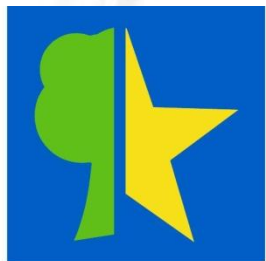




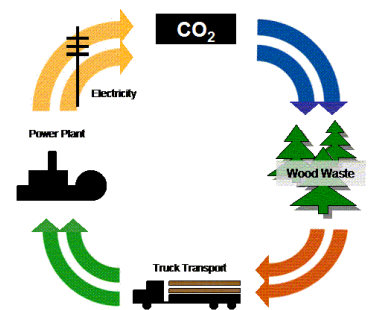
# Progress in biomass utilization in North-West Croatia

I. Przulj, V. Segon, J. Domac

Vancouver, August 25, 2009



REGIONALNA ENERGETSKA AGENCIJA  
NORTH-WEST CROATIA  
SJEVEROZAPADNE HRVATSKE  
REGIONAL ENERGY AGENCY



# Europe

Croatia ?



**Small country for a great Holliday...**



**About Croatia**  
**Population :4,4 mil.**  
**Area: 89.800 km<sup>2</sup>**

**North-West Croatia ?**  
**Population: 1,4 mil.**  
**Area: 8.800 km<sup>2</sup>**



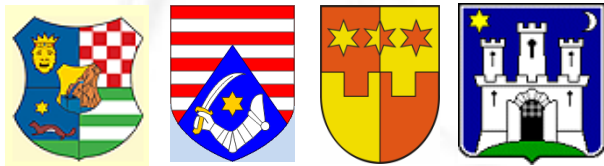
**Visual Comparison**





# Agency Key Facts

- IEE 2006 Call
- Four founding authorities



- Arc-de-Seine (Partner, local agency)
- TV Energy - SE England (Mentor)



Energy Management Agency

Intelligent Energy



Europe

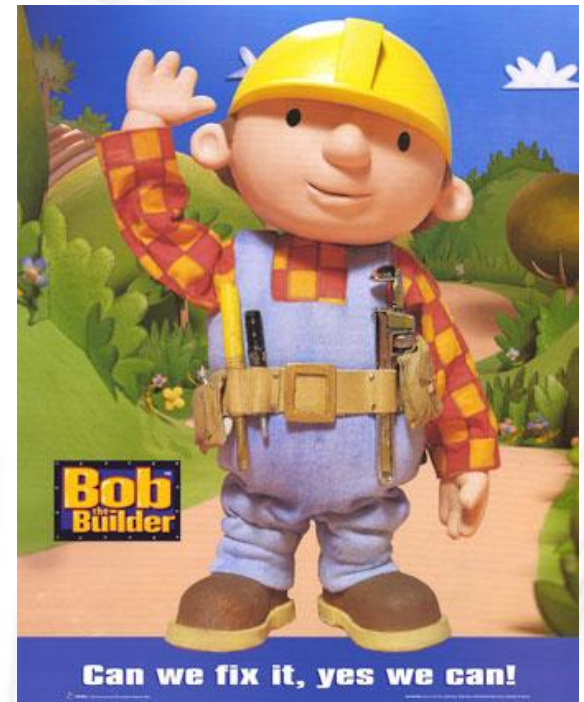




# Our Activities

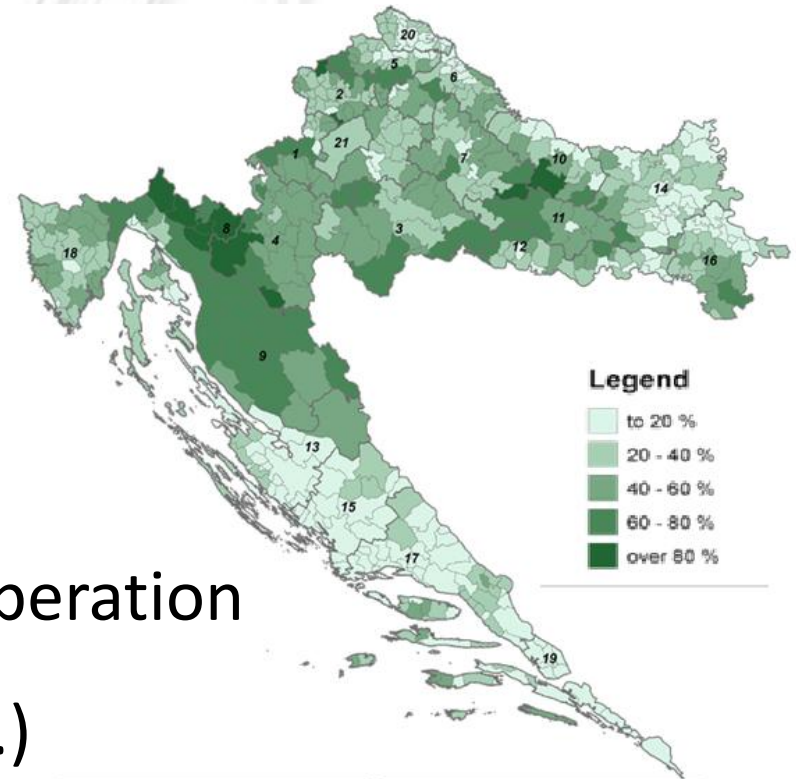


- Support/advice to counties, cities, municipalities
- Systematic energy management for counties/cities
- 'Special' projects/programmes
- Education
- International cooperation



# Bioenergy in Croatia

- High potential – agriculture, forestry, wood industry
- Existing and planned projects – CHP and DH plants, biofuels, pellets, charcoal
- Rapid market developing
- Total technical potential app. 39 PJ
- Intensive international cooperation  
(bilateral, FP6, FP7, IEE,...)





# Woody Biomass

Source	Energy potential in PJ
State-owned forests	16.83
Private forests	3.88
Wood processing industry	9.06



# Agricultural Biomass

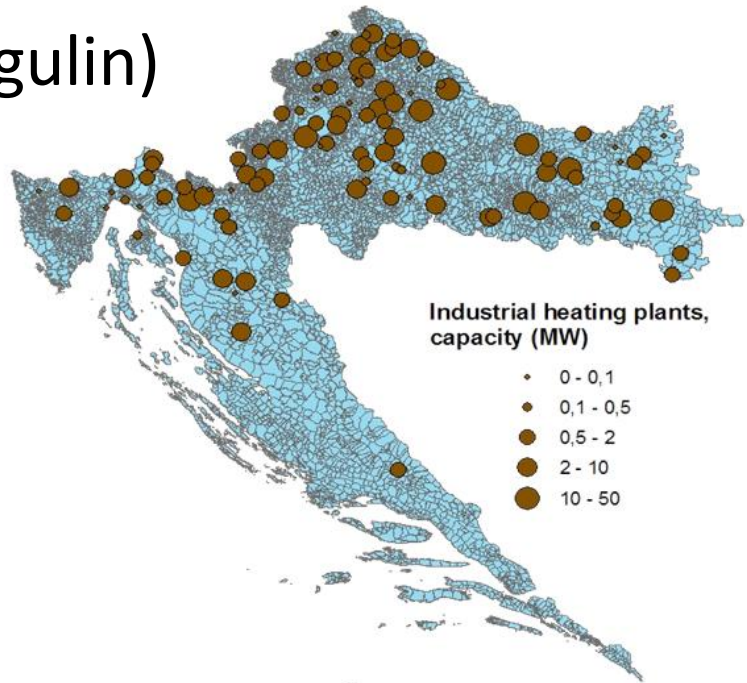
Source	Energy potential in PJ
Biogas	2,09
Fruit trees	0,69
Fruit processing	0,03
Wheat, corn, barley	11,07
Other -agriculture	0,34





# Cogeneration and District heating

- 1881. First biomass fired CHP in Croatia (Edison, Pearl Street – New York)
- New CHP projects range 1-10 MW, some very close to implementation – industry leading the way
- Few DH plants (Gospić, Ogulin) already implemented, several ongoing projects – all developed by local communities



# Renewable Energy in Croatia (2005)

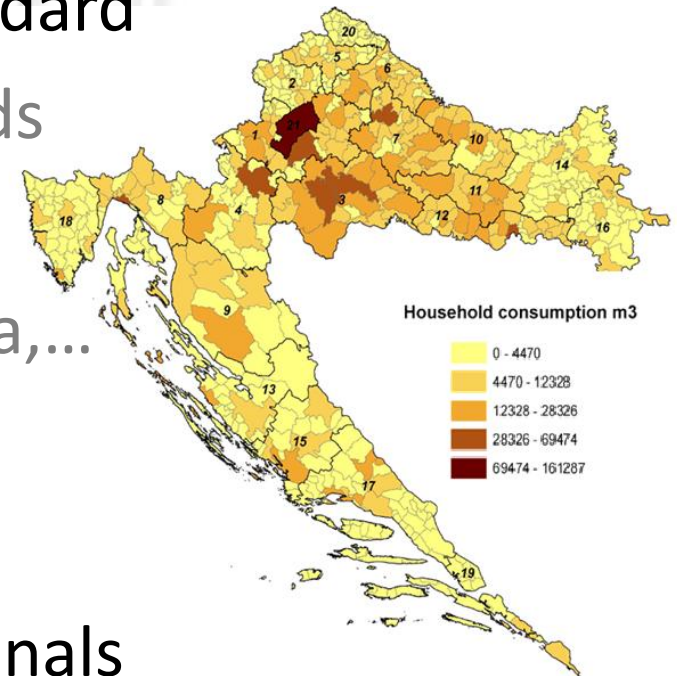
	Thermal capacity	Thermal production	Electricity capacity	Electricity production
<b>Solar</b>	N/A	N/A	12,74 kW	12,63 MWh
<b>Wind</b>	0	0	5,95 MW	1,96 GWh
<b>Biomass</b>	<b>510 MW*</b>	<b>16230 TJ **</b>	<b>0</b>	<b>0</b>
<b>Small hydro</b>	0	0	26,7 MW	126,3 GWh
<b>Geothermal</b>	114 MW	542 TJ	0	0

\*Only industrial heating plants

\*\*Total, includes fuel wood for households heating

# Winds of Change

- Public opinion and support
  - Raising concern about climate change, pollution,...
  - Overall increase of living standard
- European experiences and trends
  - Croatian accession to the EU
  - Examples from Austria, Slovenia,...
- Growing level of knowledge, expertise and participation
  - from enthusiasm to professionals
- Tariff system for RES electricity



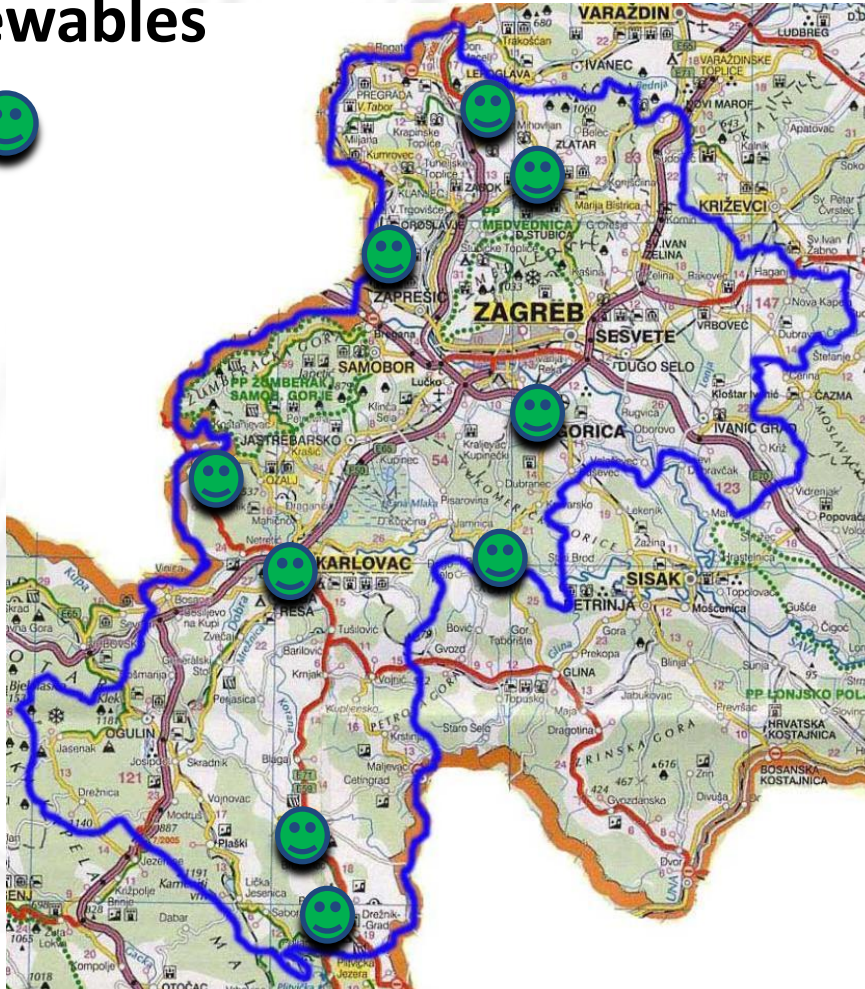


# Tariff system for RES electricity (€/kWh)

	<1 MW	>1 MW
Small hydro	9,2	5,6 – 9,2
Wind	8,53	8,66
Biomass, forestry and agro	16,0	13,9
Biomass, ind. wood residues	12,7	0,63
Geothermal	16,8	16,8
Biofuels	4,8	4,8
Biogas	16,0	13,9
Landfill gas	4,8	4,8
Wave, tidal	8,0	6,7
Solar pv, <10 kW	45,3	-
Solar pv, 10-30 kW	40,0	-
Solar pv, >30 kW	28,1	-

# Ongoing projects...

## Renewables



## Biomass

- Zakanje
- Pokupsko
- Jastrebarsko
- Slunj

## Solar thermal

- Karlovac County
- Zagreb County
- Krapina County

## Ground Source Heat Pumps

- Zagreb County

## Biogas

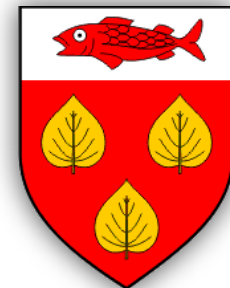
- Lobor
- PERFA





# Zakanje Biomass DH Plant

- Municipality - area of 45 km<sup>2</sup>
- 2.169 inhabitants, 22 settlements
- Zakanje village - 37 residential and administrative buildings
- Small family houses - firewood
- Administrative buildings (municipality, post office and others) - connected to DH system based on fuel oil







Municipality

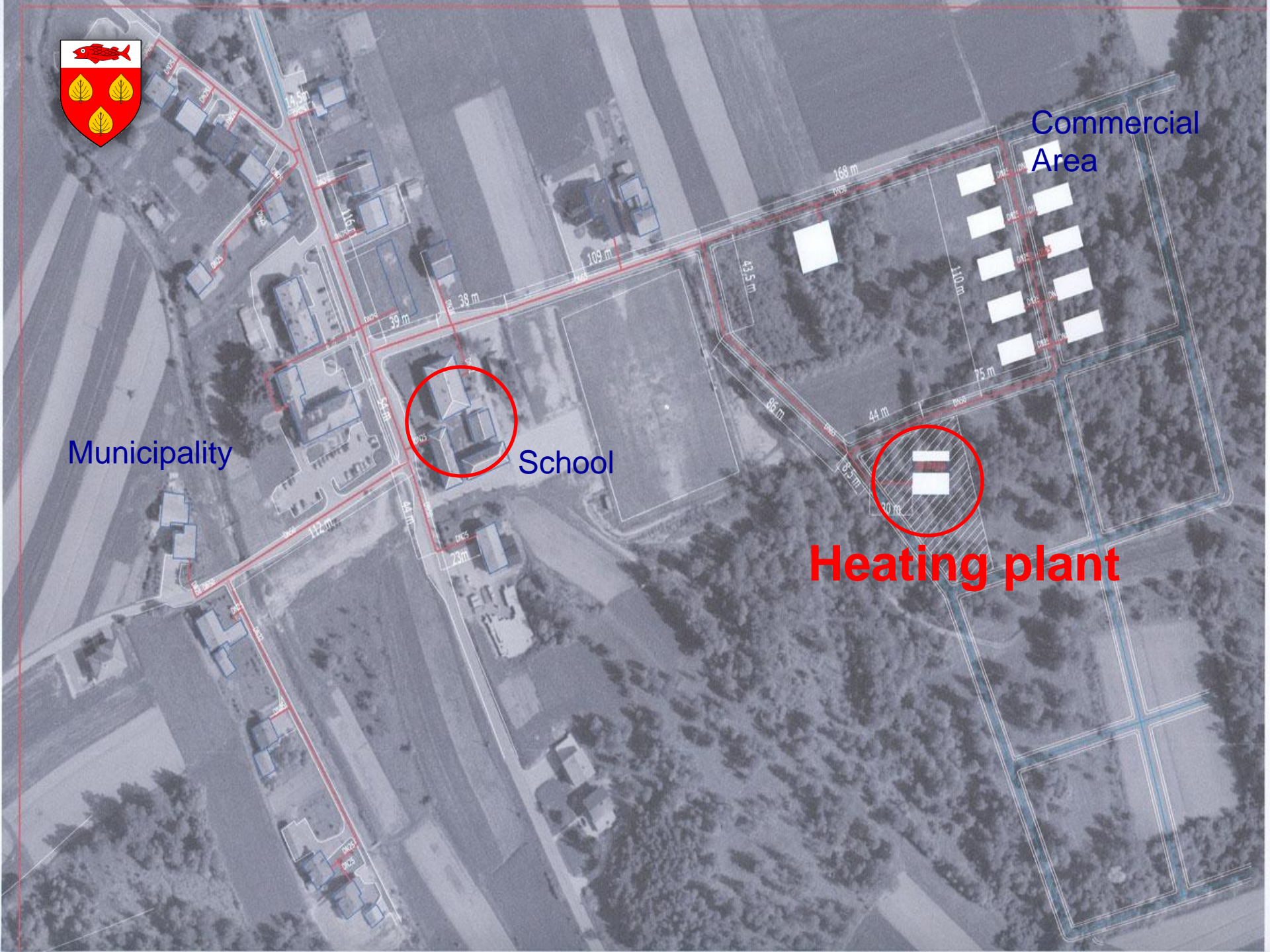


School



Heating plant

Commercial Area





# Zakanje Biomass DH Plant

- Existing heating plant capacity: 2 x 200 kW
- **Annual fuel oil consumption: 40.000 – 45.000 l**
- Total heated floor area (with the new biomass boiler): 10.000 m<sup>2</sup>
- **Projected annual heat consumption: 951.600 kWh**
- New biomass boiler capacity: 650 kW
- **Total investment – heating plant: 69.066 EUR**
- Total investment – heating network: 297.700 EUR







# Pokupsko Biomass DH Plant

- Municipality - area of 122 km<sup>2</sup>
- 2.492 inhabitants, 14 settlements
- Pokupsko village - 71 residential and administrative buildings
- Small family houses - firewood
- Administrative buildings (municipality, post office and others) - system based on fuel oil or small biomass systems



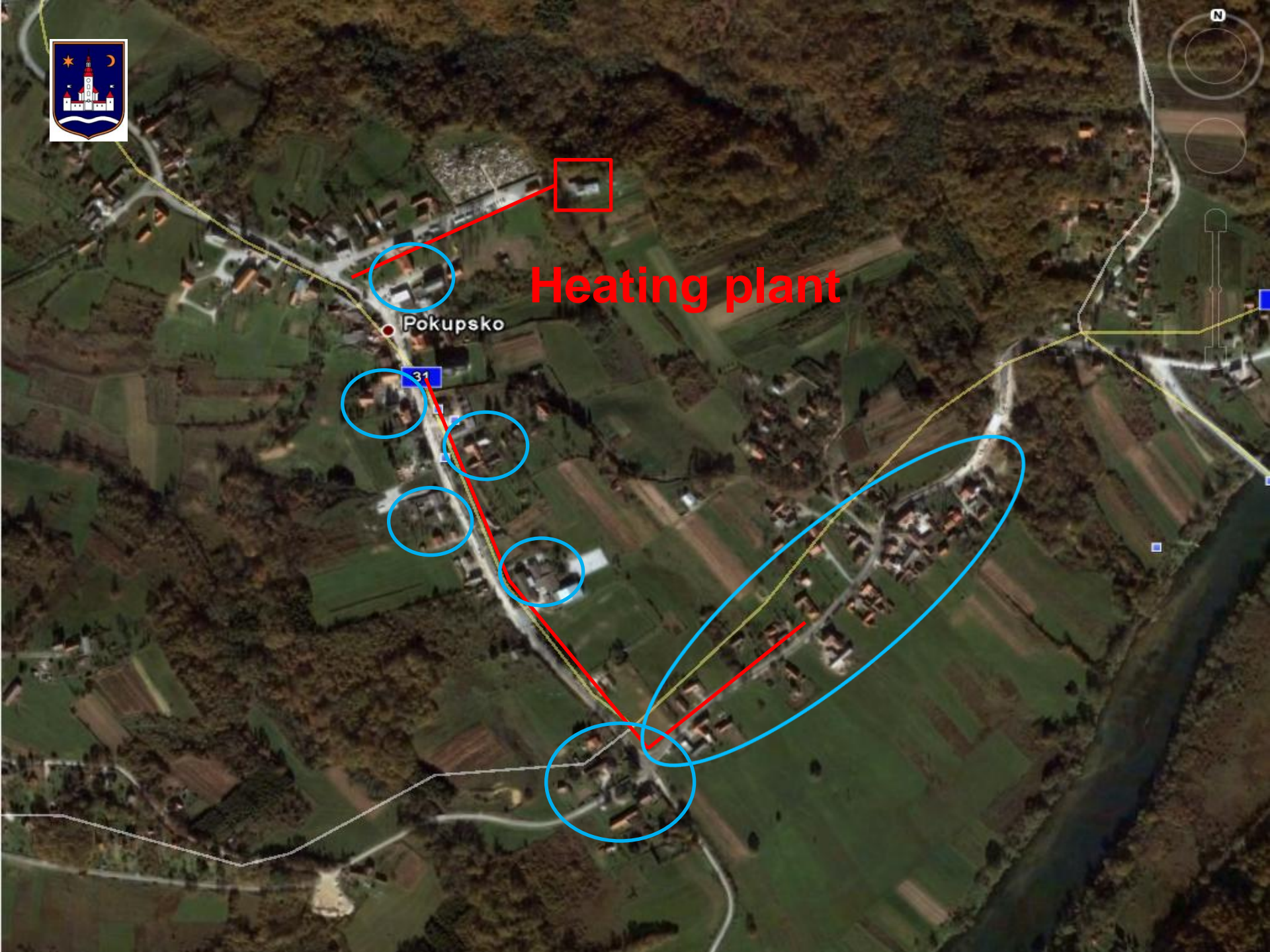




Pokupsko

Heating plant

31





# Pokupsko Biomass DH Plant

- Total heated floor area (with the new biomass boiler): 39.500 m<sup>2</sup>
- **Projected annual heat consumption: 2.190 MWh**
- New biomass boiler capacity: 1 MW
- **Total investment – heating plant: 369.863 EUR**
- Total investment – heating network: 321.917 EUR





# Jastrebarsko Biomass DH Plant

- City - area of 229 km<sup>2</sup>
- 16.765 inhabitants, 59 settlements
- First phase - Elementary and High school- 3750 m<sup>2</sup>
- Administrative buildings (municipality, post office and others) - system based on natural gas or small biomass systems







**PHASE I**

**PHASE II**

**Elementary school**

**High school**

**Heating plant**

© 2009 PPWK  
Image © 2009 DigitalGlobe  
© 2009 Google  
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elev 132 m

Jun 24, 2008

Google

Eye alt 1.83 km

45°39'42.84" N 15°38'57.82" E



# Jastrebarsko Biomass DH Plant

- Total heated floor area (with the new biomass boiler): 3.750 m<sup>2</sup>
- Projected annual heat consumption: 1.187 MWh
- Biomass boiler capacity need: 600 kW
- Total investment – heating plant: 40.000 EUR
- Total investment – heating network: 253.000 EUR







# Slunj Biomass DH Plant

- City - area of 392 km<sup>2</sup>
- 6.096 inhabitants, 67 settlements
- Town Slunj- 13 administrative buildings and 98 households
- Small family houses - firewood
- Administrative buildings (municipality, hospital and others) - system based on fuel oil or small biomass systems







Heating plant



City center



Rastoke

Slunj

1

E71

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elev 270 m

Google™  
© 2008

Eye alt 1.76 km

45°06'55.60" N 15°34'49.45" E





# Slunj Biomass DH Plant

- Total heated floor area (with the new biomass boiler): 39.580 m<sup>2</sup>
- **Projected annual heat consumption: 5.730 MWh**
- New biomass boiler capacity: 4 MW
- **Total investment – heating plant: 767.100 EUR**
- Total investment – heating network: 958.900 EUR



# Conclusion

- Significant energy potential
- Existing experience and technical knowledge
- Promising area for international cooperation
- Good funding opportunities (national, EU, others)
- Big employment potential





# Conclusion

Can we do something  
together?



## North-West Croatia Regional Energy Agency

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