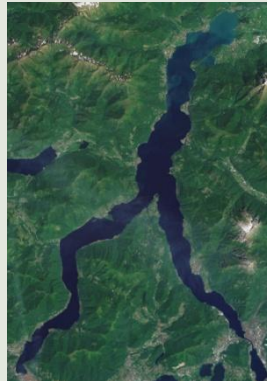


Bio-energy case of the Alpine Lake Como area, Italy

The case study presented is the output of a training period as visiting researcher attended by Salvatore Martire at European Forest Institute (EFI) Headquarters in Joensuu (Finland). Contact Diana Tuomasjukka (diana.tuomasjukka@efi.int) or Salvatore Martire (salvatore.martire@unimib.it) for more information.



The **Province of Como** is a province in the north of the Lombardy Region of Italy and borders Swiss to the North. The central and northern parts of the Province are mountainous, and with a large forest cover. The population is concentrated in the plains and along the shores of Lake Como. The local economy is based on industry and tourism.

The rural and mountain areas have a low population density, and the lack of a solid economy causes the depopulation of rural areas. Furthermore, the proximity to important urban centers (as Como, or Milano) contributes to the depopulation.

The SIA for the case study investigates different aspects related to the stakeholder's needs and regulatory framework. Key points of the development of local bio-energy chains are:

- help to achieve the Regional 2020 objectives;
- fight depopulation of rural areas;
- allow the management of un-used forests.

The SIA should investigate the effect of the development of bio-energy chain in terms of environmental and socio-economic impacts. The analysis focuses on:

- Environmental impacts (especially Air Pollution because Lombardy Region is on the most polluted European Areas);
- Economic impacts of subsidies (heat/power);
- Mechanization level of forestry activities;
- Combustion technology;
- Achievement of policy objectives.

Baseline year and Reference Futures are:

- **Baseline - 2008.** Based on the data about forestry sector of Como Province. National statistics, local data and studies, local experts judgment have been considered to outline the local wood-energy chain of Lake Como area. Firewood is used largely for self-consumption (Type IA);
- **CHP Generation Based - 2020.** Based on the 2020 Europe strategy and local plans. The chain is based on chips CHP (combined Heat and Power) plants (Type III). Subsidies for electricity are included;
- **Heat Generation Based - 2020.** Based on the 2020 Europe strategy and local plans. The chain is based on domestic heating plants (Type II). Subsidies for heat generations in small plants.

Scenarios are:

- o – Actual Chain.** Based on logs for self-consumption.
- M – Mechanization.** High level of mechanization in forestry activities.
- B – Biomass.** All biomass (annually) available is used.
- S – Substitution.** Improved of combustion technology is considered.

Combining baseline and reference futures with scenarios, 12 different chains have been analyzed in ToSIA.

The **study results** related to flows and indicators can support local decision-making processes, providing scientific evidence to the decisions and directing future assessment.

Natural Gas is used for heating and cooking. The set objective in terms of share of renewable on the total consumption for Lombardy Region is 11.3%. The maximum estimated heat production covers less than 1% of Natural Gas consumption of households of Como Province, but it exceeds 10% for rural areas.

Subsidies are decisive for economic performances of the chain. Actually, they are not provided for fuel production, though the forest-fuel chain determines the social value (employment).

Final use processes are the most important in terms of environmental and economic impacts. E.g. they produce from 48% to 98% of the GHG-Emissions (depending on the alternative chain considered).

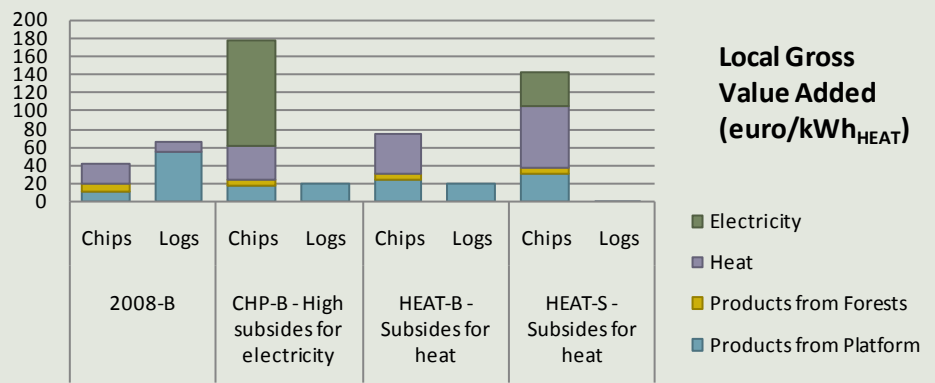
Transport processes don't affect significantly sustainability.

There are not significant advantages in using high mechanization in forestry activities: the site-specific features limit the productivity of high mechanization system;

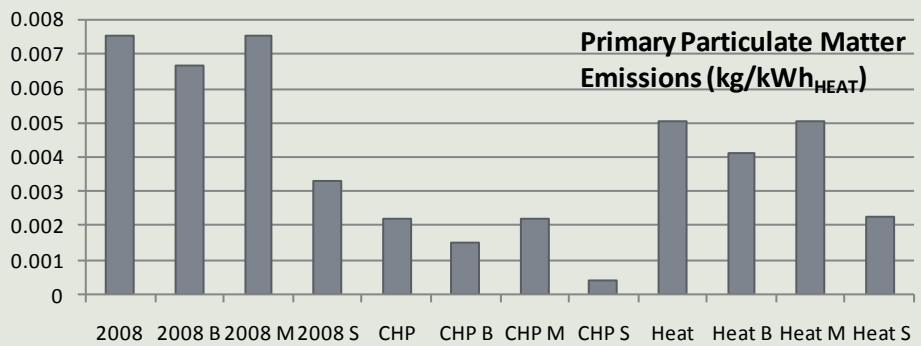
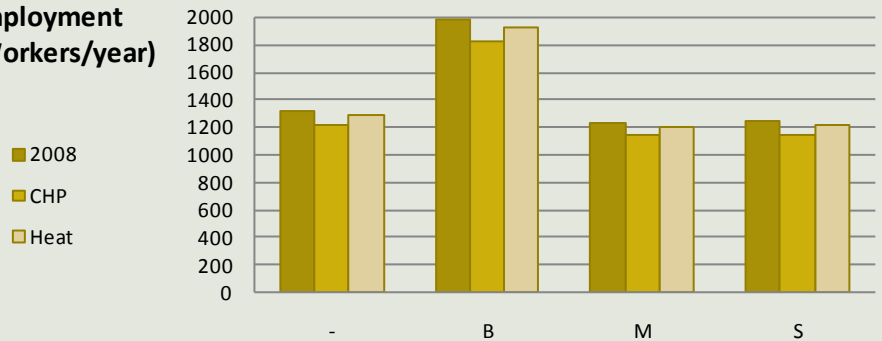
CHP plants have been modelled as most efficient technology option, and fuelled with forestry chips, so it has the best environmental and economic performance. However the development of large size systems may involve the importation of fuels, or the use of urban waste, and this may lead to different impacts on sustainability;

Absolute results show that only an increase in biomass use can lead to a significant increase of workers involved in the local forest-energy: up to 50%;

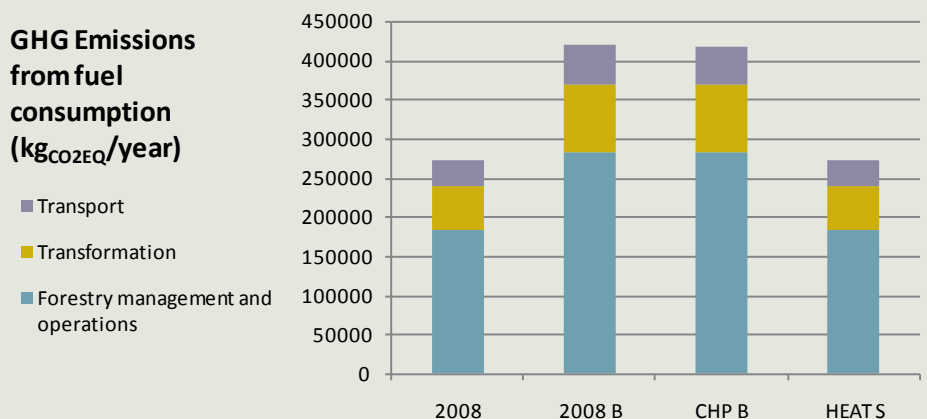
The reduction of environmental impacts is possible also increasing biomass use thanks to an improvement of combustion technology.



Employment (Workers/year)



GHG Emissions from fuel consumption (kg_{CO2EQ}/year)



The proposed case study has shown the usefulness of ToSIA for the assessment of sustainability at the local level. In addition, it allowed the modeling of a local energy system, which in itself is a useful tool for managing and directing local policies.