

# Sustainable green carbon production from solid biomass residues: the Alps4GreenC project

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Due to the high availability of biomass, the Alpine Region is characterized by a high density of industrial plants for the conversion of biomass into valuable commodities such as thermal and electrical energy, chemicals, biofuels, etc. Nowadays, industrial and academic research is focusing on the valorization of biomass residues with the aim of minimizing waste, preserving resources, fostering the transition from a linear to a circular economy and thus increasing the region's resilience. Despite the fast evolution of innovative technologies for biomass conversion and the increasing knowledge on the topic, a point of connection and coordination among the Alpine territories is still missing.

The Interreg Alpine Space project *Alps4GreenC - Implementation pathways for sustainable Green Carbon production in Alpine Region* aims to tackle this challenge by increasing awareness among Alpine Space citizens, plant owners, policy makers and all stakeholders promoting the utilization and valorization of biomass residues through common sustainable pathways.

In particular, Alps4GreenC aims at investigating the opportunities for biomass conversion focusing on the production of green carbon (biochar) through policy recommendations and pilot testing in Austria, Italy and Slovenia. By giving practical guidance on the opportunities of the production and utilization of biochar, the project would like to convince authorities as well as other interested stakeholders on the importance of the quality biochar utilization for resilient transition to carbon neutral Alpine Space. By explaining the topic, the project aims to change the behavior of biochar end-users to spread the use of biochar and scale up the quantities.

Project activities include: i) crowdsourcing campaign to collect biomass residues and raise awareness, ii) mapping of stakeholders and resources, iii) testing and piloting of biochar production and iv) context and gap analysis of biomass conversion opportunities for green carbon supply.

First, a crowdsourcing campaign is carried out in every project country (3 total) by involving directly stakeholders in dedicated workshops, sending newsletters, publishing articles and social media posts. Within the campaigns, local foresters/farmers are asked to provide the consortium with biomass residues, which they would like to upcycle. After a preliminary evaluation based on information collected through online forms, ten different residues are selected to be thoroughly characterized and tested for biochar production in both pyrolysis and gasification lab-scale plants, while two residues are selected for pilot-testing. Biochars produced are analyzed and sent back to the participants along with recommendations on possible applications especially in agriculture or steel industry.

At the same time, a deep analysis of the industry and innovation stakeholders is carried out collecting information through surveys to geolocate stakeholders, resource paths and residue quality on an interactive map.

Moreover, the operating context (considering sociocultural, political, economic and geographic factors) of the environment in involved countries is analyzed focusing on biomass conversion opportunities for green carbon supply. Besides, a gap analysis is performed to compare current performances with the desired ones and provide policy recommendations for the relevant stakeholders (policy, investors) supported with best practice examples from the Alpine Region and beyond (EU).

In conclusion, Alps4GreenC contributes to the conditions for energy sufficiency and climate protection of the Alpine Region by setting, for the first time, the scene for the transnational utilization of biomass residues investigating biomass conversion opportunities and proposing transnational biochar-based value chains. Without a transnational approach as the one of Alps4GreenC, appropriate technologies for biomass conversion will not be identified and upgraded, thus hindering the shift to green, post-carbon approaches.

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