# BIOMASS FOR ADAPTATION TO CLIMATE CHANGE

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Forests occupy over 36% of Italian soil, mostly on slopes. Forest care is therefore of primary importance for the whole territory.

Climate has changed very markedly and adaptation to climate change is very important for the stability of our territory.

In short climate change consists primarily of less raining days but more intense rains: this poses an increasing challenge for soil erosion and landslides.

The mirror challenge is posed by longer draughts that represent a higher risk of forest fires. A common consequence is a decrease of the time available to water to recharge the underground aquifers, that is aggravated by the decrease of snowfalls that with alternate snow melting and re-icing assured a constant supply for an extended time.

The response is a territorial care aimed at keeping water as long as possible where it falls, involving the whole watershed, by terracing and also by distributing bio-char mixed with soil; this last operation could improve fertility and water economy: bio-char has a porosity that represents a very good habitat for the microflora responsible for soil fertility, and can be soaked by rain by capturing practically their volume of water and releasing it as soil humidity decreases.

As for forest fire, its risk can be controlled by cleaning the forest. In the Mediterranean basin the climate change forest fire could mean desertification.

A territorial care by itself is very demanding and in many situations public finances are not able to assure a through enough and constant intervention.

But this forest care can allow collection of biomass ( forest thinning, cleaning) that together with agricultural residues and specific energetic crops grown on contaminated soils for phyto-remediation could mean the availability of 60 Mln t of dry biomass per year in the case of Italy, equivalent to 25 Mln t of crude oil, corresponding to about 15% of basic energy needs for Italy.

This could then build up a synergy if this biomass is treated for energy production, i.e. gassification to allow a very thorough territorial care.

In the case of Italy a very large proportion of the forests is practically neglected: the possible energy production could therefore attract more attention to the forest and allow a wide-range forest management that could consider the improvement of the forest to take care of a cascade exploitation for structural uses, then chemistry for bio-based industries and then energy production by conversion to gas.

The technology has substantially improved in the last years allowing an increase of electricity and heat production in competition with other energy sources and with prospect to count on the application of fuel cells with a very substantial improvement of efficiency and environmental performance.

This progress could also be helped with the aid of satellite and airborne earth observation that can suggest specific weak points for landslides, soil erosion, floods, underground aquifers, that can be performed artificially if natural mechanisms are not sufficient.

I wish to mention here the collaboration with CNR-IVALSA (Florence, Italy) that has been extremely helpful for the suggestion on forest management and the possible development of specific practices and equipment to make this initiative self-sustainable.