



POLITECNICO  
DI TORINO

# Honors thesis

Master Degree in Territorial, Urban, Environmental and  
Landscape Planning

## BIOMASS FOREST. A RENEWABLE ENERGY RESOURCE FOR THE REGION PIEMONTE

### Abstract

The producibility of biomass is conditioned by three “factors”:

1. Woods global. The word “global” consider the whole Piemonte’s forest surface (870,000 ha) therefore the biomass availability is almost 430,000 t/year. Although a significant value doesn’t take into account accessibility to the woods.

Through data and graphics revision with G.I.S. (Geographical Information System) software, we calculated the accessible surface for each recognized forestry category.

2. Woods served. From the served woods, are 29% of the global forest surface, will get about 351,720 t/year of wood biomass, noting a decrease of 18% from the global disponibility.

3. Interventions woods. The operations are conducted exclusively within the served area. The final result is the same biomass availability previously computed (351,720 t/year). The forest category from which we could get the most profitable interventions are: Chestnut (63%), Reforestation (13%) and Beech (5%).

Study’s cases: A.I.T. (*Ambito d’Integrazione Territoriale*, Areas of Integration Territorial) of Pinerolo and Ivrea.

The selection criteria of the areas of study proposed, belonging to the Province of Turin, have been the largest concentration of forests served (21,595 ha) and highest presence of residents (year 2011), reaching values that allows progress a first consideration: varying the number of residents varies energy demand.

The framework is interesting also for the unemployment rate, where due to the high percentage of mountain towns, reaches values medium-high. The ability to build new biomass cogeneration power plants brings new job opportunities across the energy process, from the collection of material, its combustion and distribution.

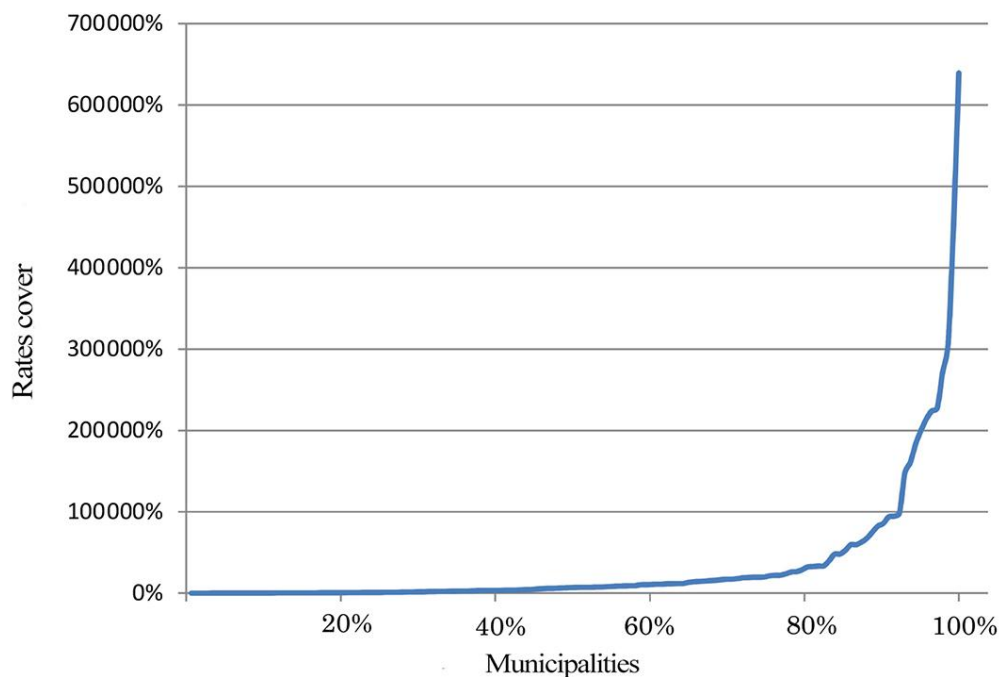
The Pinerolo and Ivrea A.I.T., have an availability of approximately 21,500 ha of forests served, for a wood mass firewood total 37,493 tons / year. Energy demand recorded in 2011 is 2,209,434 kWh of which the 81% is thermal energy.

For the evaluation of the potential energy was considered the cogeneration plant having O.R.C. turbine (Organic Rankine Cycle), from which it is estimated a thermal efficiency of 50% and electrical of 15%.

The computed the share blanket was developed exploiting the thermal energy. In municipalities where the proportion far exceeds the 100% share covered ends, the remainder is used for the demand of energy supply.

Through the distribution curve of altitude covered potential thermal energy, we notice that 100% of the municipalities would be covered by thermal energy and a good 89% of electricity.

Image 1 – Distribution curve in the share of thermal energy potential



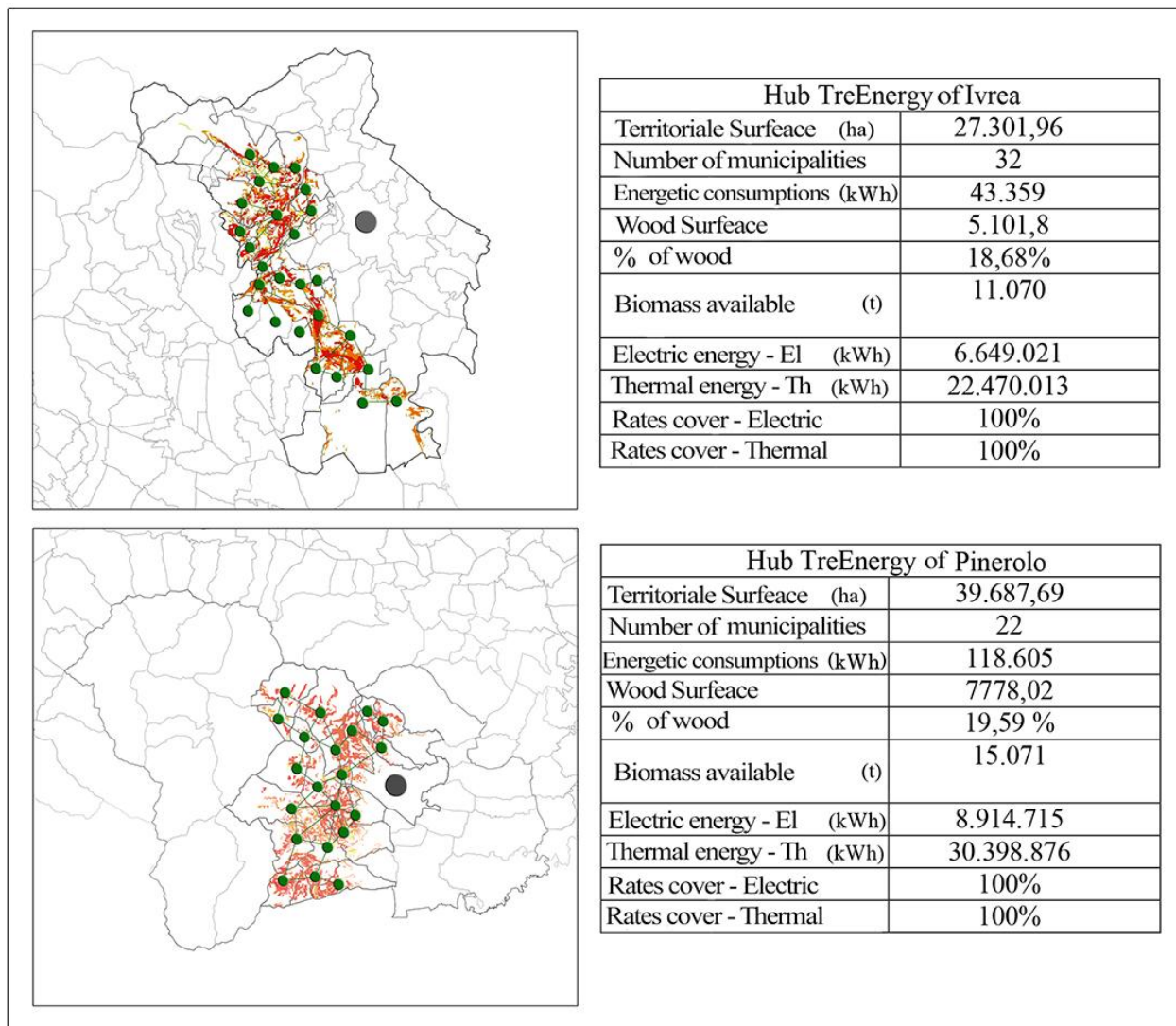
The A.I.T. is the territorial dimension through which the R.S.P. acts, but considering energy policies, the unit appears to be "weak" for "local" energy enhancement. Municipalities capitals of Pinerolo and Ivrea, from which the names of the A.I.T., are central political-administrative and socio-economic around which gravitate the surrounding municipalities. This type of "central" approach puts in the shade the many naturalistic element as possible energy heart, and consequently the role of "local territorial" is too thin. If the socio-economic and political-administrative dynamics add the values for the potential energy resulting from forest biomass, as previously discussed, we can recognize the "energy hub" or "Hub TreEnergy".

The Hub Power of Ivrea has a land area of 27,301 hectares, of which 18% is served by forests. For a demand of 43,000 kWh / year, biomass (11,000 tons) available is sufficient to cover the whole energy needs for heating and electricity. Even the Hub of Pinerolo,

concentrated in the central portion of the A.I.T., has an availability of 15,000 tons that fully responds to both the thermal and electrical energy demand.

In conclusion, the Hub is the territorial platform support for energy planning and it is the stage on which the actors, public and private, combine to bring about the associated management of forest resources.

Image 2 – Hub TreEergy of Pinerolo end Ivrea



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