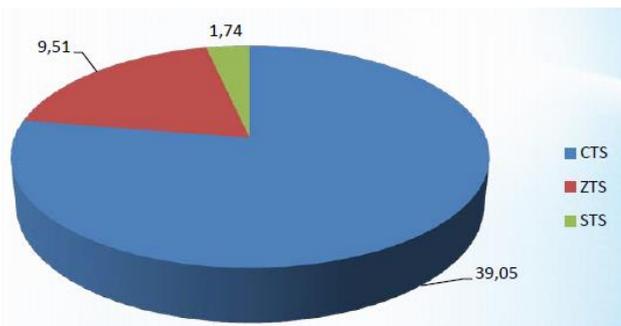
GENERAL INFORMATION

- Settlements (villages) outside Velika Gorica range from 32 up to 3.300 inhabitants and consist mainly of family houses, while more than 1/2 of the population of Velika Gorica (> 18.000) lives in more than 160 larger and smaller apartment buildings, built mostly during 1970's and 1980's (low energy efficiency), a few of them during last 10 years.
- New buildings are required to connect to the city's infrastructure (water, sewage, electricity), but not to the heating network, thus most of the newly built apartment buildings utilize natural gas boilers in each apartment for heating and sanitary hot water; the price of DH is not competitive with natural gas, although **DHN owner / provider HEP Toplinarstvo Ltd** in Velika Gorica still operates with financial losses.



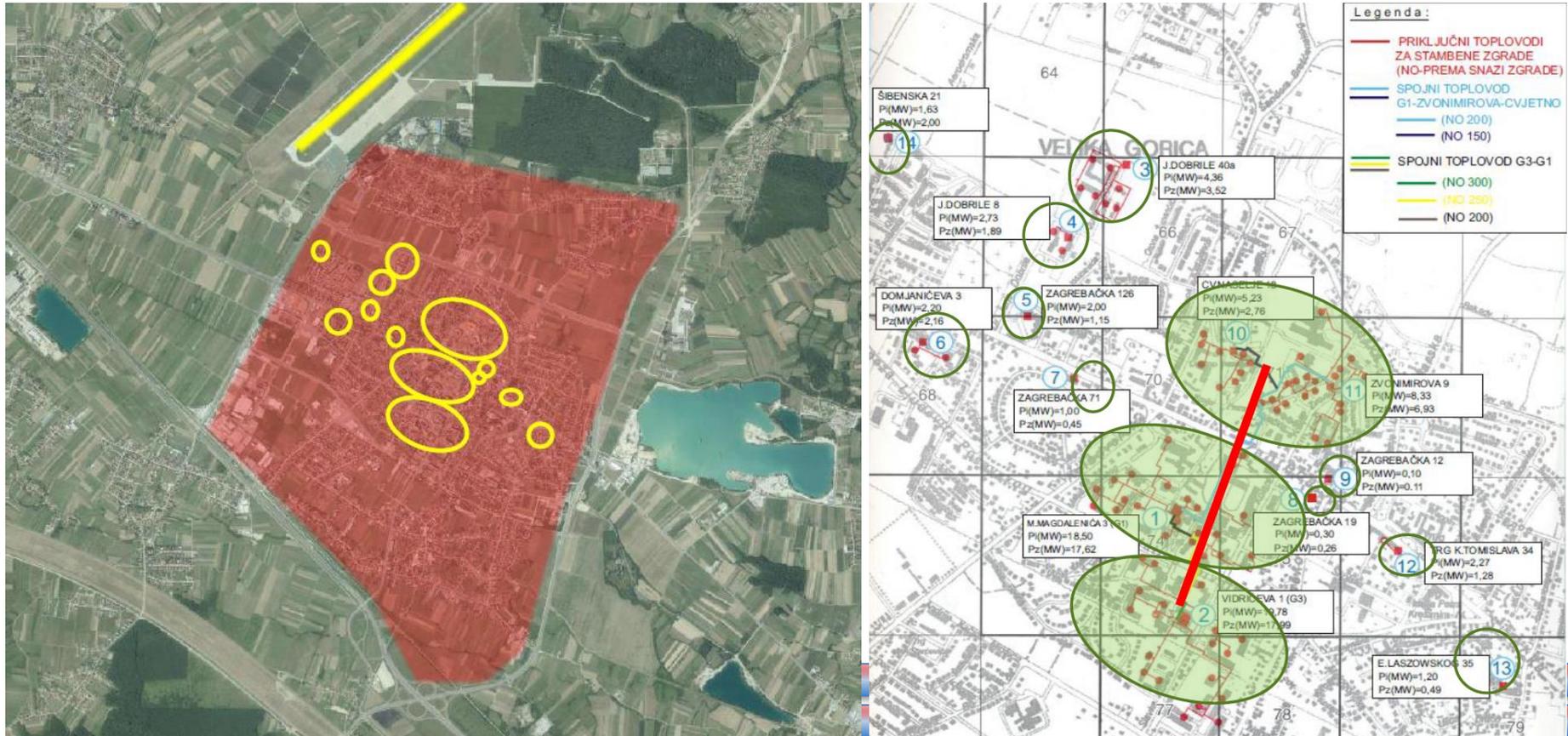
GENERAL INFORMATION

- Today DH is provided via **14 heat plants**, 4 of which belong to a **central DH network**, 6 to **closed heating networks** and 4 to **stand-alone heating systems** (see below).
- There are **34 boilers** installed, with **total installed power of 69,63 MW**, of which **46,28 MW** is leased, there are **120 heat substations** and **9,82 km of main heat pipes**.
- During the 2014 total of **50,3 MWh** have been delivered to the consumers



GENERAL INFORMATION

- Heating networks in Velika Gorica need to be interconnected to become more efficient



GENERAL INFORMATION

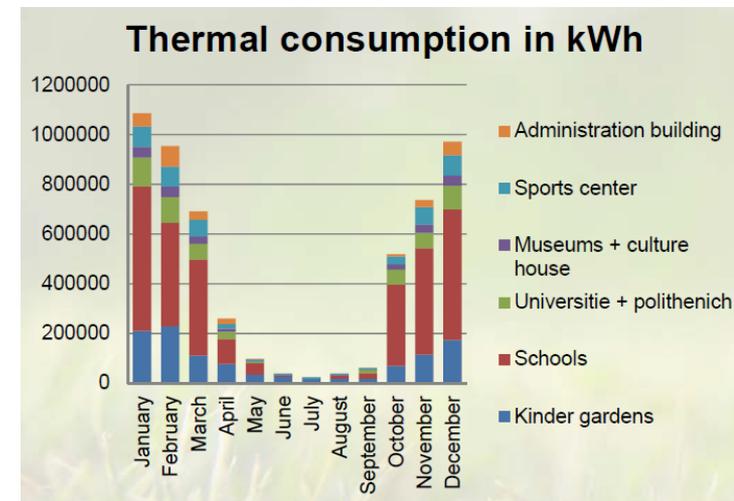
- **Main problems of DHNs are:**
- Extra-light fuel-oil as an energy source in 12 heating plants, natural gas in just 2 – fuel costs are high, barely covered with the high price of energy delivered to customers, fossil-fuel utilization with high GHG emissions,
- Energy losses during transport mainly in closed and stand-alone heating systems (most pipes in the central heating system have been replaced during last few years), high losses of energy due to poorly insulated buildings,
- Not all customers have individual measurements of energy consumption, which leads to improper energy management in individual households,
- Different types of installed burners and boilers, difficult for maintenance,
- Low efficiency due to older technologies and lack of coordination and interconnection between systems,
- Harmful emissions of smoke and gasses in urban zones.

GENERAL INFORMATION

- Cooling is provided individually, using air-conditioners, even in larger public buildings, which leads to large electricity consumption during warmer months.
- Outside Velika Gorica heating is mainly provided by individual, inefficient burning of oil, gas or biomass.
- Among public buildings, only one newly built school has heating on wooden chips installed, others still rely on fossil fuels, primarily fuel-oil.

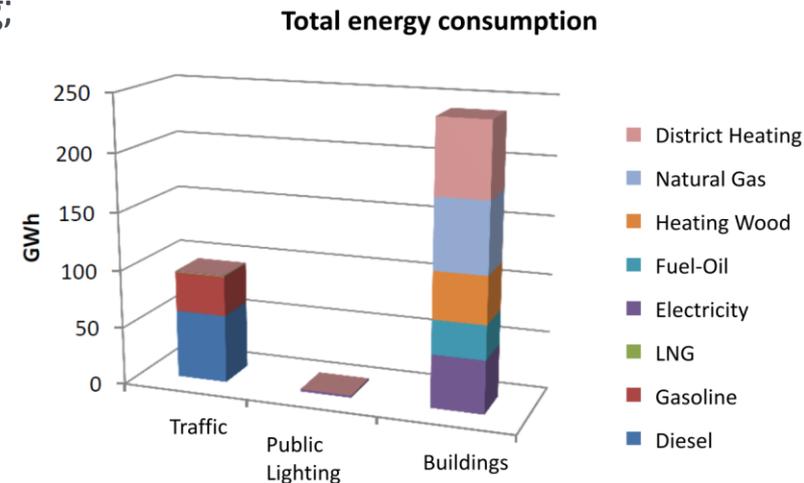
GENERAL INFORMATION

- Many of those problems exist also in other local communities, and not only in new EU member states, so the City of Velika Gorica should be a good example and relevant validation case for the PLANHEAT project.
- City's administration has been motivated to involve in the project, as to ensure better energy planning for heating and cooling the city in the future. Until now, no heating or cooling plans have been made for the City of Velika Gorica.
- There is a need for several departments to involve in this project – the Department of urban planning and environmental protection, the Department of investments, entrepreneurship and EU funds, the Department of schools and preschool education (most of the energy inefficient public buildings!) and the Department of infrastructure and traffic. At least one person per department should be appointed, to ensure the exchange of information and cooperation between departments during the execution of project activities.



PLANS ON HEATING AND COOLING

- SEAP devised by Regional Energy Agency of Northwest Croatia (REGEA) during 2010 and accepted in 2011, using the inventory data for 2008.
- Main goals: to lower CO₂ emissions from all sectors by conducting energy efficiency measures, using renewable energy sources, consumption management, education and other measures; to ensure and diversify energy supply; to lower the energy consumption in sectors of building, transport and public lighting; to increase the usage of RES; to transform urban areas to energy and ecologically sustainable ones.



PLANS ON HEATING AND COOLING

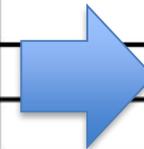
ENERGY CONSUMPTION BY SECTOR AND ENERGY SOURCE IN VELIKA GORICA

	Fuel Consumption (GWh)				%
	Transport	Public Lighting	Building	Total by Energy Source	Share by Energy Source
Diesel	59,25	-	-	59,25	17,60%
Gasoline	34,36	-	-	34,36	10,21%
LNG	0,71	-	-	0,71	0,21%
Electricity	0,33	1,93	45,98	48,24	14,33%
Fuel Oil	-	-	29,52	29,52	8,77%
Biomass / Firewood	-	-	40,67	40,67	12,08%
Natural Gas	-	-	60,61	60,61	18,00%
Municipal Heating	-	-	63,32	63,32	18,81%
TOTAL	94,65	1,93	240,11	336,69	100,00%
Share per sector %	28,11%	0,57%	71,31%	100,00%	

PLANS ON HEATING AND COOLING

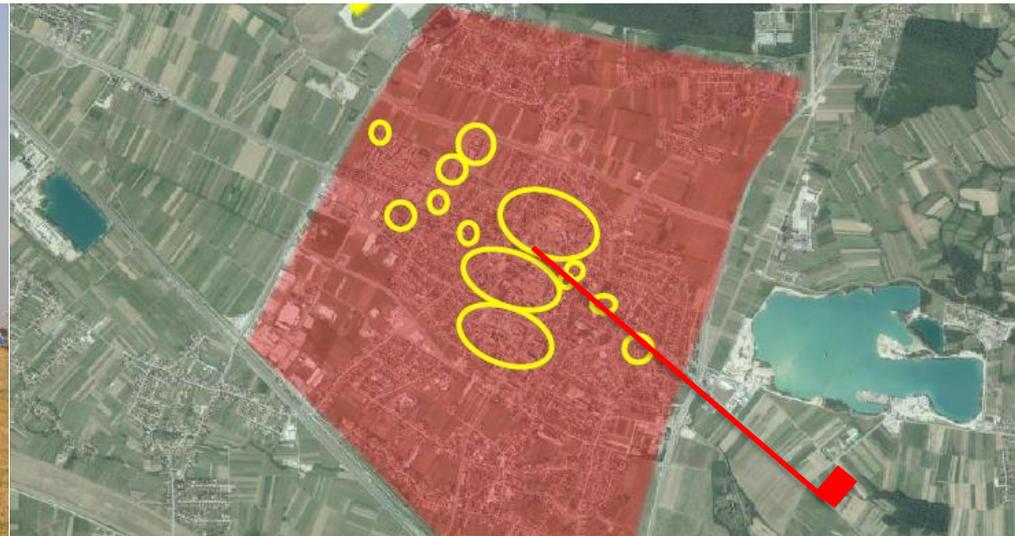
- SEAP targets for Velika Gorica – planned quite ambitiously, but now impossible to reach

Scenario	Sector	CO ₂ Emissions		Ratio compared to 2008
		2008	2020	%
"Business as usual"	Transport	24 702	29 042	17,57
	Buildings	58 077	63 458	9,27
	Public Lighting	623	747,7	20,02
	TOTAL	83 402	93 247,7	11,81
With measures for CO ₂ reduction	Transport	24 702	18 154,82	-26,50
	Buildings	58 077	22 493,70	-61,27
	Public Lighting	623	460,23	-26,13
	TOTAL	83 402	41 108,75	-50,71



PLANS ON HEATING AND COOLING

- During 2011 public utility company „HEP Obnovljivi izvori energije” tried to prepare the documentation for the investment into a biomass co-generation plant near Velika Gorica, but the project had failed at the public debate in local community during the environmental impact assessment process, due to the NIMBY syndrome



PLANS ON HEATING AND COOLING

	STATUS	FUTURE OBJECTIVE
Waste Heat Exploitation	No systems installed	Possible (e. g. from sewage system, industry)
Thermal RES Exploitation	A few installations on private buildings (solar)	Installation of solar systems on public buildings and in DHN
Energy Efficient Buildings	Renovation of apartment buildings started	All buildings should be energy class B or higher
District Heating/Cooling Network Expansion	HEP Toplinarstvo started interconnecting of DHNs	Expansion and interconnection of DHN, introduction of DCN

AVAILABLE DATA

	Available	Available Soon
Map of Energy Source Potential	NO	NO
Map of District Heating Network	NO	YES
Satellite Images of the City	YES	
Map and Estimation of Urban Waste Heat	NO	NO
Monitored Production Data of the DH	Partial	
Monitored Consumption Data of the DH	Partial	
Local RES production Data	NO	NO
(other data useful to the PLANHEAT project)		Heating and cooling demand

LITERATURE

- Environmental Impact Assessment Study – New Passenger Terminal of the Zagreb Airport, INSTITUT IGH D.D., Zagreb, 2012
- Mario Marjanovic, dipl. ing. el., mr. sc. Robert Krklec, dipl. ing. el.: Plans of HEP Toplinarstvo for the development and enhancement of the heating system in Velika Gorica – presentation given during the EU Sustainable Energy Week in Velika Gorica
- Javier Felipe Andreu: Energy Consumption in Velika Gorica and Technologies to Use. Presentation of results of the research funded under the EU IEE project BEAST.
- Sustainable Energy Action Plan for the city of Velika Gorica, REGEA, Zagreb, 2011.

THANK YOU FOR YOUR ATTENTION!

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