

Workshop Output WS 2.2.A

Title of workshop: The future of Mountain forest

Prepared by

Moderators	Stefan Mayr, Maaïke Bader, Georg Gratzner, Michael Bahn
Participants*	Workshop participants (Hansson, Amanda; Wieser, Gerhard; Oberleitner Florian; Frei, Esther R.; Urbinati, Carlo; Ramirez Ramirez Lirey Aysen; Toivonen, Johanna; Oberhuber, Walter; Obojes, Nikolaus; Ganthaler, Andrea; Bär, Andreas; Charrier, Guillaume; Moos, Christine; Lechner, Veronika; Diaz-Maroto, Ignacio J.; Salles, Mali C.; Teich, Michaela; Brožová, Natalie; Toivonen, Johanna) plus poster presenters and audience (ca. 80 participants)

* Workshop participants that have submitted contributions to the workshop

General questions to please be answered in the workshop reporting

- 1) What was the focus of the workshop? Methodological issues and advancements or thematic issues (systems knowledge, transformation knowledge, target knowledge). Please check and fill in the matrix in the output section.

Methodological issues and advancements	Thematic issues		
	System knowledge	Transformation knowledge	Target Knowledge
(x)	x	(x)	(x)

- 2) Which key points were discussed in the workshop as a whole? (This should be more a synthesis and not simply a summary of the key points in each presentation)

The session contained presentations and subsequent discussions (supported by mentimeter surveys) of three topics (treeline, stress, management) with respect to (i) the motivation for research, (ii) most important aspects and (iii) knowledge gaps. In a synthesis part, group discussions (9 groups consisting of 5-8 participants each), focused on functions, changes, required actions and research needs in mountain forests in future. The output of these discussion groups is presented in the following, and **the most important aspects are printed in bold**.

Output of group discussions:

What are the main functions of mountain forests in the future?

- Snow **protection**
- Water resource protection / regulation /provision
- Hazard protection
- Soil protection
- Wood & other **production** functions (now shifting more to other functions, but products also remain important)
- **Carbon sequestration, climate mitigation**
- **Habitat for animals, biodiversity, including humans**
- Cultural values
- Intrinsic value

- Region-dependent

What are the main changes affecting mountain forests in the future?

- Climate change, land use change, and invasive species

More specifically:

- **Elevational range shifts (management may modify this)**
- **Altered disturbance regimes**
- Cascading effects of extreme events, which will be more frequent
- Changes in species composition

- Human population changes (both increase and decrease, depending on scale and region)
- Abandonment of forests and local management
- Increase of recreation / tourism
- **Introduced pathogens/ neobiota and shifts of native pathogens and pests**

What are the main actions needed to safeguard mountain forests in the future?

- Structural diversity and multi-stage stands needed
- Preserve large areas of natural forests in networks
- **Species composition and demographic structures adjusted to climate change**
- Reduction overpopulations of wild ungulates
- Adaptation of forest management to changed disturbance regimes

- **Focus activities and research on poor countries**
- More (long-term) research funding
- Science-driven policies
- Trans- und interdisciplinary approaches
- Knowledge transfer and education
- **Participative approaches, inclusion of local communities**
- Capacity building, reduce knowledge divide
- Certification of well-managed forest (e.g. for biodiversity, carbon storage or water regulation)
- Payment for ecosystem services

What are the main research needs concerning mountain forests in the future?

- Responses of different ontogenetic stages to stress
- Demography of trees at treeline
- **Characterizing changes in disturbance regimes**
- Forest history determining present-day patterns (especially at treeline)
- The role of soils, nutrients and mycorrhizae in treeline advance and forest resilience to stress and disturbance
- **Identifying stressors and disturbance factors and their interactions, including climatic extremes, pests and pathogens and human intervention**
- Species-specific requirements for recruitment (especially at treeline)
- Species-specific growth responses (to stress factors, moisture and temperature)
- The role of soil-plant-animal interactions

- Site-specific responses; regional studies needed, including more research needed outside of Europe and North America
- Indicative value of spatial and dynamic patterns for understanding processes
- Cascading effects from soil processes to atmospheric exchange
- Biocultural diversity, perception of cultural landscapes (Satoyama)
- **Cost-benefit of forest management options for different ecosystem services and regions**
- Impact of certification (effectiveness)

Preferred research approaches:

- Multi-scale approach, in time and space
- Involvement of local communities
- Long-term research

3) What is your opinion on the current state of knowledge concerning your topic(s) (focusing on mountain regions)? *Please check and fill in the matrix on the following page.*

We performed a survey via Mentimeter.com and asked all workshop participant in advance for rankings of the respective questions. The survey was closed the day before the workshop (23:45).

Overall assessment of the state of:

What is your personal opinion on the current state of knowledge concerning the topic(s) addressed in your workshop. Please tick the appropriate field. Brief explanations are appreciated.

The following table is based on the outcome of the mentimeter survey amongst the workshop participants, including the moderators. 19 colleagues participated, Results are indicated in %.

State of knowledge	Very good	Good	Poor	Very poor	Not appropriate	Comments
Global	5.3	26.3	63.2	5.3	0	
Regional	5.6	44.4	44.4	5.6	0	
Scattered case study-based knowledge	31.3	50.0	12.5	6.3	0	
Knowledge about past states/trends	6.3	75.0	18.8	0	0	
Knowledge about current situation	6.3	68.8	25.0	0	0	
Knowledge about future states/trends/thresholds	0	18.8	56.3	25.0	0	
Knowledge about the system	6.3	37.5	50.0	6.3	0	
Knowledge about shaping pathways to more sustainable development (transformation knowledge)	6.3	25.0	50.0	18.8	0	
Knowledge about envisaged goals (target knowledge)	0	50.0	37.5	12.5	0	

