

Impact Objectives

- Define Climate-Smart Forestry (CSF) in the European context
- Identify key silvicultural characteristics and the harmonisation of CSF in mountain areas to create a common knowledge base at European level

A greener future for forest production systems

With the world facing the challenges associated with climate change, Professor Roberto Tognetti of the University of Molise and the European Forest Institute Project Centre on Mountain Forests (MOUNTFOR), in Italy, believes more open communication and improved solutions in forestry management are a key part of the solution



Why is it important to discuss smarter ways to develop forestry, and how are current environmental changes impacting forest ecosystems?

Forest management, which plans for the long term, has to deal with uncertainties related to the productivity and health of forest ecosystems, and their adaptation to environmental changes. Most likely, climate change will exceed a 2°C rise in mean global temperature by the end of this century. International agreements set the global warming target to be well below +2°C compared to preindustrial levels, and voluntary pledges are clearly not enough to reach this target. However, with the right incentives and investments, a significant contribution to cut CO₂ emissions can be expected from forests, forestry and the forest-based industries of mountain regions.

Climate change exerts a growing pressure on mountain regions, therefore there is a need to emphasise forest production systems that are resilient to climate change and natural disturbances. These climate targets can be mainstreamed through Climate-Smart Forestry (CSF) – paying attention to regional circumstances, opportunities and challenges. Sustainable adaptation to and mitigation of climate change require proactive management decisions based on observed forest status and projected change

impacts. Policy and silvicultural measures tailored to the regional contexts can be implemented, and should be in synergy with other targets, aiming at incorporating carbon sequestration into European mitigation schemes, while developing the bioeconomy and preserving biodiversity of mountain regions.

How do you plan to disseminate and integrate sustainable forestry practices and ecosystem services among mountain region communities?

The initiative will strengthen and mobilise European mountain forest research and expertise to address policy-relevant needs. Efforts will be invested in helping regional authorities to make more effective climate-sensitive decisions via improved access to timely, meaningful and trustworthy information and knowledge, while developing CSF tools.

All the required materials will be contributed to the web platform based on the results of research infrastructures, permanent sites, and data modelling. The website will act as a repository for collected data, as well as a reference point about scientific and technical aspects, and a channel for diffusion of objectives and results, open to the potentially interested audience. Beyond researcher partners, we expect to engage public authorities in technical workshops to discuss and refine the central question, define key terms, and propose a dissemination strategy in a participatory manner, with the aim

of connecting the review to national and regional policy concerns.

Can you elaborate on the necessary steps for the success of a future CSF model?

Mountain forest ecosystems can provide both mitigation and adaptation benefits if they are designed and managed appropriately and if the landscape context is considered. The Climate-Smart Forestry in Mountain Regions (CLIMO) COST Action proposes a strategy to modernise the appeal and vision of CSF and build a 'whole' green infrastructure at the continental scale, in a segmented approach due to a variety of technical, political, financial, and socioeconomic constraints. There are several possible interventions addressing different combinations of the primary driving objectives: climate change mitigation, climate change adaptation, and livelihoods (though such approaches can include varying and additional combinations of objectives).

Such an effort will require a wider pool of European-level datasets on climate-smart forests, with the double task of working on the selection of CSF proxy data to be monitored and discussing a possible way for the harmonisation of the data available with future data. Only then it will be possible to build the desired interdisciplinary approach and define long-lasting criteria in CSF, and foster the growth of a new generation of experts from different disciplines.



Changing opinions about forestry resource use

Funded by the EU's Horizon 2020 COST Action programme, *Climate-Smart Forestry in Mountain Regions (CLIMO)* is at the centre of a fundamental change in the way forestry resources are used by the European community

Reports presented at the Paris Climate Change Conference held in 2015 predicted a 2°C rise in mean global temperature by the end of this century, which is well over the global warming target set in international agreements. While the effects of climate change are being felt across the globe, mountain regions are considered to be extremely vulnerable to this increment. Nearly one-quarter of the planet is covered with mountain areas, containing 50 per cent of the world's genetic diversity and 38 per cent of forestry resources, the latter a source of biologic products, ecological balance, and renewable energy to half of the world's population, all of which plays a central role in bioeconomy. Because climate change is increasing the frequency and intensity of ecosystem imbalances, the economic value and adaptive capacity of these regions is jeopardised, which has led to a call for changes in forestry policies and management.

Forests are also recognised as a natural climate mitigation measure, as they act as CO₂ sinks and reservoirs. European forests currently produce an overall climate mitigation impact of 13 per cent on total European CO₂ emissions, however their potential is not being used in an optimal way, largely due to lack of sustainability and proactive monitoring of forest status. Aware of these pitfalls, Professor Roberto Tognetti, who is based at the University of Molise and EFI Project Centre on Mountain Forests (MOUNTFOR), in Italy, has devised a research project designed to re-evaluate, restructure and optimise the contribution of current forestry policies as a sustainable response to climate change.

PLANTING A SEED

Initiated in October of 2016, CLIMO is an EU COST Action focused on finding synergies between climate change actions and forestry policies, while highlighting the region's bioeconomy, biodiversity, and capacity to contribute to mitigation issues. Led by Tognetti, this work aims to introduce current Climate-Smart Agriculture practices to European forestry industries and communities alike.

The project is set to last four years, during which a three-dimensional approach will be presented in an effort to enhance adaptation and resilience to climate change within forest ecosystems, optimising climate change mitigation programmes, and improving the livelihood of mountain region inhabitants, making them a crucial piece of this system. 'The concept of Climate-Smart Agriculture was defined and presented by the Food and Agriculture Organization (FAO) of the United Nations,' says Tognetti. 'Taking into account its key messages, Climate Smart Forestry (CSF) should introduce climate change as a pressing issue, and foster a widespread application of sustainable forest management principles so as to strengthen local institutions and governance processes.'

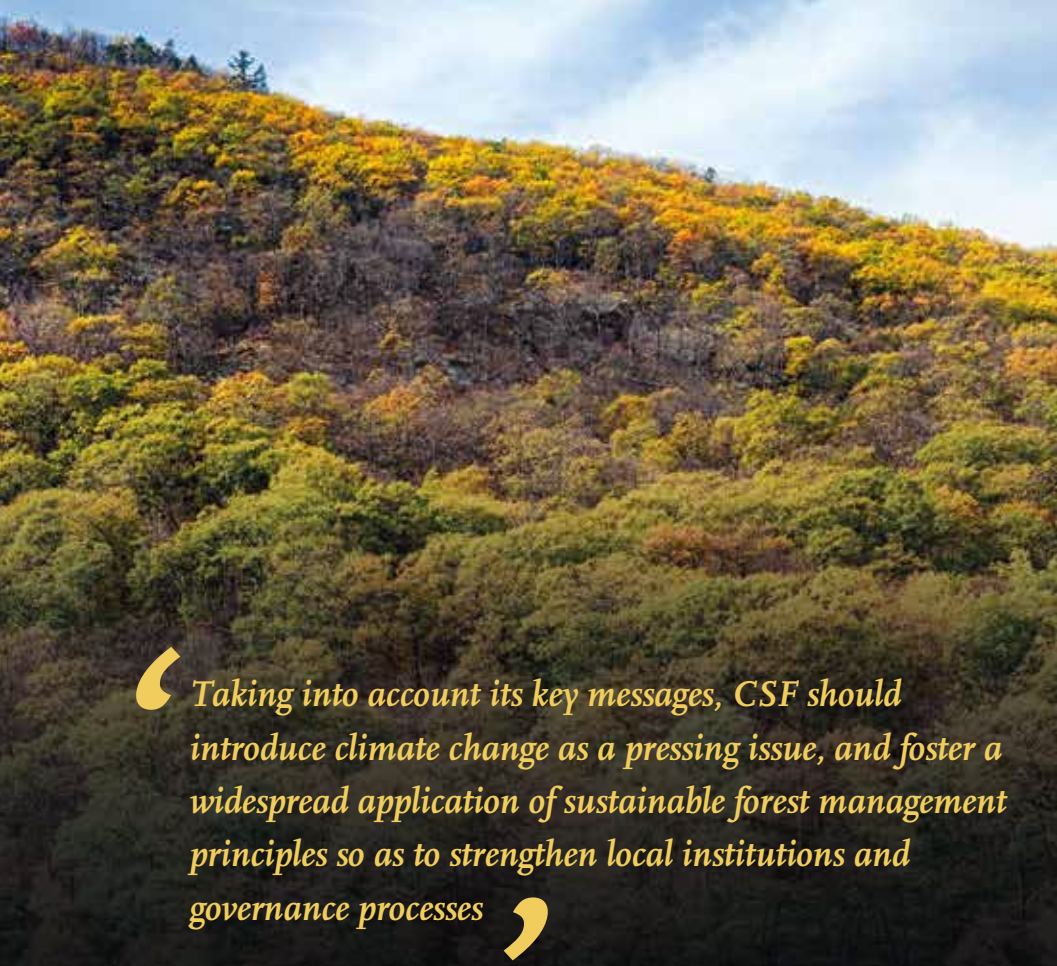
Land abandonment is a commonly seen scenario in many European rural areas despite the presence of a strong forestry industry, leaving these regions even more vulnerable to climate change effects. European forests are already seeing changes in ecosystem processes, mainly in water dynamics. Due to the fact that mountain regions in Europe comprise a significant proportion of the total area and

population, Tognetti finds these regions ideal to address both ecological and social questions associated with climate changes, and strengthen the role of the forest sector through CLIMO's adapted philosophy. 'These forests are a particularly valuable natural capital asset and provide a continuous stream of ecosystem services, including wood products, biomass energy, biodiversity conservation, erosion control, flood prevention and water provision,' elaborates Tognetti. It is hoped the new European Forest Strategy proposed through CLIMO will provide a new framework in response to the increasing demands put on forests to enable the delivery of multiple goods and services in a balanced way, as well as fostering the sustainable production and consumption of these products within a rural community.

SMART FORESTS

Adaptation and mitigation activities within CLIMO's consortium will be approached separately at the initial stage, however as criteria for CSF are defined through interdisciplinary exchange of datasets, a whole new set of combined interventions will be available to help realise the project's primary goals. CSF is a new concept for both scientific and public communities, and while the fragmentation of knowledge presents itself as a great challenge to CLIMO's framework, a big effort has already been carried out to study climate change effects on several aspects of forest ecosystems and integrate gathered data into an international network.

The very first step in building such a massive network was taken in the Alpine Regions, where CSF monitoring practices



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were tested for the first time in order to probe for forest health indicators. Data collected revealed nitrogen deposition levels surpassing critical levels, along with crescent landscape degradation and a decline in forest workforce numbers and work conditions. The task now is to demonstrate whether the same effects are being seen across all regions.

‘Compared to the current state of information from indicators, adaptive forest management planning for multifunctional mountain forests requires additional evidences on the effects of climate change on tree growth and carbon stocks,’ Tognetti says. ‘Indicators on forest health and extreme events give insight into the temporal development, but provide little information on the dynamics and societal responses, hence the role of mountain forests, and response activities needs to be more clearly demonstrated by pan-European forest indicators in the future.’

GROWING THE NETWORK

CLIMO researchers are focusing on establishing inclusion-oriented communication across participants in the project, in concert with several international organisations such as the European Forest Institute (EFI), the FAO, the Tropical Agricultural Research and Higher Education Center (CATIE), the International Centre for Research in Agroforestry (ICRAF), and the International Centre for Integrated

Mountain Development (ICIMOD). ‘The CSF initiative offers a strategy to organise cyber infrastructures for the collection and delivery of environmental data at mountain forest sites across Europe,’ says Tognetti. Recent advances in environmental sensor technology and software applications will harmonise future partnerships in the field and facilitate dissemination of CSF practices to other experimental mountain forest sites with benchmarking potential in Europe.

Tognetti and his team are focused on addressing the heterogeneity among the multidisciplinary teams involved in CLIMO as all the information collected will be gathered into a single data and knowledge repository. Communication is indeed the key ingredient within CLIMO’s framework as the aim is to promote discussions on operative measures and use climate-smart indicators to transform management practices.

As the project grows, the main findings and teaching opportunities will be shared through joint conferences, technical workshops, and informative seminars programmed on a yearly basis, in order to transfer state-of-the-art tools to the final users: the community. This way, one by one, the seeds of progress in forest practices will be sown, hopefully germinating into results that will allow for a more sustainable future.

Project Insights

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COST PARTICIPANT COUNTRIES

Austria • Belgium • Bosnia and Herzegovina • Bulgaria • Croatia • Czech Republic • France • FYR Macedonia • Germany • Greece • Hungary • Iceland • Ireland • Italy • Norway • Poland • Portugal • Romania • Serbia • Slovakia • Slovenia • Spain • Sweden • Switzerland • Turkey • United Kingdom

COST NEAR NEIGHBOUR PARTNERS

Ukrainian Research Institute for Mountain Forestry (Ukraine) • Ukrainian National Forestry University (Ukraine) • Al-Hussein Bin Talal University (Jordan) • Institute of Botany of the National Academy of Sciences (Armenia)

COST INTERNATIONAL PARTNERS

University of British Columbia (Canada) • University of Cuenca (Ecuador) • Federal University of Tocantins (Brazil) • University of Concepcion (Chile)

COST SPECIFIC ORGANISATIONS

European Forest Institute (EFI) • Food and Agriculture Organization of the United Nations (FAO) • International Centre for Research in Agroforestry (ICRAF) • Tropical Agricultural Research and Higher Education Center (CATIE) • International Centre for Integrated Mountain Development (ICIMOD) • International Union of Forest Research Organizations (IUFRO) • Mountain Research Initiative (MRI)

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