

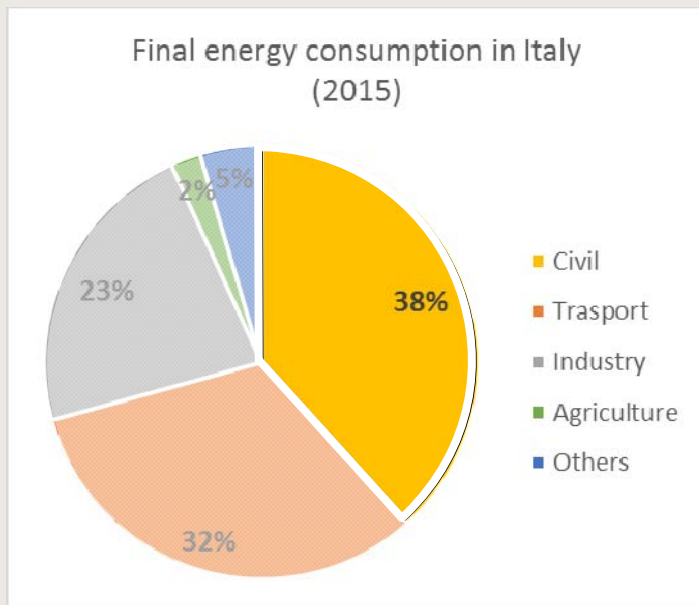
Renewable district heating and heat planning - 25.01.2017

Mapping heat demand and supply: Examples from Italy

A. Dénarié – AIRU – Politecnico di Milano Energy Dept.

Introduction - Energy sector

- The potential of renewable energies for heating and cooling is still largely unexploited in the EU.



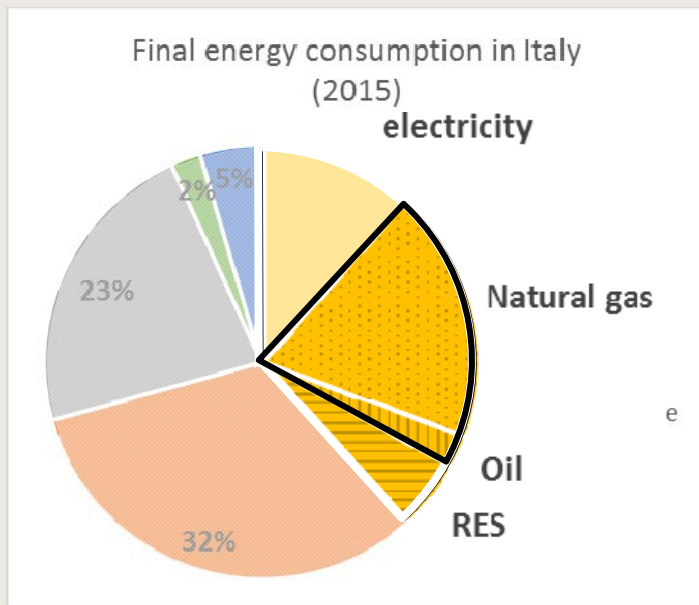
Final energy consumption civil sector:

- 30% electricity
- 70% heating cooling

Data: *Ministero Dello Sviluppo Economico*

Introduction - Energy sector

- The potential of renewable energies for heating and cooling is still largely unexploited in the EU.



Final energy consumption civil sector:

- 30% electricity
- 70% heating cooling

Heating and cooling consumption:

- 72% Natural gas
- 9% Oil
- 19% Renewables

Data: *Ministero Dello Sviluppo Economico*

RES H/C Spread and SmartReFlex projects

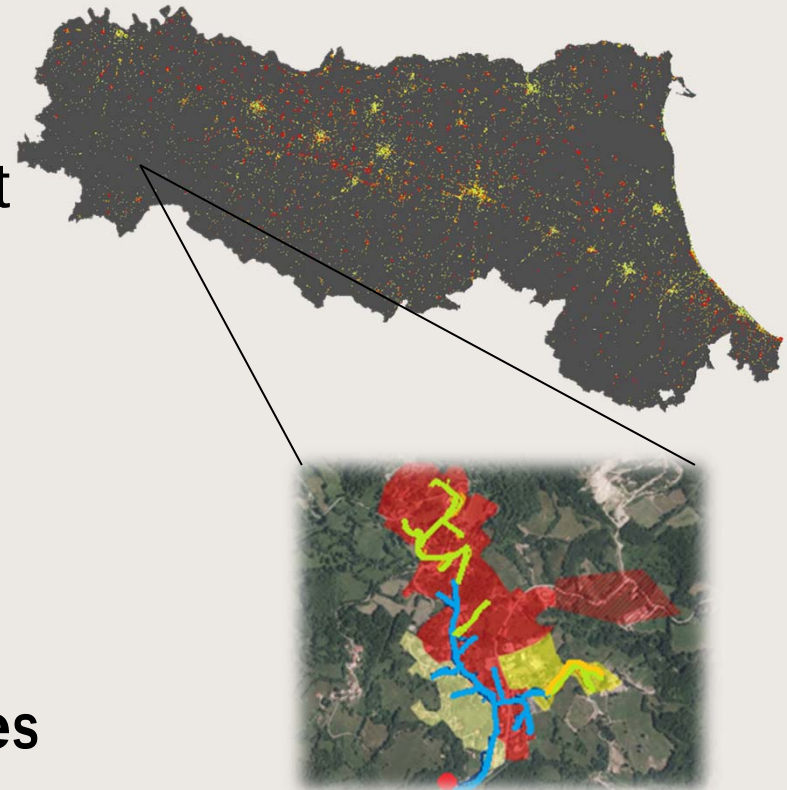
Regions and municipalities play a crucial role in the growth of RES use and energy planning

RES H/C Spread

- Supports regions in development of RES H/C plans
- **Energy mapping**

SmartReFlex

- Supports local authorities in development of energy plans
- Energy mapping, **DH case studies**



Sinergy in Emilia Romagna implementation region

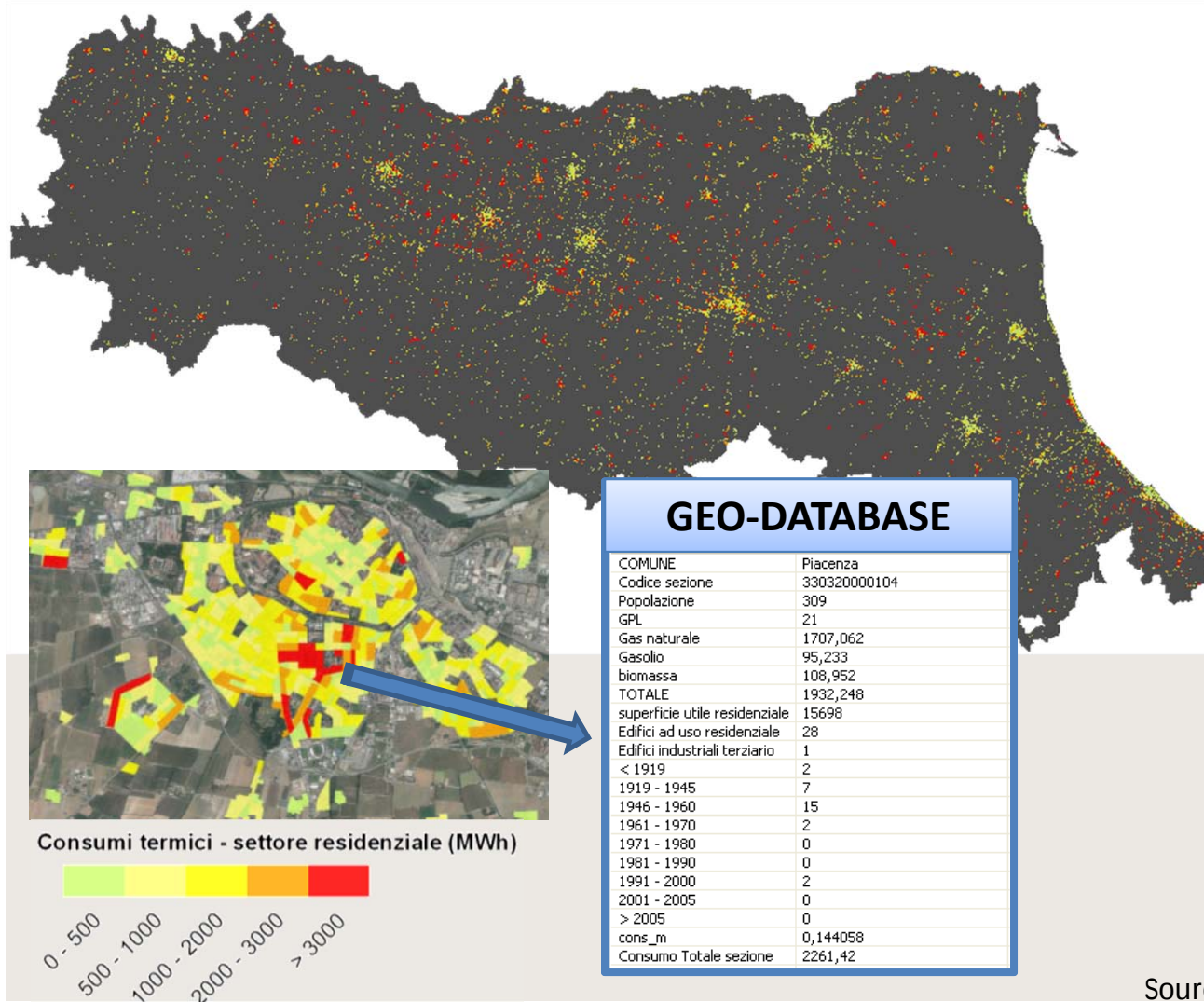
Demand map - Residential sector

Data source

- **Heat consumption** for different fuels per municipality (database INEMAR - ARPA ER 2010)
- **Land use data** (Regione Emilia-Romagna 2011; Census ISTAT 2011)

Output

- **Energy demand per residential area in MWh.** (approx. **100 x 100 m**)
The analysis is made at “census area” level



Source: RES H/C project - F. Lussu, ARPAE ER

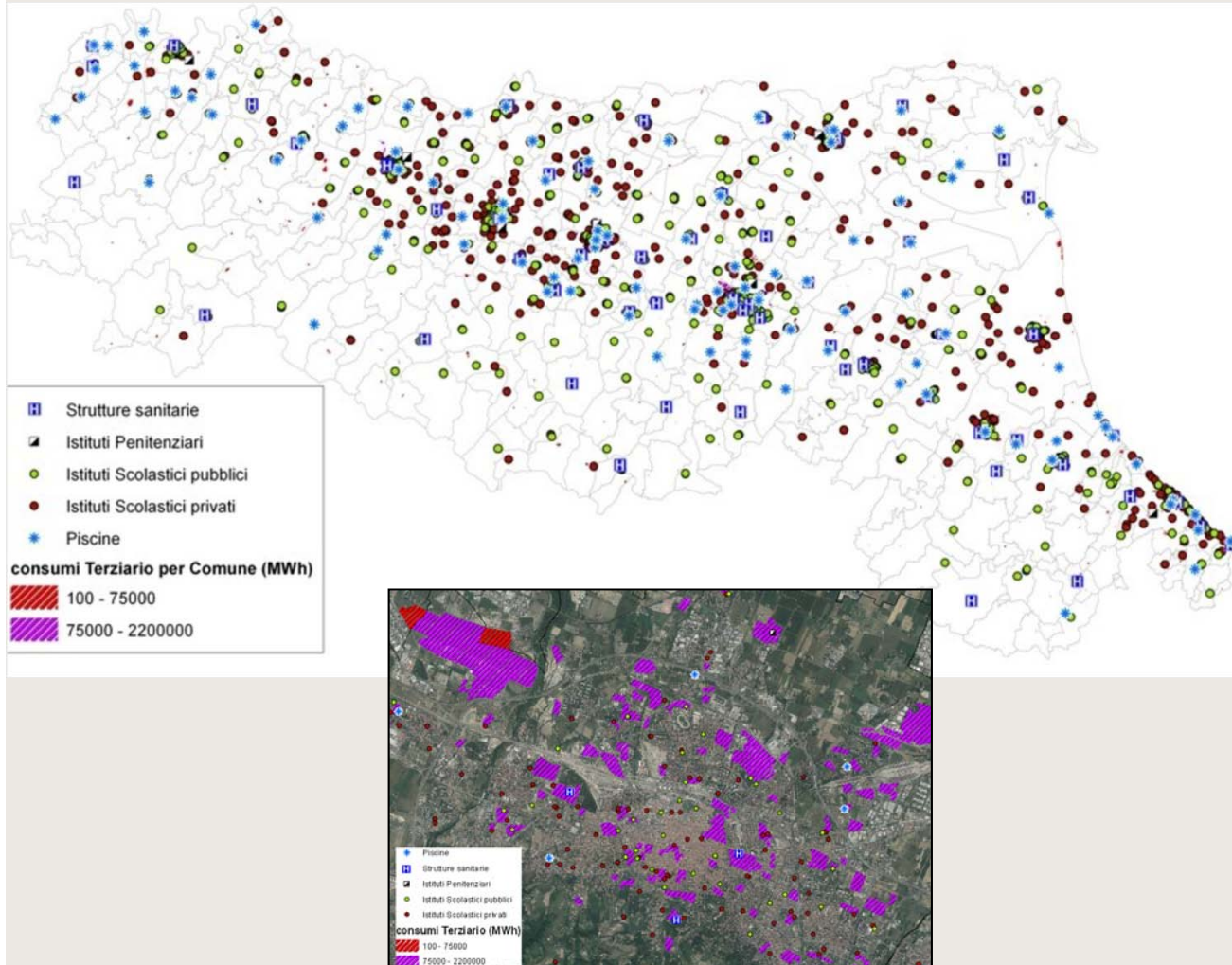
Demand map - Tertiary sector

Data source

- **Heat consumption** for different fuels per municipality (database INEMAR - ARPA ER 2010)
- **Land use data** (Regione Emilia-Romagna 2011; Census ISTAT 2011)
- “**Anchor loads** buildings” (swimming pools, schools, hospitals, prisons)

Output

- Energy **demand** per **tertiary** area in MWh. (approx. **100 x 100 m**)
The analysis is made at “census area” level
- Geo-localisation of anchor loads



Source: RES H/C project – F. Lussu, ARPAE ER

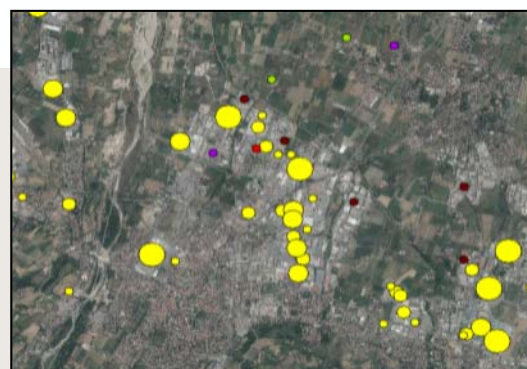
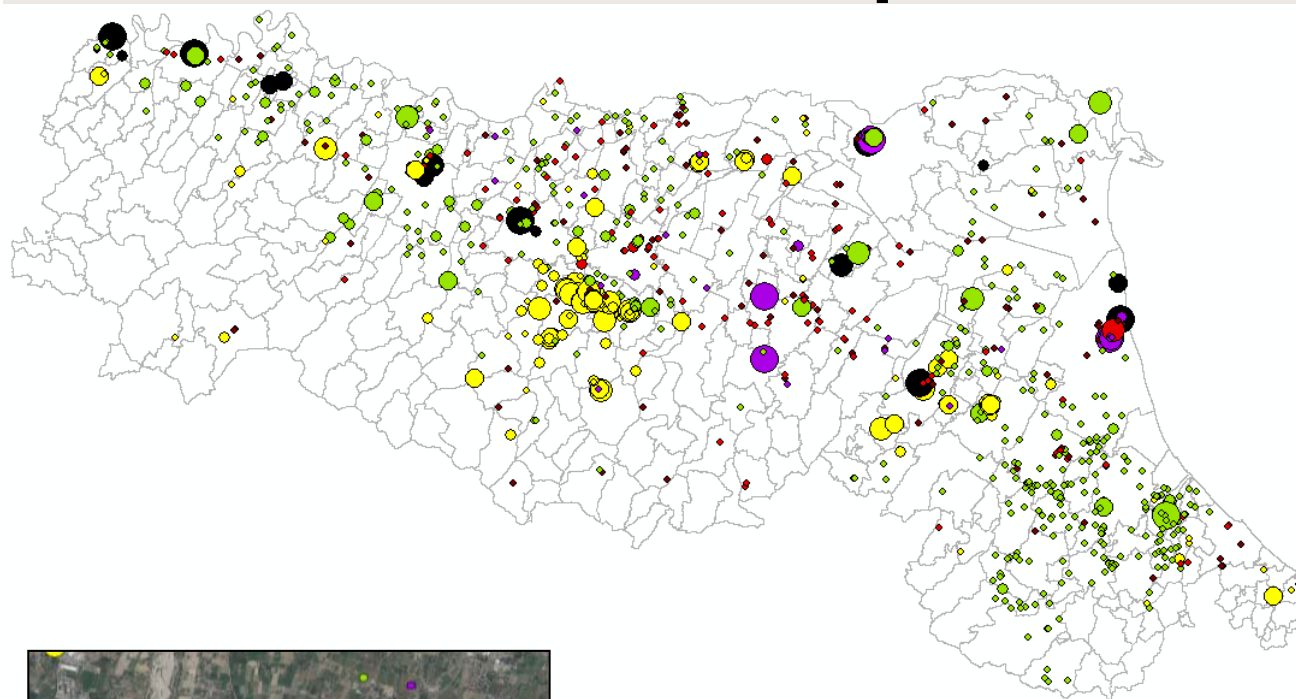
Demand/source map - Industrial sector

Data source

- Database of IPPC industrial activities AIA authorizations (Arpa ER 2013, Environmental Ministry 2013)

Output

- Energy demand and geo-localisation of industrial process



Source: RES H/C project - F. Lussu, ARPAE ER

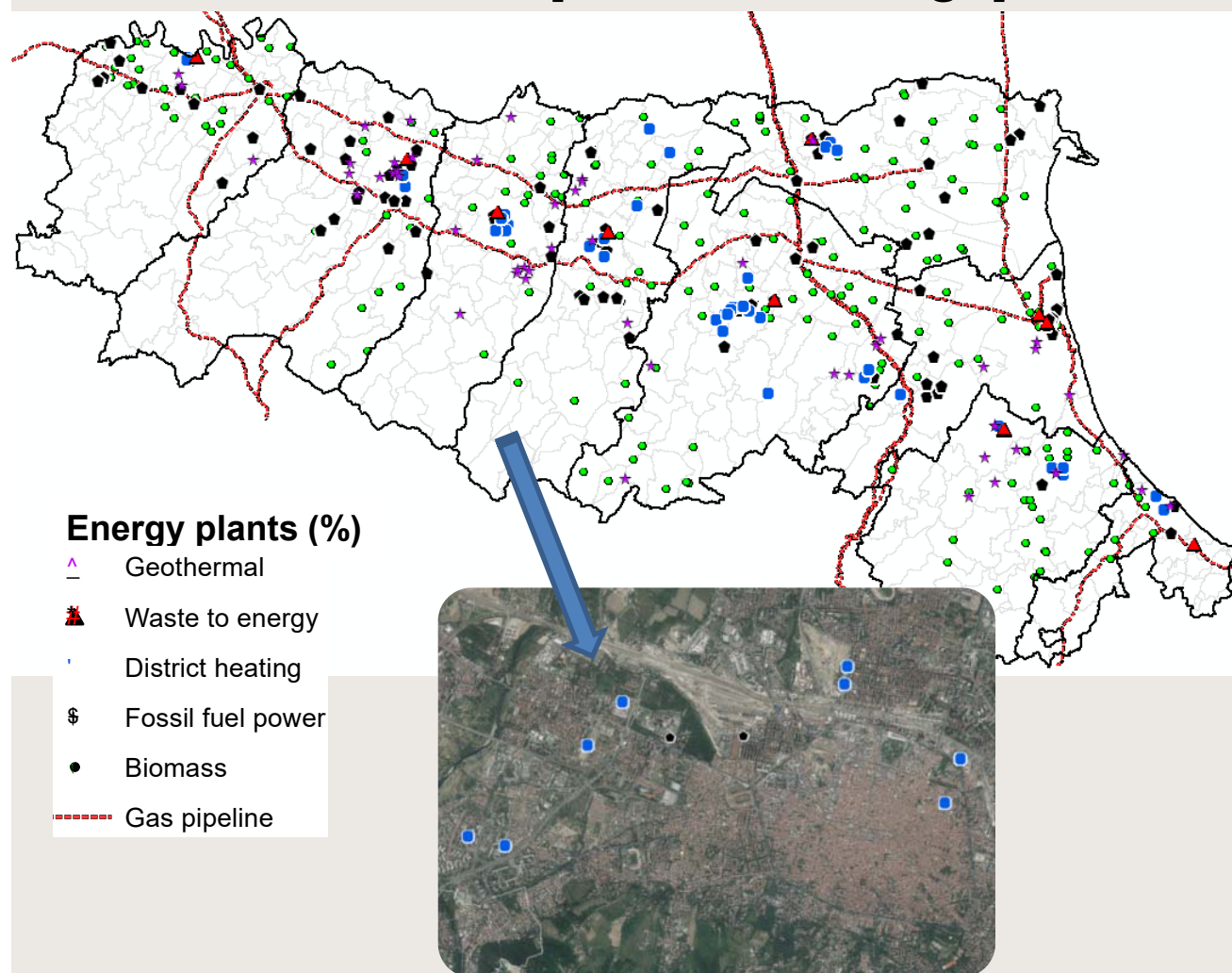
Sources map - Existing plants

Data source

- Database of **IPPC industrial activities/ incentives authorizations** (Arpa ER 2013, GSE)

Output

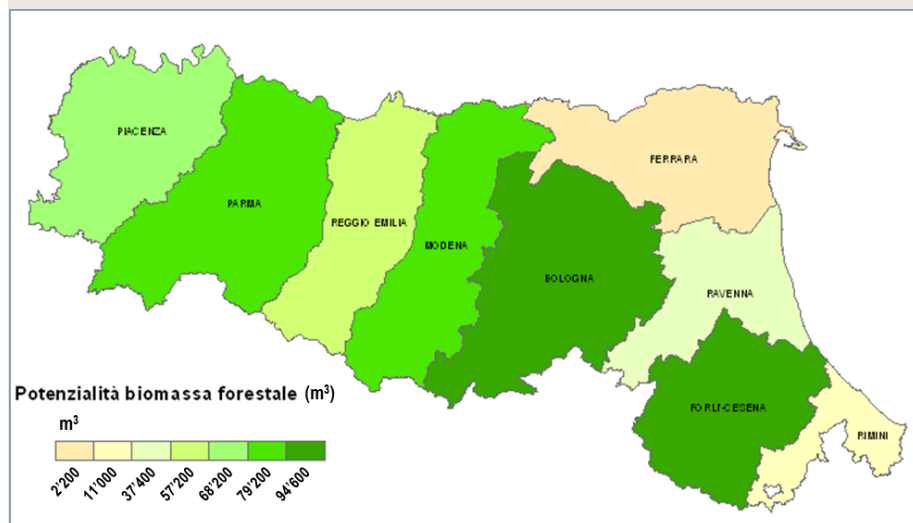
- Energy **production** and **geo-localisation** of fossil fuels, biomass, and geothermal plant



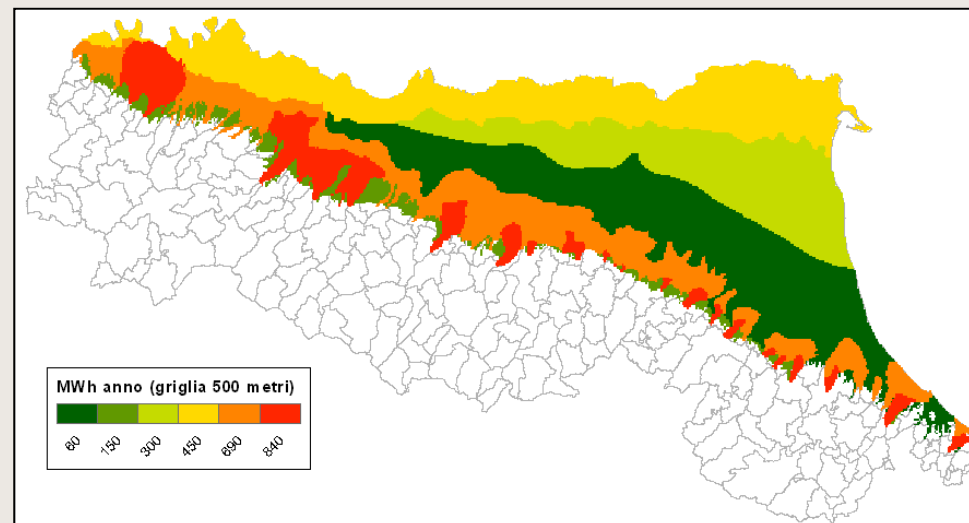
Source: RES H/C project – F. Lussu, ARPAE ER

Sources map - Potentials maps

Forest biomass potential



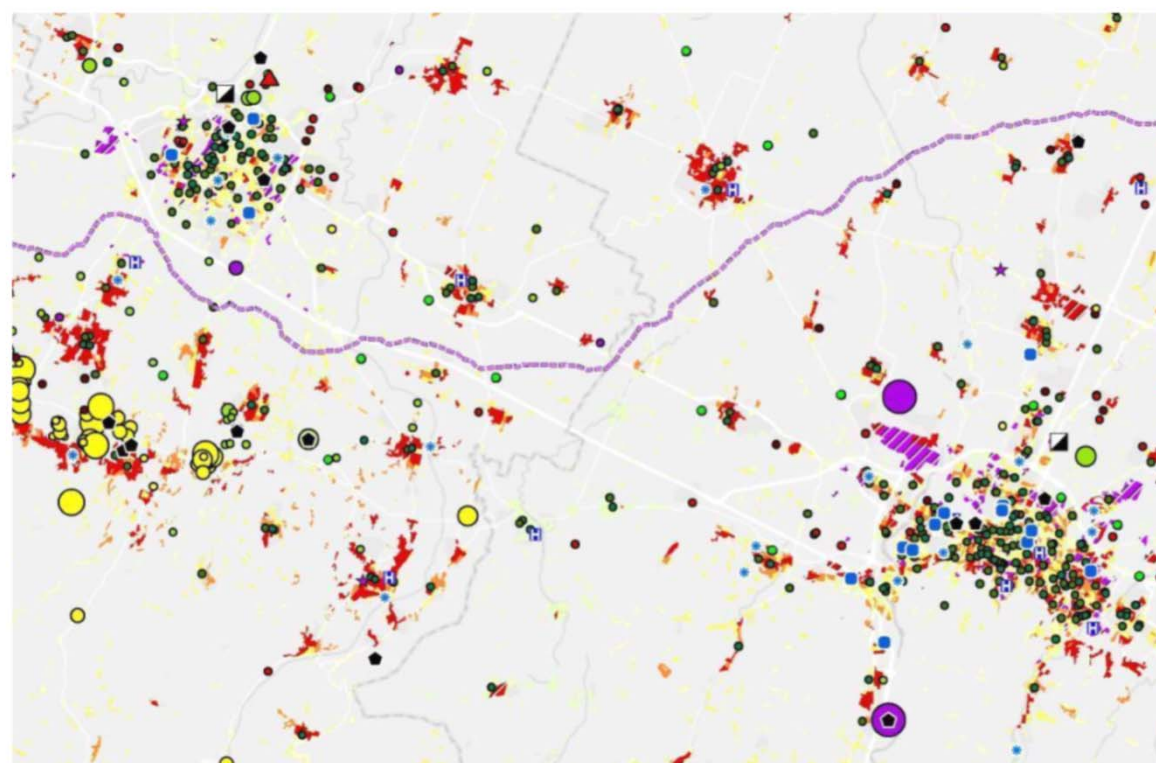
Geothermal potential - low enthalpy



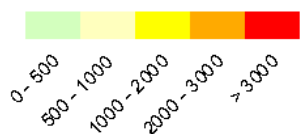
Source: RES H/C project – F. Lussu, ARPAE ER

Overlap demand and offer layers

[WebGIS](#)



Heat demand - Residential sector (MWh)



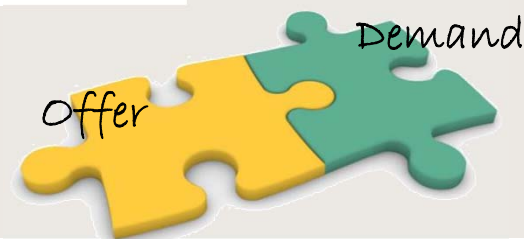
- Energy Industries
- Production and processing of metals
- Mineral Industry
- Chemical Industry
- Waste Management
- Other activities (farms, food industry, paper)

Energy Offer

- ★ Geothermal
- # Waste to energy
- ' District heating
- \$ Fossil fuel power
- (Biomass
- Gas pipeline

Energy Demand

- k Swimming pool
- v Hospital
- Ò Prison
- Public school
- Private school
- 100 - 75000
- 75000 - 2200000

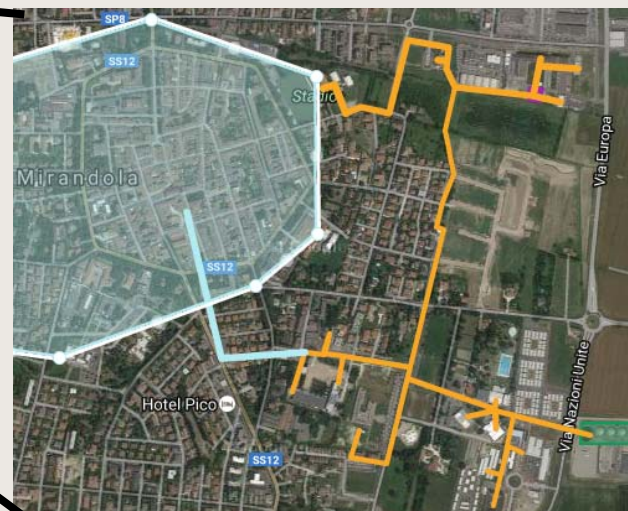
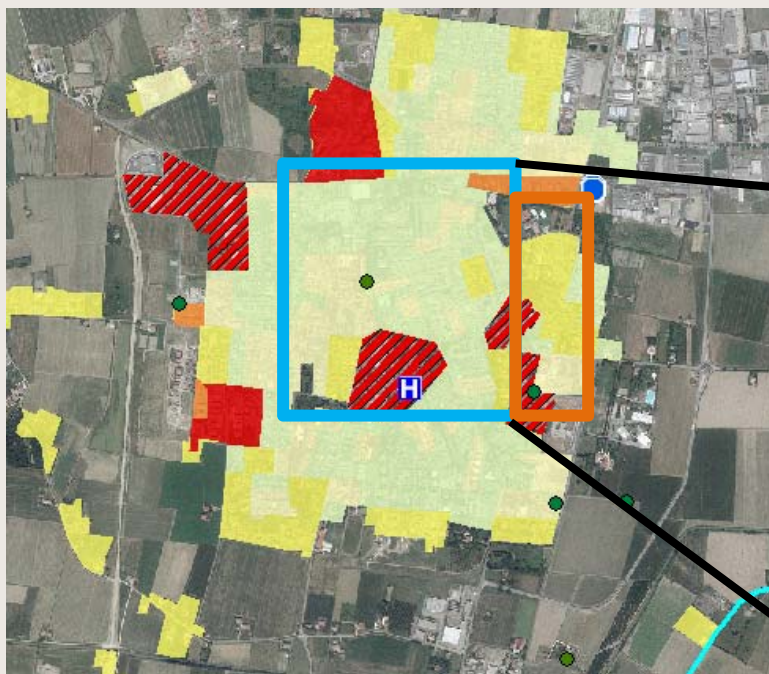


Source: RES H/C project – F. Lussu, ARPAE ER

SmartReflex case studies - Mirandola

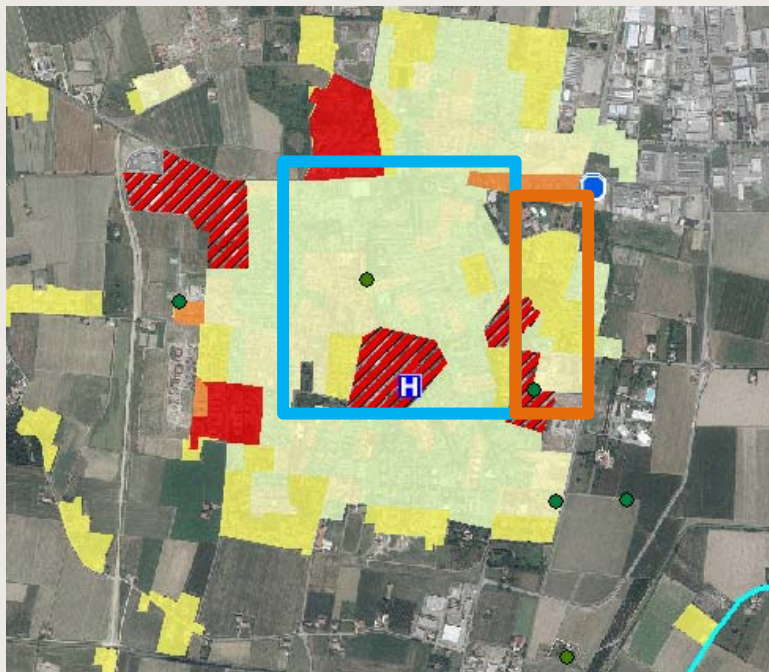
Extension of **existing DH**. The utility, together with the local authority and other local actors, is elaborating the recovery of **local biomass** before it becomes waste.

After the earth quake of 2012. **Integrated planning** of city renovation, **DH** as energy supply of the city center

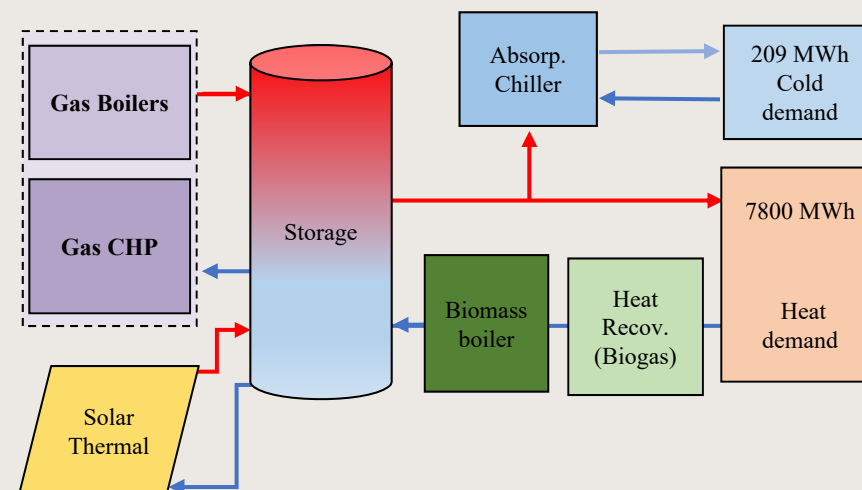


SmartReflex case studies - Mirandola

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After the earth quake of 2012. **Integrated planning** of city renovation, **DH** as energy supply of the city center



SmartReflex case studies - Milano

Assessment of the potential **recovery** of **industrial waste heat** in the region of the future possible **DH connection** from **Cassano d'Adda** CHP plant to **Milano** – Lombardia Region



Cassano d'Adda:

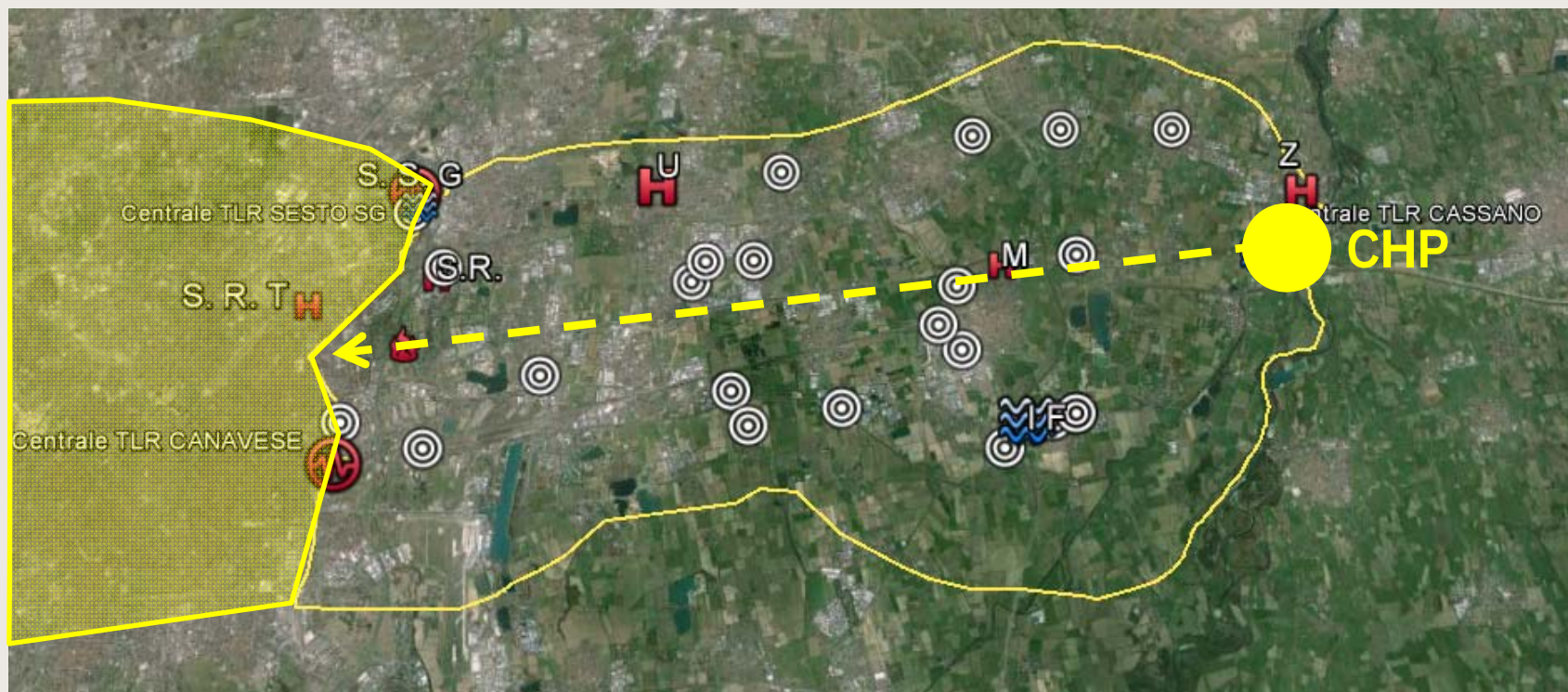
- CHP (820 MWe) small DH ~ 80% heat wasted.
Potential recovery ~ **1 TWh/a**

Milano:

- Primary energy for heating ~**13 TWh/a**
- Heat given by DH **0.85 TWh/a** (2012)<10%
- DH potential ~**4-6 TWh/a**

The aim is to support the **utility** A2A and the **region** in the process of **sustainability** assessment of this connection considered as an “**energy infrastructure**” → **benefits** for the **towns** crossed along the path

Milano - Input data

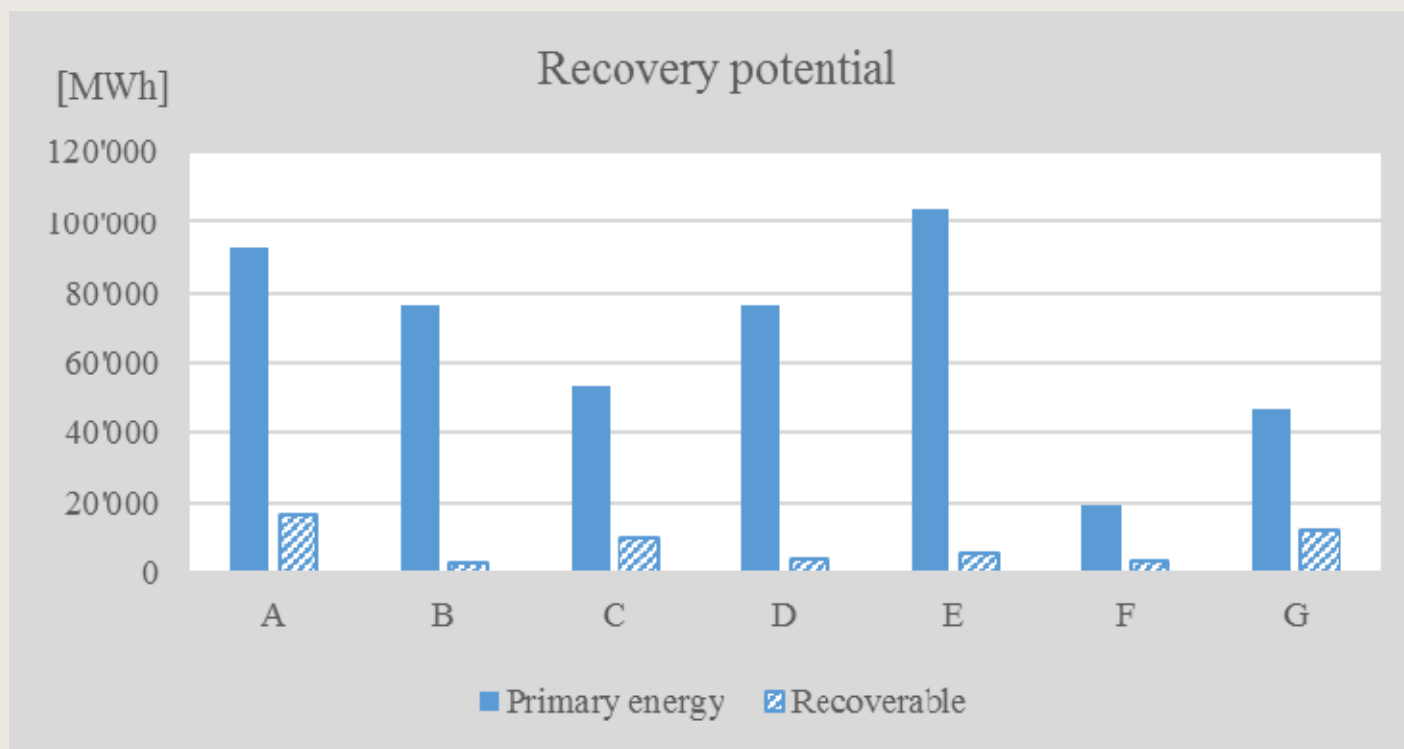


Regional database of location and consumptions of industries:

AIA - *Autorizzazione Integrata Ambientale*

Authorization industries have to ask and update every year for environmental emissions monitoring

Milano - Potential waste heat recovery

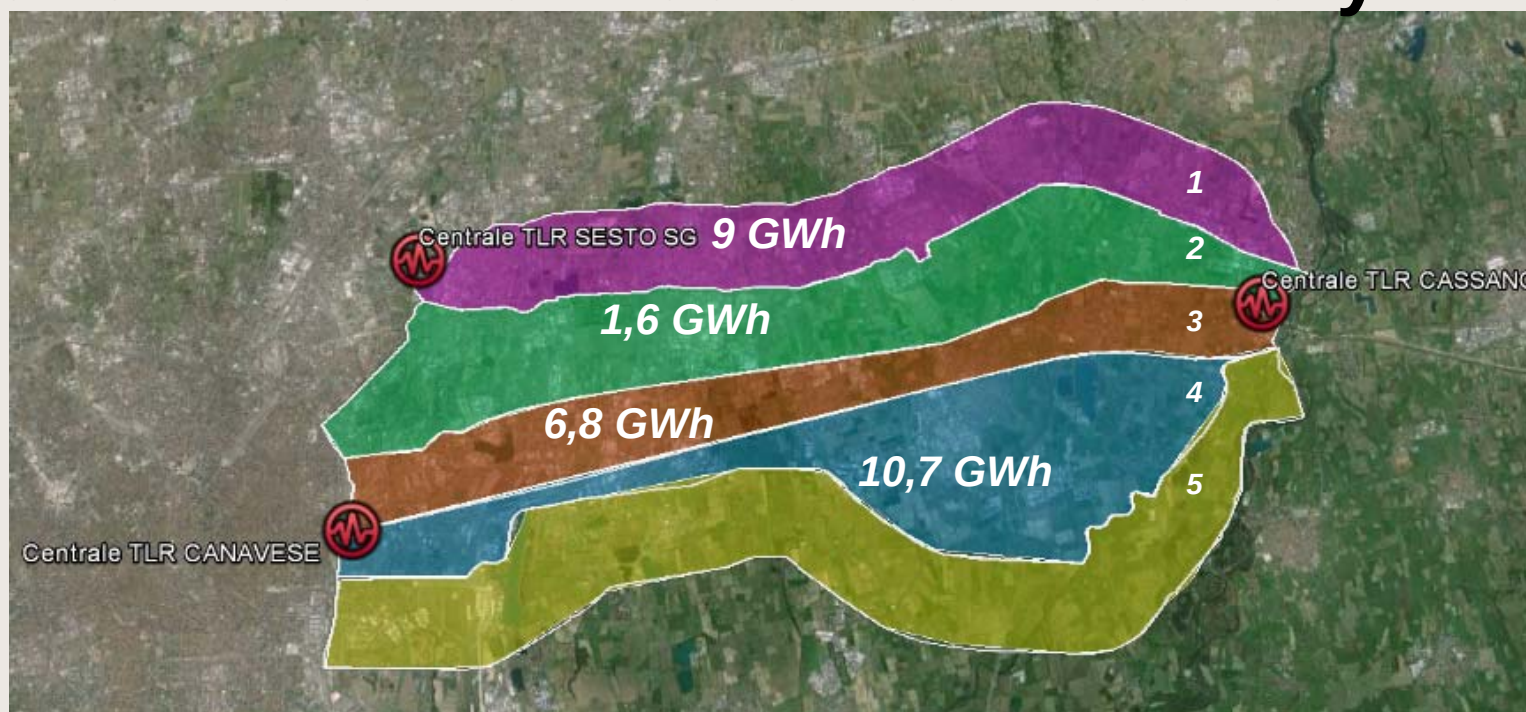


Primary energy consumption → Heat recovery

$$E_{rec} = \eta_{heat} \cdot E_{prim}$$

From Ecoheatcool project Methodology

Milano - Potential waste heat recovery



Belt	Primary energy consumption (GWh/a)
1	47
2	19
3	160
4	170

Technical potential

Heat road map Europe

Recoverable heat in DH (GWh/a)
9
1,6
6,8
10,7



Thank you

for more information

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