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# Oberammergau Pilot Action Region: Mountain Forest Initiative (BWO)

*Helena Eisele, Roland Schreiber and Anne Stöger*

## Abstract

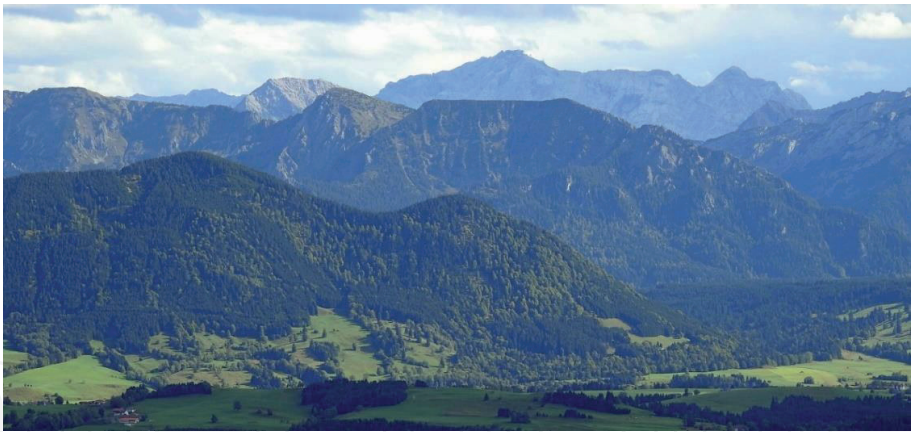
Natural hazards caused by climate change pose a permanent threat to the inhabitants of the Alpine Space. In addition to technical protection measures, forests are very often the key to permanent and cost-effective protection against these hazards. In the Mountain Forest initiative (BWO) of the Bavarian state government, launched more than 10 years ago, suitable measures for the preservation of protective forest are discussed and, if possible, decided by consensus in on-site round tables with all involved interest groups. Only a functioning interaction between the different actors in the Alpine Space will contribute towards the set objective of integrating forests and ecosystem services in risk governance and balancing the numerous interests, demands and costs. Using the example of the Oberammergau Pilot Action Region (PAR), the process and implementation of the BWO is presented against a background of more than 10 years of experience. At the beginning, the identification of stakeholders and the overall goal and expectations of the participatory process (technical issues, trust and community building) is clarified. After a detailed actor analysis, the moderated participatory process is described.

**Keywords:** protective forest, natural hazards, Mountain Forest Initiative, round table, participatory process, stakeholder involvement, risk governance, actor analysis

## 1. Introduction

Several factors contributed to the decision to select the Municipality of Oberammergau as a PAR within the GreenRisk4Alps project. The municipality is located in the Ammertal Valley on the Ammer River, which gives the municipality its name. The river has its source in the Ammergau Alps south of Oberammergau. The Ammergau Alps, with an area of about 30 x 30 km, are a mountain group of the Northern Limestone Alps, about 75% of which are located in Germany (Bavaria) and 25% of which are located in Austria (Tyrol) (see **Figure 1**). The forests in the region protect the municipality and its infrastructure from various natural hazards, especially from the Große Laine Torrent and partly from rockfalls and avalanches. These facts are the basis for the immense importance of the establishment, management and maintenance of protective forests, with their typical challenges.





**Figure 1.**  
*Ammergau Alps [1].*

For more than 10 years, the region has participated in the Mountain Forest Initiative (Bergwaldoffensive, BWO), which is part of a broad Bavarian state government program combatting climate change. In the defined BWO projects, measures for the maintenance and adaptation of forests are established to maintain the protection function of forests in the face of climate change. One important part of the BWO is the involvement of forest owners and local stakeholders in order to consider their interests and ensure the broad agreement of society.

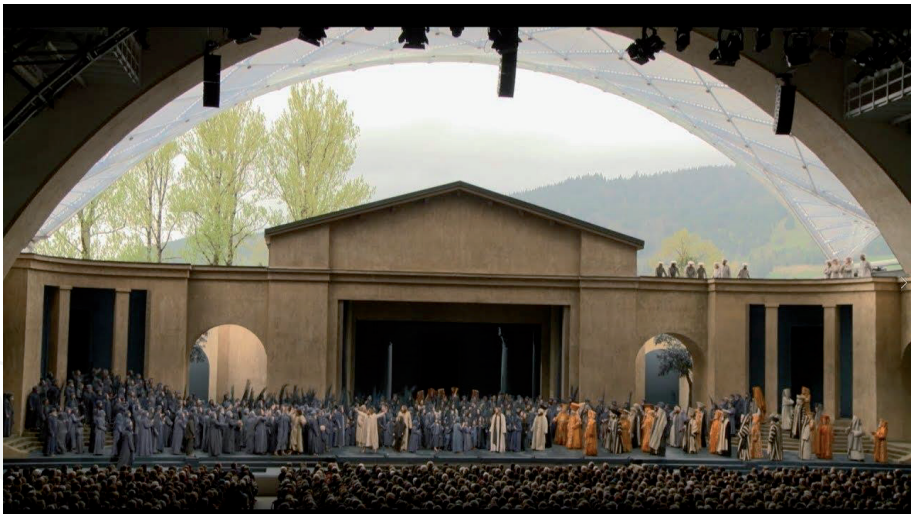
## 2. Description of the Oberammergau PAR

The Oberammergau PAR is a municipality in the Upper Bavarian district of Garmisch-Partenkirchen and is located 90 km southwest of Munich (see **Figure 2**). The municipality has an area of 30 km<sup>2</sup> and a population of about 5,500 inhabitants and is located in the Ammergau Alps Nature Park. The area was declared a nature park by the Bavarian State Ministry for the Environment and Consumer Protection on July 27, 2017 and covers an area of 227 km<sup>2</sup>. Its tasks are comprehensive and range from nature conservation and landscape management, with the aim of protecting biodiversity, climate and resources, among other things, to recreational opportunities, sustainable regional development and education in sustainable development.

Only about one kilometre from the village center is Kofel, a striking hilltop that can be seen from afar and offers a variety of hiking trails. In addition to numerous mountain biking and hiking opportunities, the region is also well-known for winter tourism, with a wide network of cross-country ski trails and family-friendly as well as more challenging downhill runs.



**Figure 2.**  
*The village of Oberammergau and surrounding area [2].*



**Figure 3.**  
*The passion play [3].*

Oberammergau is also an attractive destination for various tourist groups. It has gained particular recognition for its Passion Festival, which takes place every 10 years and features locals as performers (see **Figure 3**). Its history began almost 400 years ago when the plague ravaged Oberammergau. To put an end to the misery, the people of Oberammergau vowed in 1633 to perform the Passion and Death of Christ every ten years, provided no one else died of the plague. The first Passion Play was performed in 1634.

**2.1 Forest and forestry in Bavaria**

Forestry in Bavaria follows the “Bavarian Way” of integrative forest management. The guiding principle here is to “protect and benefit over as large an area as possible.” With this approach, the diverse services of the forests are considered in a balanced and locally adapted manner. In Bavaria, more than 50% of forests are privately owned, while state-owned forest accounts for about 30% (see **Table 1**) [4]. Although beech sites actually predominate in Bavaria as well, the leading tree species is still spruce, which is more or less due to a historically determined approach to forest management. Today, foresters and forest owners consistently create stable mixed stands of deciduous and coniferous species that are adapted to the respective location.

Ownership	Percentage share (%)
Private forest (distributed among about 700,000 forest owners)	54.2
Corporate forest (mainly communal forest, i.e. forest owned by municipalities or cities)	13.5
State forest (forest of the Free State of Bavaria, managed by Bayerische Staatsforsten AöR under the legal supervision of the Bavarian Forestry Commission)	30.1
Federal forest (Forest of the Federal Republic of Germany, mostly forest on training grounds of the German Armed Forces)	2.2

**Table 1.**  
*Distribution of ownership in Bavaria [5].*



A look at the Bavarian Alps shows that about half of the area – around 260,000 hectares – is covered with forest. As the 2012 Federal Forest Inventory revealed, the forest in the mountains is older and has larger reserves per hectare than the forest in the lowlands. With a share of 68%, coniferous species predominate in mountain forests.

Spruce alone, which has one of its natural distribution centers in the Alpine region, accounts for 58% of the forest structure. Fir ranks second among coniferous species with about 7%, followed by the pine with 2%. Larch and Swiss stone pine play only a minor role in the Bavarian Alps [5].

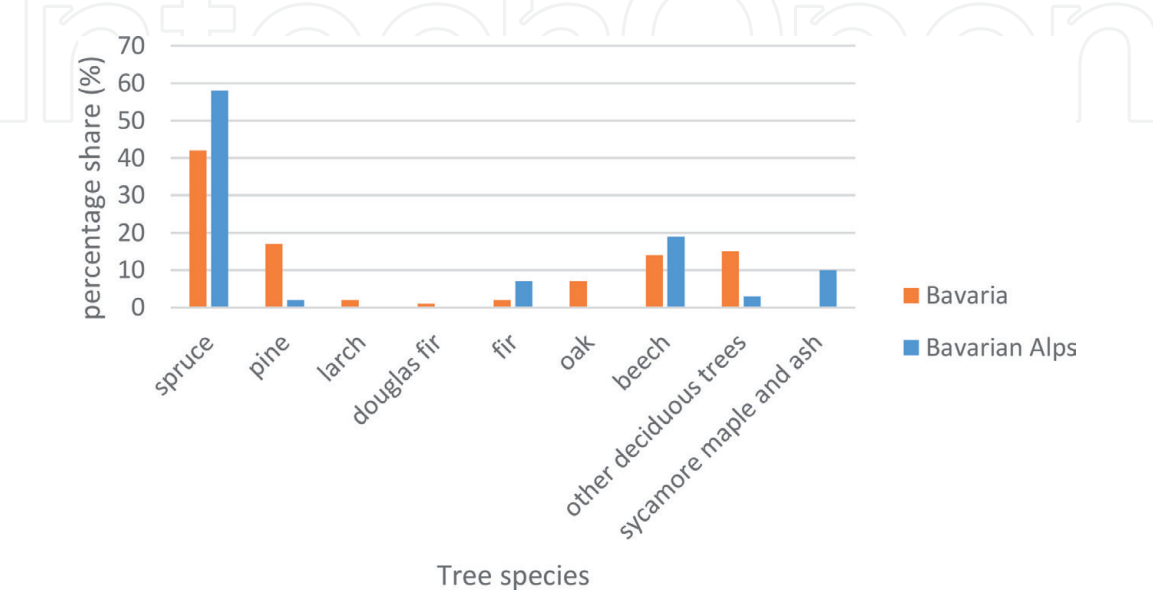
The predominant deciduous tree species in the Bavarian Alps is beech, with an area share of about 19%. Sycamore maple and ash, both of which are deciduous tree species, together take up about 10%. The remaining 3% is distributed among other deciduous tree species such as rowan, hackberry, alder, birch and willow (see **Figure 4**).

Originally, half of the mountain forest in the montane zone between 700 and 1,400 meters above sea level consisted of spruce and about 20 to 25% each of beech and fir. The other mixed tree species accounted for about 5 to 10% of the forest structure. Because of the extreme climatic conditions in the high mountains, trees grow much more slowly in the Alps than in the lowlands. Mountain forests, with an average age of 101 years, are older than lowland forests, with an average age of 83 years. With about 420 solid cubic meters of stock per hectare, the average wood stock in mountain forests is about 6% higher than the Bavarian state average. For many decades, wood utilisation has been significantly below the increment [6].

Of the 260,000 hectares of mountain forest, around 60% fulfil priority protection functions and are specially protected by the Bavarian Forest Law (BayWaldG). The preservation of intact protective forests or their restoration is therefore a forestry and socio-political task of high priority.

In 1986, the Bavarian Forestry Administration surveyed the condition of protective forests in all forest ownership types and derived from this the first long-term overall plan for protective forest restoration in the Bavarian Alpine region. Since then, the plan has been updated at regular intervals and adapted to the latest findings [6].

Protective forests are considered to be in need of rehabilitation if their functional capability is clearly impaired and this cannot be restored within the framework of regular forest management.



**Figure 4.**  
*Tree species distribution in Bavaria and the Bavarian Alps [5].*

This applies above all to

- thinned protective forests without sufficient regeneration;
- overaged protective forests (average age over 200 years without sufficient regeneration and more than one third of decaying, dying or dead trees in the upper layer);
- protective forests damaged by storms, bark beetles, shearing damage or declining vitality;
- protective forest regeneration that is not capable of development due to high browsing damage or grazing load.

Currently, there are 1,190 rehabilitation areas in the Bavarian Alpine region with a total area of about 14,000 hectares. This corresponds to about one tenth of the total protective forest area. Mainly due to storm damage and subsequent bark beetle calamities, their extent has increased by about 1,200 hectares since the first planning in 1986. Almost 40% of the rehabilitation areas are of special importance for object protection and therefore have a very high priority [6].

Since the redevelopment measures usually have to be coordinated on a large scale and with other measures, the redevelopment sites have been grouped into redevelopment areas. They include, for example, the sum of the redevelopment sites of a mountain flank with avalanche protective forest above a federal road or a village or all redevelopment sites in a torrent catchment area. At the level of the development areas, necessary accompanying measures such as large-scale hunting and wildlife management concepts are coordinated.

Bavaria's mountain forests are habitats for cloven-hoofed game species, such as red deer, roe deer and chamois, as well as some rare game species that are not hunted. Despite different habitat requirements, their habitats overlap, especially in the forest area. In order to reduce game damage in sensitive protective forest areas to a tolerable level, hunting management must consistently aim for adapted game populations of the three cloven-hoofed game species.

The Bavarian Hunting Act stipulates that impairment of proper agricultural, forestry and fishery use by game are to be avoided as far as possible. In particular, hunting should enable the natural regeneration of tree species appropriate to the location, essentially without protective measures [6].

## **2.2 Forest and forestry in the Oberammergau PAR**

Since the Ammergau Alps were once royal hunting grounds, much of the region is still forested today. Forests with a high proportion of spruce cover 60% of the 3,000 ha PAR area; many of these are over-aged forests. The Private Forestry Association owns 1,800 ha, and the remaining part belongs to the Bavarian State Forests.

The centuries-old traditional use of parts of the Alpine area as forest pasture (see **Figure 5**) have created many species-rich and valuable habitats [7]. At the same time, however, the conversion to open land is said to have considerable disadvantages for the protective function of the forests against rockfall, mudflows and erosion due to the inhibition of regeneration by treading and browsing (see **Figure 6**). Therefore, the forests in the respective areas play a particularly important role as object protective forests. The separation of forest and pasture in areas exposed to grazing is therefore a declared political goal and also part of the Mountain Forest Initiative [8].



**Figure 5.**  
*Resting cattle in mountain forest [9].*



**Figure 6.**  
*Forest pasture [10].*

Forest diversity ranges from the peat-forming alder forest of the moraine and grey alder-spruce forest in the flysch, to mixed mountain forests, some of which are little influenced by forestry, to xerothermic carbonate pine forest on the west- and south-facing steep slopes. Subalpine spruce forests are found on the ridges.

Absolute rarities in Bavaria are thermophilic mixed forests of summer lime. Their occurrence in the Bavarian Alps and their composition there are still very insufficiently researched [11].

The last forest inventory for the private forest was carried out in 2006. According to it, the proportions of the main tree species are as follows (see **Table 2**).

Timber harvesting is complicated by steep and rocky slopes and low road density, which can result in increased stock buildup (average 478 m<sup>3</sup>/ha).

### 2.3 The main problems regarding natural hazards in the PAR

The Alpine region will be particularly affected by climate change. Not only will rising temperatures change growing conditions, floods, storms and avalanches are also likely to increase, giving forests an increasingly important role in their protective function.

In the PAR, dolomite and flysch play a major role from a geological point of view, which in part leads to dry, barren but also landslide-prone soils that are not very suitable for purely agricultural cultivation. With about 1,500 mm of annual precipitation, Oberammergau is among the regions with the highest precipitation in Germany.



In Oberammergau, rockfalls, mudflows and floods pose challenges, and flood protection structures require high maintenance costs. The flood damage potential in settlements is quite high (see **Figure 7**), and the protective forest fulfils an important protective function.

The Große Laine Torrent, which in the past repeatedly caused damage during storms and heavy rain, represents a particular hazard potential.

As early as the middle of the 18th century, attempts were made to protect settlements against water masses by means of structural measures. However, the existing flood protection is not sufficient to discharge a major flood without damage.

Repairs have already been carried out since 2010. In addition, the construction of a larger debris barrier took place in 2015 (see **Figures 8 and 9**), as well as the creation of a partial drainage of the floodwater by means of a drainage channel [13].

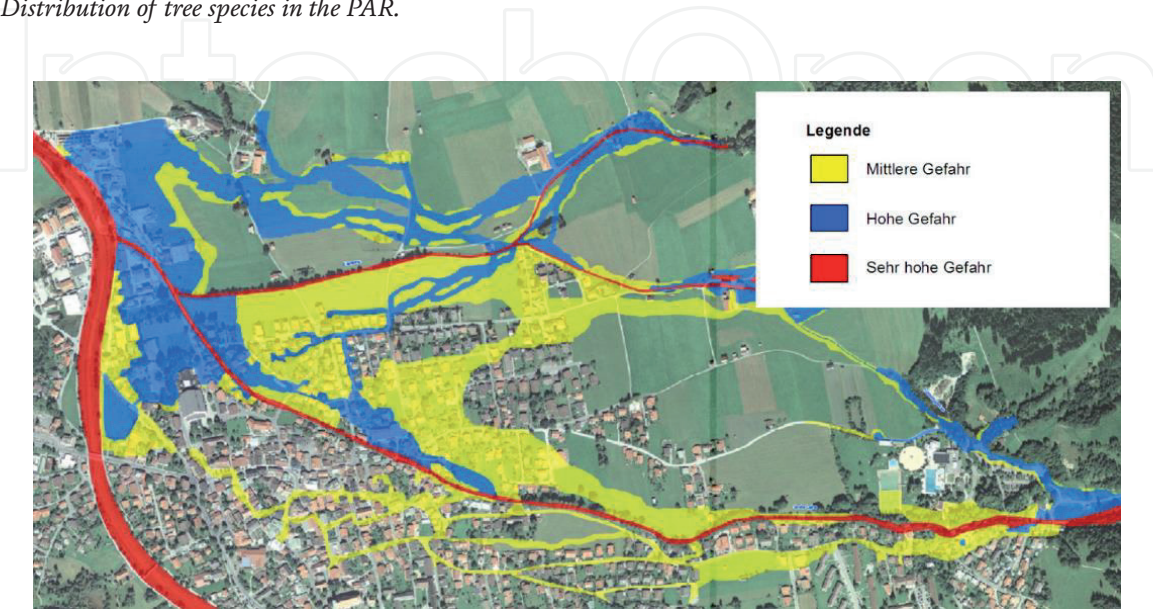
However, these measures are associated with immensely high costs in the millions of euros and go hand in hand with a functioning mixed mountain forest that can fully develop its protective potential. This is because the forest not only protects against rockfalls and avalanches, but it also has a delaying effect on water runoff and snowmelt in the spring, reducing the risk of flooding [12].

The loss of the forest would lead to a significant challenge for the safety of settlements near the Große Laine. Therefore, the main challenges are as follows:

- Große Laine Torrent with a large catchment area and high risk/damage potential for the city Oberammergau; flood peaks cannot be drained; 332 flood protection structures.

Tree species	Percentage share (%)
Spruce	80.3
Silver fir	1.7
Beech	7.9
Special deciduous trees	7.4
Alder	1.2

**Table 2.**  
*Distribution of tree species in the PAR.*



**Figure 7.**  
*Hazard zone map of the Große Laine torrent in Oberammergau [12]. Legend: Yellow – Medium risk; blue – High risk; red – Very high risk.*





**Figure 8.**  
Looking downstream at a construction site with a drainage channel on the right [12] (firma Hubert Schmid).



**Figure 9.**  
View of the completed barrier structure. A driftwood rake can be seen in the background on the left [12].

- Rockfall and debris flow potential on the Schaffelberg and in the Graswang Valley.
- Sites are mostly geologically unstable and sensitive to erosion.

Sixty percent of the pilot action area in Oberammergau is covered with mostly tall, pure spruce. Game and hunting management is in the hands of forest owners, resulting in excessive red deer/roe deer populations causing calamity areas (stripping damage by red deer (see **Figure 10**)).

Spruce stands have been converted into mixed mountain forests since the invention of the round table (Mountain Forest Forum) by the Mountain Forest Initiative. Some silvicultural measures have been tested in Oberammergau in research projects, such as thinning to stabilise forest stands, planting, reorganisation of hunting grounds, redesignation of forest and pasture areas (see **Figure 11**).





**Figure 10.**  
*Stripping damage by red deer [14].*



**Figure 11.**  
*Growing protective forest [15].*

On the other hand, challenges remain in Oberammergau and include the improved involvement of local actors and the integration of the Mountain Forest Panel into the participatory development process of the Ammergau Alps Nature Park.

### 3. Best practice description

Almost 60% of Bavaria’s mountain forests in the Alps are protective forests. These forests are increasingly endangered by climate change. Bavaria has increased its efforts to preserve multifunctional mountain and protective forests with a broad package of measures, as described in the following chapters.

#### 3.1 Mountain Forest initiative (BWO) program

The BWO is a part of a widespread program of the Bavarian state government to combat climate change. According to the Mountain Forests Protocol of the Alpine Convention, the implementation of the BWO is put forward together with

concerned stakeholders. Since 2008, the Bavarian state government has financed the BWO with about 2.5 million euros annually. The measures of the BWO are specially designed for private and communal mountain forests, where the size of the single properties is usually very small.

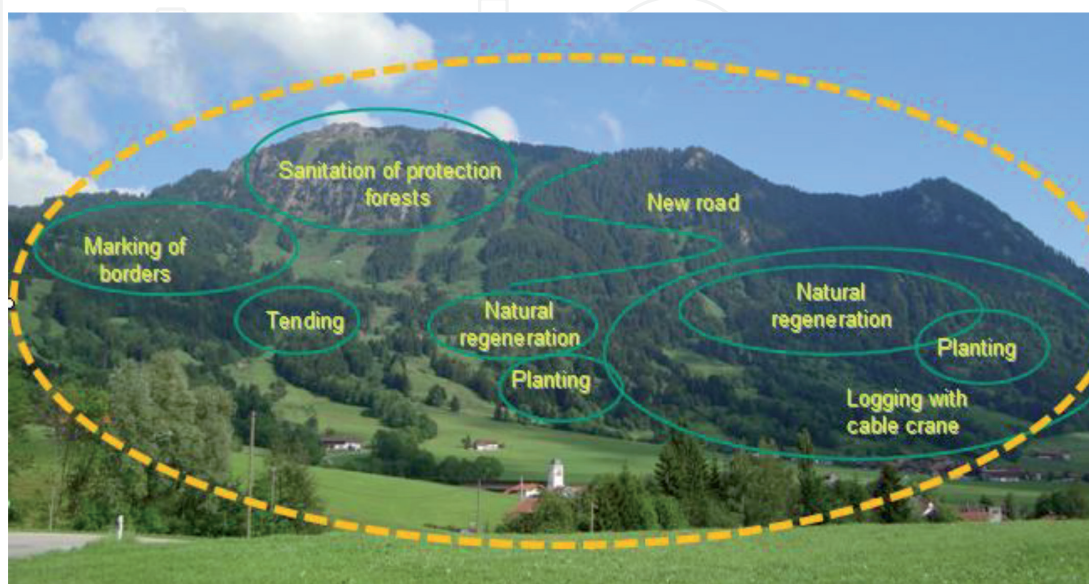
The central parts of the BWO are the so-called BWO projects. These are specially identified areas with an elevated risk of degradation due to climate change. In these areas measures for the maintenance and adaption of forests are established with the input of different forest owners. Examples of such measures are the planting of adapted tree species, tending with the special aim of supporting adapted tree species, natural regeneration, logging with cable crane or building new forest roads (see **Figure 12**) [16].

Local forest authorities plan the individual measures and put them into action together with the forest owners. Bringing together different owners increases efficiency and reduces costs. A project manager of the local forest authority is responsible for the BWO project from planning until completion and is the contact person for forest owners and stakeholders.

In addition, the process of integral planning participation is an important part of the program. Therefore, all concerned persons have the possibility of bringing in their ideas from the beginning of the selection of the project region and during the planning process until the implementation of individual measures. In general, a so-called BWO advisory board is founded for BWO projects. The members of the advisory board differ in each project area. Generally, they consist of politicians, deputies of the forest owners, local authorities and other organisations (e.g. hunters, farmers, conservationists). We regard the BWO advisory board as the central factor of the success of the BWO.

In addition to BWO projects, several other actions are part of the BWO as a program for the adaption of mountain forests to climate change:

- Adapted seed sources: Forest regeneration, whether natural or artificial, is based on the utilisation of forest genetic resources (i.e. seeds). The selection of suitable forest reproductive material has assumed new importance both because trees are long-lived species and because rapid climate change will have an impact on the environmental conditions of trees as they grow and mature.



**Figure 12.**  
*Schematic picture of a BWO project in the Bavarian Alps.*



This is especially pertinent for the Alps because global warming will impact mountain areas in a particularly severe way, posing a very serious threat to Alpine forests. Adaptation to these novel environmental conditions is nearly impossible without genetic diversity. Therefore, the Bavarian Office for Forest Seeding and Planting (ASP) has established a project to identify site-adapted seed stands in the Bavarian Alps and to secure an adequate supply of seeds of high genetic quality.

- Information on mountain forest sites: Whereas there are existing detailed forest site maps for the lowlands of Bavaria, for a long period no such maps existed for the Alpine region. As part of the BWO, together with partners in Austria, the project WINALP – “Forest Information System for the Northern Alps” ([www.winalp.info](http://www.winalp.info)) developed intermediate-scale maps of the potential natural forest vegetation for the Northern Calcareous Alps, which are based on the ecological gradients of temperature, soil reaction and soil moisture. The project was financially supported by the European Fund for Regional Development (EFRE) within the “INTERREG Bayern – Österreich 2007–2013” program.
- Research: Although research findings show that the Alpine region will be increasingly affected by climate change, there are many questions associated with the effects of climate change on forests. Therefore, in the frame of the BWO, Bavaria has also intensified research on the effects of climate change on forests. For example, the INTERREG co-financed projects SICCALP and STRATALP dealt with the effects of loss of humus in a succession of wind-throws in the Northern Calcareous Alps.

With the BWO, Bavaria is increasing its efforts to preserve multifunctional forests in the Alpine region. It is expected that it will help to preserve mountain forests as areas for recreation, biodiversity, wood supply and other ecosystem services for the coming generations [16].

One BWO project is located and being implemented in the GreenRisk4Alps PAR of Oberammergau.

### **3.2 Stakeholder involvement in the Oberammergau PAR in the framework of the project**

Many actors inside and outside the forestry sector intervene in forest management, as societal demands are manifold. Whereas forest-based sectors are interested in meeting the current and future market demands for wood, increasing needs for other ecosystem services in the Alpine Space must be met as well. Only a functioning interaction between the different actors in the Alpine Space will contribute towards the set objective to integrate forests and ecosystem services in risk governance and balance the numerous interests, demands and costs.

As described in deliverable D T2.1.2 “Report GR4A SNA concept” [17], the involvement of stakeholders leads to better solutions through joint learning, i.e. innovations, innovative approaches and measures [18]. The importance of a participatory approach in the planning phase of forestry activities leads to greater public acceptance of policy decisions and provides an inclusive platform for constructive discussion. These aspects are even more important when dealing with forests and their management due to the multitude of conflicting interests and demands related to them [19, 20].



**Figure 13.**  
“Round table” excursion [21].

### 3.2.1 Identification of the goals of the participatory process

Although the overall framework of the stakeholder involvement might be known, concrete and clear objectives of the participatory process must be clarified at the beginning. Besides the technical issues to be discussed during the round tables (see **Figure 13**), other important aspects also have to be considered. These include the following:

- Trust building between
  - a. local actors and public officials and
  - b. neighbouring municipalities
- Community building: creating shared collective goals

Thus, communication between different interest groups has been fostered continuously.

### 3.2.2 Identification of actors and stakeholders

Before starting the participatory process, it was necessary to identify the relevant and important stakeholders in the PAR. For the Oberammergau PAR, the following groups are considered to be important for the success of the process:

- Governmental actors / district: regional forest office (government), regional watershed authority, regional nature conservation authority, regional hunting authority
- Ammergauer Alps Nature Park: Nature Park Manager, Tourism Manager

- Environmental NGOs
- Actors of the communities of Oberammergau and Ettal: municipalities of Oberammergau and Ettal, land use actors, hunters, recreational users of the nature park

### 3.2.3 Actor analysis in the PAR

#### 3.2.3.1 Initial conditions

With respect to Oberammergau and Ettal, there are two municipalities involved. Both municipalities are part of the district of Garmisch-Partenkirchen. Natural hazard management is not a new topic in the area; since 2009, the BWO has encouraged the improvement of the protection function of mountain forests.

For many years, a major topic in Oberammergau has been the torrent & flood management of the Große Laine Torrent and the improvement of protection measures in recent years. Another topic has been the rock fall and debris flow potential at Schaffelberg and the Graswang Valley.

#### 3.2.3.2 Objective

The objective of the actor analysis was the provision of social data to prepare and support the participation process focusing on the development and preservation of a safe and liveable regional Alpine living space in the region. The participation process is expected to enable the intermunicipal implementation of measures in the long run.

#### 3.2.3.3 Approach

During the interviews with selected experienced actors in the PAR (mayors, regional forest officials and nature park officials), the important stakeholders and participants of the round tables are identified in a “snowball-system”. The interviews are complemented with data from a literature analysis.

The following questions should be answered during the process:

- Which stakeholders are involved in natural (hazard) management?
- What is the characterisation of each stakeholder (organisation, group or person).
- Which goals are most vigorously pursued?
- What are the concerns regarding (joint) nature (hazard) management?
- With whom do they work together or with whom do they have conflicts?

The main goal of this approach is not a mere scientific exploration but the preparation of the social process in the region. The participants of the GR4Alps round tables should start the process together with a joint project briefing at the first event (“Proactive” rumours must be avoided”) [22].

### 3.2.4 Starting the participatory process

The process started with a kick-off event, which was announced well ahead of time in an invitation letter sent to all identified stakeholders from both



municipalities. They were informed about the topics to be discussed to achieve a common understanding of the following process. An external moderator accompanied the process to ensure that it was as productive and constructive as possible and to summarise the results for the participants.

The introductory work with actors from Ettal and Oberammergau led to a common objective: to identify the different types and intensity of use of the natural areas in the municipality and the added value of cooperation.

### *3.2.5 Expectations of the organisers*

With the round tables, the initiators expected that in the short and medium term, existing local knowledge gaps concerning risk management would be closed, the available risk mitigation programs would be improved and the involvement of and exchange between local stakeholders would be fostered by this initiative. Furthermore, the Mountain Forest Panel of the BWO and the participatory development process of the Ammergauer Alps Nature Park would be merged into a visible perceived institution.

## **4. Conclusion**

Due to its location in the Ammergau Alps, Oberammergau has been confronted with the topic of protective forest and protective forest management for years. Not least because of the perpetual challenge of potential flooding of the Große Laine River. Mechanical shoring is of immense importance in this context. However, the use of forest-based support is also of great importance, and the management of the protective forest has played a major role for years. This is also demonstrated by the state-funded Mountain Forest Initiative, which aims to protect mountain forests against climate change by involving multiple stakeholders. This is done most effectively on the ground with so-called round tables, joint excursions, talks and discussions. The GreenRisk4Alps project has now been able to draw on these many years of experience. This experience was complemented by a social network analysis, which identified the goals of the participation process and the actors and stakeholders in order to then target local knowledge gaps on the topic of risk management, improve existing risk reduction programs and promote the involvement of and exchange between local actors through this initiative.

## **Acknowledgements**

We would like to thank Markus Hildebrandt and Felix Miller from the Office of Food, Agriculture and Forestry in Weilheim for their support as reviewers.

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