Heat Maps in Emilia-Romagna

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Arpa - Environment and Energy Agency of Emilia-Romagna Region

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Project tools

Energy Supply and Demand
HEAT MAPS and INDICATORS

Cost Benefit Analysis
CBA

Participated planning
FOCUS GROUPS
Energy Supply

- + 410 energy plants georeferenced
- **Biomass** -> high diffusion
- **Fossil fuel power plants** -> major contribution of energy generation
- **Geothermal** -> ongoing analysis with Regional Geological Survey

**Energy plants (%)**

- Geothermal: 11%
- Waste to energy: 1%
- District heating: 60%
- Fossil fuel power: 25%
- Biomass: 3%
- Gas pipeline: 1%

Co-funded by the Intelligent Energy Europe Programme of the European Union
Thermal energy demand

Residential
Heat consumption per census area

Industrial
Heat consumption per IPPC industrial activities (Directive 2010/75/UE) and per municipality

Tertiary
Heat consumption per areas (municipality) and per large and steady consumption points
Residential sector

Dataset(s) (source)
• Heat consumption for different fuels per municipality (database INEMAR - ARPA ER 2010)
• Population per census area (Census ISTAT 2011)
• Land use data (Regione Emilia-Romagna 2011)
• Usable floor area (Census ISTAT 2011)

Methodology
• Intersect (GIS) between census area and land use (only residential zoning) -> new layer “residential area”;
• Estimate m2 heat demand;
• Estimate total consumption of residential area (m2 heat demand x census usable floor area)
• Classification

Outputs
For every residential area:
• Consumption of different fuels (MWh)
• Number of buildings per age class
• Usable residential area
• Average consumption (kWh/m2)
Tertiary sector

Dataset(s) (source)

- Heat consumption for different fuels per municipality (database INEMAR - ARPA ER 2010)
- Land use data (Regione Emilia-Romagna 2011)
- Buildings with large and steady demand - “anchor loads” (swimming pools, schools, hospitals, prisons)

Methodology

- Selection of tertiary area by Land use data (airport, fairs, shopping centres, ...)
- Mapping of tertiary area not included in Land use data (for municipality with heat consumption in tertiary sector)
- Mapping of buildings with large and steady demand

Outputs

- Site geo-localisation of hospitals, schools, swimming pools, prisons etc.
- For every municipality:
  - Consumption of different fuels (MWh)
  - Total consumption (MWh)
## Dataset(s) (source)

- Database of IPPC industrial activities (Arpa ER 2013, Environmental Ministry 2013)
- Geo-localisation data (Arpa ER)

## Methodology

- Extraction of energy information for every plant by the monitoring & control plan (IPPC)
- Creation of new shp.file (GIS)
- Classification (categories, energy consumption)

## Outputs

For every industrial activity:

- Site geo-localisation
- Category of activity
- LNG consumption (MWh/year)
- Liquid fuel consumption (Kg)
- Electricity consumption (MWh/year)
- Self-produced energy (MWh/year)
- Consumption of self-produced energy (MWh/year)
- Export self-produced energy (MWh/year)
- Total consumption (GWh)

### Categories of activities

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

Different heat requirements (and temperatures) for different sectors

excess heat = $\eta_{\text{heat}} \times \text{MWh}$
Forest biomass potential (draft)

- Regional Forest Plan 2014-2020
- Evaluation of sustainable harvest of forest biomass for energy generation
- Energy potential: about 24 MWe
Geothermal potential (draft)

- Cooperation with Regional Geological Survey
- **Low enthalpy** -> plain
- Resolution: 500x500 m grid
- Research addressed to understand the **potential** for residential sector
- Contribution to tertiary and industrial sector will be analysed
Constraints (suitable/non suitable areas)

• Regional regulations for solar plants (2010), wind, biogas, biomass and hydro plants (2011)
• Analysis by Arpa for geothermal plants (ongoing in RES H/C SPREAD)
Regional INDICATORS dataset

- 340 Municipalities
- indicators coherent with law requirements (annex 3 DLgs. 102/2014 transposition of EED)
- other indicators (e.g. CO2 reduction objectives from SEAPs)

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<thead>
<tr>
<th>MUNICIPALITY</th>
<th>Climatic zone (DPR 412/93)</th>
<th>Plot ratio</th>
<th>Density population (inh/km2)</th>
<th>Per capita residential heat demand (MWh/ab)</th>
<th>Energy generation (GWh)</th>
<th>Industrial consumption (GWh)</th>
<th>WTE plants (n.)</th>
<th>DH plants (n.)</th>
<th>Swimming pools (n.)</th>
<th>Prisons (n.)</th>
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Co-funded by the Intelligent Energy Europe Programme of the European Union
Summary sheets for municipalities

RENEWABLES ENERGY PROMOTION FOR HEAT & COOLING

Municipality: Bologna
Surface: 140.8 km²
Population: 386,298

Indicators:
- Climatic zone (DPR 412/93): E
- SEAP adhesion: SI
- CO₂ target reduction: 20%
- Plot ratio DLgs 102/14 (built-up/area tot): 0.42
- Density population (pop/km² built-up area): 6443
- Energy generation (GWh): 603.5
- Pro-capita residential heat demand (MWh/m²): 6.5
- Heat consumption - Residential sector (GWh): 2398.9
- Heat consumption - Tertiary sector (GWh): 2178.6
- Heat consumption - Industrial (GWh): 1180.8
- Waste to Energy: -
- District heating: 11
- Hospitals: 4
- Swimming pools: 5
- Prisons: 1
- Public schools: 38
- Private schools: 139

Sectorial distribution of heat consumption:
- Residential: 42%
- Tertiary: 38%
- Industrial: 20%

Heat Map (domanda e offerta di energia termica)

Offerta di energia:
- Combustibili fossili
- Impianti Teleriscaldamento
- Biomasse
- Termovalorizzatori

Residenziale - consumi termici (GWh):
- 0 - 500
- 500 - 1000
- 1000 - 2000
- 2000 - 3000
- > 3000

Terziario - consumi termici (GWh):
- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100

Industrie AIA - consumi totali (GWh):
- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
All data already available
Thank you for your attention

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