

GREEN RISK 4 ALPS



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Activity: T2-ACTINA objectives are: i) to provide the socio-economic foundation of an ecosystem-based risk mgmt. in the AS, considering the increase of risks of natural hazards by: systematic stocktaking of all relevant actors; identifying decision and responsibility structure; identifying conflicts, awareness of issues and acceptance of action alternatives; ii) to map the adjacent interests, values and costs. T2 supports WP3 and WP4 with the necessary information on actors, interests and conflicts.

Activity A.T2.3	Analysis and comparison of decision structures in the networks	2018.10	2019.09
Following the actor- and decision-oriented principles of GR4A, an important step in the implementation process is to identify, distinguish and compare the decision structures in the PAR: i) at the 'internal' decision level only; as well as ii) for the overall decision network, including the 'external' actor cooperation. Thus, focus will be on actors/organizations. GR4A will distinguish between legal, factual and organizational dimensions of the decisions. T2.3-interviews will build on T2.2.			
Deliverable D.T2.3.1	Report on 'Comparative decision structure analysis in the PAR'		1,00
Quantitative and qualitative description of the five PAR networks, regarding their decision structures. A comparison of the actor composition, roles and influence, considering decision and involvement levels, for the five PAR, is provided.			

ACTIVITY T2.3 – Activity objective

Following the actor- and decision-oriented principles of GR4A, an important step in the implementation process is to identify, distinguish and compare the decision structures in the PAR: i) at the ‘internal’ decision level only; as well as ii) for the overall decision network, including the ‘external’ actors’ cooperation. Thus, the focus will be on actors/organizations. GR4A will distinguish between legal, factual and organizational dimensions of the decisions. T2.3-interviews will build on T2.2.

ACTIVITY T2.3 – State of the Art and previous projects

Due to the focus of the GR4A project on actors, we follow an analytical, theory-based and empirically applicable framework for assessing actors’ interest in decision structures. Several studies have applied the Research-Integration-Utilization (RIU) model in different developed and developing countries for land use issues. For the first step of the RIU approach, actors and interests are identified and assessed by using three sources of empirical data and measured by different indicators. The analytical framework is currently applied in the European Union’s Horizon 2020 project ALTERFOR¹. Our contribution to GR4A builds on the experiences of ALTERFOR. We also link the analytical framework with the results of the projects AlpES² and AlpGov³ with a special focus on alpine-related issues.

ACTIVITY T2.3 – Methods applied in GR4A

This report is based on a triangulation of qualitative data (document analysis, participatory observations, qualitative interviews with selected key actors) in all PAR’s. The data for the PAR has been compiled by interviews with experts in the field of risk management, land use management and forest management on different levels of the decision structure in cooperation with other work packages.

ACTIVITY T2.3 – GR4A Analysis

The analysis consists mainly of a qualitative description of the five PAR networks regarding their decision structures. Additionally, we provide a comparison of the actor composition, roles and influence that consider different decision and involvement levels, for the five PAR.

¹ Alternative models and robust decision-making for future forest management (<https://alterfor-project.eu>).

² Alpine Ecosystem Services - mapping, maintenance, management (<https://www.alpine-space.eu/projects/alpes/en/about/about/ecosystem-services>).

³ Implementing Alpine Governance Mechanisms of the EU Strategy for the Alpine Region (<https://www.alpine-space.eu/projects/alpgov/en/home>).

GreenRisk4Alps Partnership

BFW - Austrian Forest Research Center (AT)

DISAFA - Department of Agricultural, Forest and Food Sciences, University of Turin (ITA)

EURAC - European Academy of Bozen-Bolzano – EURAC Research (ITA)

DISAFA - Department of Agricultural, Forest and Food Sciences, University of Turin (ITA)

IRSTEA - National research institute of science and technology for environment and agriculture, Grenoble regional centre, IRSTEA (FRA)

LWF - Bavarian State Institute of Forestry (GER)

MFM - Forestry company Franz-Mayr-Melnhof-Saurau (AT)

SFM - Safe Mountain Foundation (ITA)

UL - University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Resources (SLO)

UGOE - University of Göttingen, Department of Forest and Nature Conservation Policy (GER)

WLS - Swiss Federal Institute for Forest, Snow and Landscape Research (CH)

WLV - Austrian Service for Torrent and Avalanche Control (AT)

ZGS - Slovenia Forest Service (SLO)

Deliverable D. T2.3.1 – Report on 'Comparative decision structure analysis in the PAR'

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1. Decision structures in alpine hazard management for knowledge transfer

As a consequence of an expanding land use in mountainous areas triggered by societal changes and rising economic values the vulnerability of the socio-economic system is higher than decades before (Brang et al., 2001). Additionally, giving the fact that climate change will alter the natural hazard pattern (Probst et al., 2013), future innovative strategies in alpine risk management are needed. Scientists from various disciplines work hard on new innovative solutions for facing the upcoming challenges. Despite the enormous challenges within the alpine regions, new innovative strategies in risk management of alpine hazards, especially the protective forest maintenance, are difficult to implement (Wehrli et al., 2007). Research results have to overcome strong constraints in practice by taking into account the practical actors need and demand for solving their own issues. This position of actors leads to a selection of new knowledge according to their own interests. Therefore, actors will be advocating these interests by influencing the decision making process and using the decision structures in alpine hazard management only for this innovative knowledge which is beneficial for this specific actor and his own purpose (Böcher and Krott, 2014, p.3644).

1.1. Successful knowledge transfer for alpine hazard management

For a successful knowledge transfer process in the GreenRisk4Alps project we follow the theory of the Research-Integration-Utilization (RIU)-model which consists of three different phases (Böcher and Krott, 2016):

Research is the process of the production of knowledge by using scientific principles, methods and standards. The research process should guarantee the state-of-the-art of scientific theories and methods. As the foundation for successful knowledge transfer, research's main tasks are to identify the research questions, to define the subject of research, to develop methods, to gather data and to draw theory-based scientific conclusions (Böcher and Krott, 2016). This high quality research process increases the credibility and legitimacy of political solutions (Böcher and Krott, 2010) and is represented in the GreenRisk4Alps project partnership consortium.

Success factors:

- *Assessing current scientific information*
- *Compliance with the procedures of good scientific practice*
- *Cooperation with other scientific institutions and projects*
- *Independent meaningfulness of scientific findings*

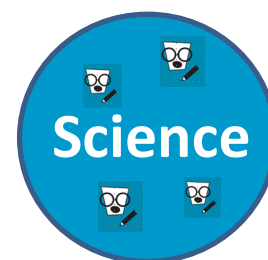


Figure 1: Research circle

Utilization means the active use of scientific knowledge by actors in practice. Science has no longer influence on what the practical sphere will do with the scientific information. Science itself can use the findings within the scientific community for publications and scientific discourses. The utilization phase is characterized of existing and well established relations and information channels between actors. Such typical networks of actors have been existing in natural hazard management for long time. The relation between the Austrian forest technical service for torrent and avalanche control and state agencies of forests or nature conservation is one of them (Weiss, 2003). Based on this existing interrelations, the interests of actors will be enforced by power processes driven by the individual capabilities of actors (Böcher and Krott, 2016).

Success factors:

- *Contribution to democracy*
- *Contribution to rule of law*
- *Contribution to 'good governance'*
- *Appropriate solutions to problems*
- *Participation in the scientific discourse*



Figure 2: Utilization circle

Integration is the critical step between Research and Utilization where successful knowledge transfer is an active process driven by specified steps and success factors. Integration is the orientation of research toward practical and/or political problems. This phase is bi-directional with two main questions: What is the demand of the practice in terms of science-based research solutions and which research results could be selected according to their relevance to the practical solution? Therefore, integration is oriented towards practical issues and needs and is only a hypothetical process in the two directions of the main questions. During the integration process the two different rationalities of science and practice encounter. The first works by logic, empirical evidences and truth and the latter by interests and power. Between the two worlds with incompatibilities, between research and utilization, a bridge have to be build . The chances to have a successful scientific knowledge transfer could be increased by the support of powerful allies which act according to their interests and power. People who are acting in the sphere of integration for successful knowledge transfer require expert knowledge in research as well as in practice with a strong focus on actor's needs, demands and capabilities to act in the real world (Böcher and Krott, 2016). This role can be assigned to integrators with the tasks of building a close and trustful relationship with scientists and practical actors (Böcher and Krott, 2016). They translate selected scientific information, reiterate it using an understandable language for the target groups (Nagasaka et al., 2016). Besides these individual facilitators there is a noticeable amount of integration processes where scientific knowledge can be placed successfully in a formal or an informal process. For instance, the PAR Oberammergau in Germany takes the advantage of the existing integration process of the Mountain Forest Initiative, launched in 2009. It implements new modes of governance in the Bavarian forest policy and is driven by the Bavarian Ministry of Food, Agriculture and Forestry which is a powerful actor in this policy field with strong interests in avoidance of natural hazards by protection forests and adaptation of mountain forests to climate change (Böhling and Arzberger, 2014, p.43). The GreenRisk4Alps project is embedded in the activities of the Mountain Forest Initiative and supported by the subordinated agencies.

Success factors:

- *Orientation toward public goals (like sustainability, resilience, ...)*
- *Relevance in regard to political processes*
- *Relevance in regard to allies*
- *Target-group oriented intermediation*

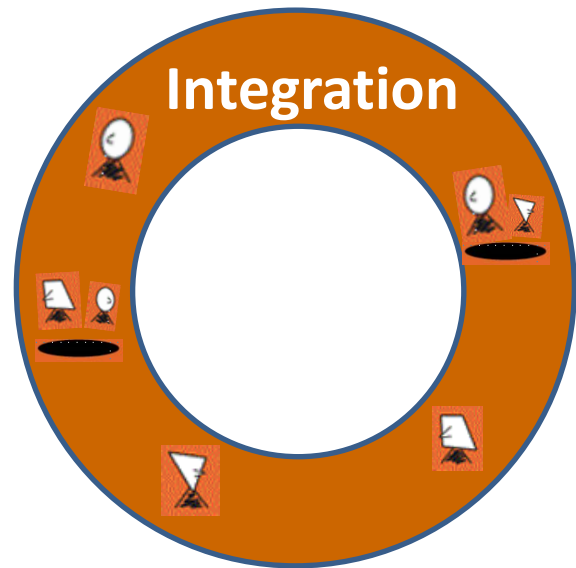


Figure 3: Integration circle

The actor focus is given through the lens of interests and power resources of individual or collective actors among the knowledge transfer process from science to practice. When interests meet a convenient scientific argument, political power will be the crucial source behind this argument in order to force other actors to follow these arguments (Böcher and Krott, 2016).

In the field of natural hazard management, we examined the data sources about relevant actors. When we got hints according to the data collection guide questions⁴ the actor were included in the networks survey. Additionally, we extended the networks to those actors who are advocating the interests on higher levels of the political-administrative system as organized interest groups. We consider furthermore those actors who are influencing other actor's tasks, goals or capabilities to do that indirectly. This approach covers institutions, organizations and state agencies which have the possibility to intervene in interests of other actors (Schusser, 2013). The snowball sampling technique was repeated so often until no new actor was identified anymore.

In the present report we developed an analytical framework to evaluate interests of actors in alpine hazard management and in implementing new alpine risk management strategies that allow us, as a first step, to identify actors who have their specific interests and who are highly relevant for successful knowledge transfer in this field. In report D.T2.5.2 we will examine the power sources of actors to complete the requirements for a successful consulting and supporting of the knowledge transfer process in the GreenRisk4Alps project according to the RIU model.

1.2. Decision structures – actor's interests, ecosystem services and actor roles

The risks of natural hazards as a value of the socio-economic sphere of human beings is defined as the probability of occurrence of an event and the extent of an adjacent damage. The first mentioned factor is directly linked to the ecological sphere. Both systems are linking people and nature in Social-Ecological Systems (SES) as complex adaptive systems with various interactions, different dependencies, time scales and heterogeneity in demands of solutions according to the individual

⁴ Here we refer to the question 4.1 and 4.2 of the data collection guide which was used during the interviews for the deliverable D.T2.3.1 and D.T2.5.2:

(4.1) With which actors do you normally collaborate, e.g. natural hazard actors?

(4.2) Who are important other actors for your work or activities, especially veto players?

interests of actors and to the spatial range of measurements of protection and the potentials hazards (Ostrom, 2007, 2009).

The requirements of actors regarding scientific solutions in natural hazard and forest management are given from the socio-economic sphere. Actors will support solutions which are useful for their own interests. Interests determine in a high degree all actions of individual actors or groups and are defined as an activity orientation which designate the usefulness for an individual or group that will be obtained from a scientific solution or an object like forests (Krott, 2001, p.5). Sabatier (1988, p.143) highlights also the importance of belief systems of actors which will determine the direction of political actors who try to influence governmental programs. Belief systems consist of three structural categories of interests with different resistance to changes. While the natural science-, the economic- and the technical feasibility is often part of a suggested solution or clearly predictable, the interests of actors are often unconsidered in applied research projects and are not part of that solution.

The determination of actors interests as starting point for successful knowledge transfer is a critical and challenging task. It is a matter of finding a relevant measurement of actors' interest which combines the socio-economic and the ecological sphere. In recent years the concept of Ecosystem Services (ES) and its adaptation for various fields of applications in sciences seems to be a promising tool for explaining natural dependencies and human being behaviour in the complex system of SES.

The Millennium Ecosystem Assessment (MA) report (Chopra, 2005, p.53) defines ES 'as the benefits people obtain from ecosystems'. This includes provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and habitats; and cultural services such as recreational, aesthetics of cultural lands-capes, spiritual, religious and other nonmaterial benefits (Chopra, 2005). Changes in these services affect human well-being in many ways. The ES framework of the MA places human well-being as the central focus for assessment in benefits and values as the demand side. The limitation of ES is highlighted by the Cascade Modell of the 'The Economics of Ecosystems and Biodiversity' initiative (TEEB) (Kumar, 2010, p.11). It starts in the sphere of ecosystems and biodiversity with biophysical structures and processes to functions and represent the potential that ecosystems can deliver. The final services are the linkage between human well-being and the environment. Therefore, a dynamic interaction and dependencies between people and other parts of ecosystems is existing. Changing human conditions leads directly and indirectly to changes in ecosystems and consequently will influence human well-being. The ES concept allows an actor-centred view to interests and the role of actors and its influence on ecosystems.

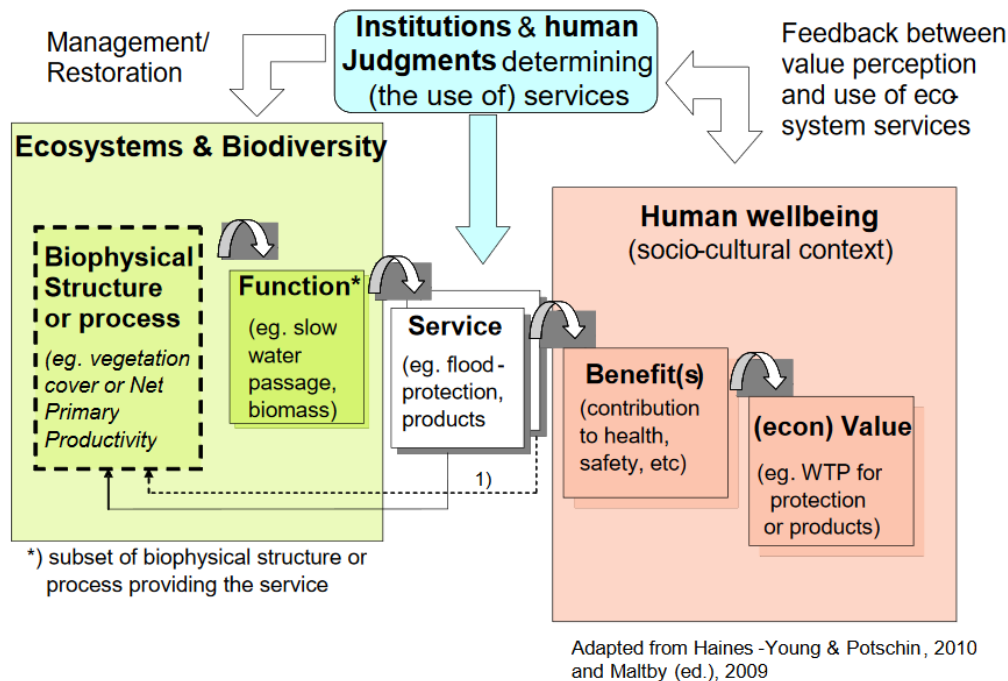


Figure 4: The Cascade Model from ecosystem structures and processes to human-well-being. (Kumar, 2010).

In the field of ecosystem-based natural hazard management, there is a need for an appropriate selection of ecosystem services. It has to describe, (i) the objective of the project; (ii) the sphere of ecosystems and biodiversity as the potential; (iii) the sphere of human well-being as the demand side; (iv): relevant interactions and dependencies of the connections in nature as well as the actors' influence on it.

Only human needs or demands can transform a potential into a real service. In this strong human perspective, services are valued, demanded or used for applying in practice. The Interreg-AlpES project has been developing an alpine ES concept for a common understanding on ES among the alpine countries (Interreg AlpES, 2018). It selected components of different theoretical concepts like the MA as well as the TEEB initiative for classifying ecosystem services. Further, it aims to map and assess ES in the alpine region. Therefore, this project delivers a sound foundation for the practical application in the GreenRisk4Alps project. We extended the concept to such services based on our own research findings during the data collecting process. Expert interviews, participatory observations and document analysis gave additional hints to the complex interaction and dependencies system of ES in natural hazard management and especially to the ecosystem based strategies with focus on protection forests.

The GreenRisk4Alps project focuses on natural hazard risk management in the alpine space and will establish, test and implement new forestry and ecosystem-based management in the Alpine region. This project wants to bring the protection forests into affordable and long-term oriented risk management by balancing green, technical and preventive risk strategies against natural hazards such as rock fall, avalanches, debris flows and torrents. The protection of areas against natural hazards could be achieved by the three strategies that all have the central aim of mitigating or preventing function of natural hazards. As specific regulating ES they provide either site protection and here soil protection (F1) or process protection (F2) or object protection as direct protection (F3) or indirect protection(F4) (Kleemayr et al., 2019). The following definitions are used for the regulating ES: (i) green prevention by maintenance, afforestation or deforestation of protection forests, (ii) technical

prevention by setting up artificial structures in ecosystems to prevent or mitigate natural hazards, (iii) reduction of land use by changing the previous land use to prevent or mitigate risks of natural hazards. These regulating ES should guarantee that people will be able to continuously benefit from the protective services whether the existing ecosystem is a natural or a semi-natural system.

Regulating ES
Green prevention
Technical prevention
Reduction of land use in risk zones

Table 1: Regulating ES

In a complex interaction of an ecosystem, many other regulating services (carbon sequestration, climate regulation, pollination, ...) exists and might be in the interest sphere of actors. However, these ES were not indicated with a major influence on the objective of the GreenRisk4Alps project because we did not get substantial evidences for its relevance in regard to our collected empirical data, e.g. expert interviews. Additionally, the data collection process did not achieve an empirical quantifiable interest of relevant actors in these ES.

The regulating ES describes a potential to what an ecosystem can provide and contribute to human well-being in case of natural hazards. But it must be extended to other categories of ES which ensure human well-being and which are in the interest sphere of affected actors. On this ground, they are linked to the regulating services and the objective of the project and additionally, linked by relevant interactions and connections in nature and actors influence on it. Our conducted research has identified the following ES (table 2) that has been substantial influence to the objective of the GreenRisk4Alps project and therefore to the regulating services and reversed as well as to each other.

Provisioning ES
Wood provision
Game provision
Grass for feeding
Water provision
Supporting ES
Biodiversity
Habitats
Cultural ES
Aesthetics of cultural landscapes
Tourism
Outdoor recreation

Table 2: Classes of ES

The broad diversity of actors interests in ES is bounded to the services which are relevant to natural hazard management in the alpine space. Actors perspectives to ES could be one dimensional, multidimensional, congruent or conflicting. For instance, a high density of game animals could have a direct effect on trees by browsing and debarking. It could influence the natural regeneration of forests,

the segregation of species, the annual growth of timber and the protective function of forests (El Kateb et al., 2009; Ammer, 1996; Didion et al., 2011). Different ES are affected by another service and co-vary positively or negatively as well as behinds actors interests (Grunewald and Bastian, 2015, p.43).

The selected ES relevant to natural hazard management in the alpine space gave a direct link to individual or collective actors. An ES is only a service if there is a human benefit (Fisher et al., 2009). This needs necessarily a specific actor with a set of different goals, objectives or conditions where the ES can contribute (van Oudenhoven et al., 2012). Actors benefit from different ES in different ways and influence themselves by direct use, primarily by harvesting, consuming and even producing services (Grunewald and Bastian, 2015, p.43). Indirect influence is exerted by users (McGinnis and Ostrom, 2014, p.6) through the decision making system for instance by elections. Different forms of political steering, from hierarchical governmental interventions up to non-hierarchical steering by governance procedures (Mann et al., 2015) determine actors participation on ES. Governmental actors themselves are responsible by mandate for the public task of management, maintenance, restauration and distribution of ES. This regulating social role is composed of various collective actors which specific goals, objectives or conditions resulting in a variety of interests in ES. Its influence is visible directly on the ecosystems and their services and indirectly as a consequence of changing the behaviour of users. Such actors receive their mandate often as a result of formal institutional settings and occurs as key stakeholders (Felipe-Lucia et al., 2015, 14).

With the objective of the GreenRisks4Alps project to promote natural-based risk mitigation strategies with focus on green prevention strategies all actors with institutional influence on forests are expected to be key stakeholders.

The latter represents the innovative new knowledge which is provided by the interdisciplinary researcher's consortium of the GreenRisk4Alps project and where users and regulator select scientific bricks in regard of their interests. The fundamental distinction between users and regulators is in which way and manner they are able to act to achieve their interests and what kind and extent of power sources are available for them.

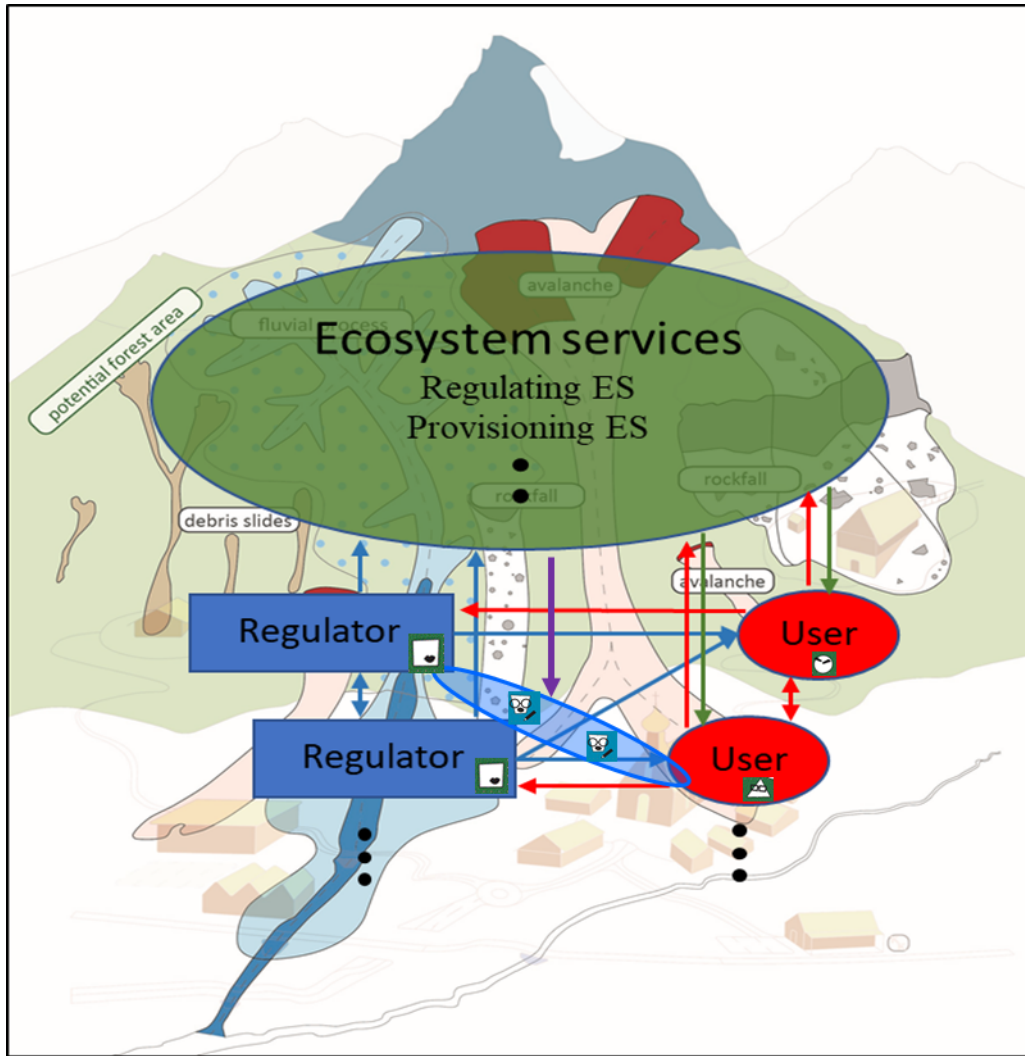


Figure 5: Decision structures in alpine hazard management.

Own figure based on: Karl Kleemayr (2019), Austrian Research Centre for Forests (BFW), Department of Natural Hazards, Rennweg 1, A-6020 Innsbruck. This work has been carried out on behalf of the Interreg Alpine Space project GreenRisk4ALPs – www.alpine-space.eu/projects/greenrisk4alps/en/home.

Users and regulators are represented by individual actors, collective actors and cooperative actors (Prittwitz, 1994, pp. 14-15). All are able, in varying extent, to address and advocate their interests within and to the political administrative system as well as to the society. Actors are embedded in institutional settings which define the ‘rules of the game’ by shaping human behaviour and action (North, 1992, p.3). This institutional influence to human behaviour determines strongly the human interactions with nature and the effects on ecosystem services. This institutional setting consists of: (i) legally binding laws; (ii) non legally binding instruments; (iii) norms, rules and traditions of the society; (iv) institutions and (v) organisational and functional dimension. All dimensions are able to obstruct or support actor’s interests, depending on the specific interest and the affected structure. In natural hazard management, the structures are broad spread and the following graphic provides an overview about it by the example of the German PAR Oberammergau.

<p>Legally-binding law</p>	<ul style="list-style-type: none"> • Bavarian forest act • Bavarian nature nonsevation aw • Bavarian regional planning act • Bavarian hunting law • Bavarian water law • Bavarian town and country planning code • Bavarian land development plan
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	<ul style="list-style-type: none"> • Bavarian guideline for grants to silvicultural measures within a forestal funding programme
Non legally binding instruments	<ul style="list-style-type: none"> • Bavarian forest days • Bavarian nature conservation funds • European agricultural fund for rural development (EAFRD) • Climate program 2020 of the Bavarian state government • Extension of state forest service to private and municipal forest owners • Avalanche warning service
Rules and norms of the society	<ul style="list-style-type: none"> • Ethics and moral <ul style="list-style-type: none"> ○ Autonomy of individuals ○ Religious belief • Values <ul style="list-style-type: none"> ○ Farming traditions and values in alpine regions ○ Hunting traditions and values in alpine regions ○ Land ownership
Institutions	<ul style="list-style-type: none"> • Bavarian state ministry of food, agriculture and forests • Bavarian State ministry of the environment and consumer protection • Regional government of upper Bavaria • Office for food, agriculture and forestry Weilheim • Municipality of Oberammergau/Ettal • Local avalanche commissions
Organisational and functional dimension	<ul style="list-style-type: none"> • Distribution of responsibilities and competences <ul style="list-style-type: none"> ○ Forestry administration ○ Nature conservation administration • Levels of the administrative system <ul style="list-style-type: none"> ○ 2 levels in the forestry administration ○ 3 levels in the nature conservation administration • Organizational structures of institutions <ul style="list-style-type: none"> ○ In regard to tasks

Table 3: Institutional setting of the PAR Oberammergau (selection)

These institutional settings are linked to actors widely in a formal but some in an informal way. The possibility of an actor to enforce its interests are strongly determined by the described institutional settings and how an actor is embedded in it. If he will succeed to use the institutional settings for their interests and he can successfully establish networks of actors with own institutional capabilities, then he can influence the decision making process for his own interests by additional sources of power (Krott et al., 2014, p.38). To sum up, the decision structures which influences ES relevant to alpine natural hazard management are part of the surrounding institutional setting and, in an actor perspective, it enhances the actors extend and possibility to participate at the decision making process where they can successfully advocate their own interests. Therefore, decision structures can empower actors. This fact will be detailed in D.T2.5.2..

1.3. Users' influence on ES

As seen in the chapter before, actors can be empowered more or less by the institutional setting to influence the ES and it strongly determines the own capabilities to do that. The way they do that is a dichotomy between direct and indirect influence and does become an effect on the ecosystem. Direct means to do something in nature by themselves and influence ecosystem processes (Chopra, 2005, p.57). Indirect influence operates more diffusely from a distance and changes the behaviour of another actor in his acting in the ecosystem. Both processes are constantly running driven by the own interests and capabilities of actors but resulting often in a steady state of actors positions and well known exchange of arguments between involved actors. For instance, the actor composition and institutional

setting as well as interests and values in Austrian protective forest policy are highly constant since 20 years (Weiss, 1999, pp. 6-8).

Direct influence of users on ES includes such activities triggered by - land use and land cover, species introduction and removal, technology adoption and use, amount of harvest and consumption of ES, non-use of ES, planting and production activities, maintaining and improving of ES (Chopra, 2005, p.57). Interactions between different ES have to be considered by the mentioned activities, i.e. forest pasture use influencing natural regeneration in protective forests by browsing, fraying, trampling and breaking young trees and depends strong on animal stocking rates (Mayer et al., 2003). These activities entail formal influence opportunities supported by the legally binding law, i.e. property rights which allow the forest owner to harvest and plant trees in their own forest (L.112-2, French Forest code, 2020); forest act of Austria which allows the free access to the forests for ski touring, hiking and recreation (§ 33, Austrian Forest Act, 1975). Informal direct influence are all activities without compliance with legally binding laws affecting ES, i.e. illegal clear cutting in protective forests or non-use of ES despite obligation – do not respect shooting quota of game animal. Legally binding law is never foreseen for all possible applications (Krott, 2001, p.177). Many direct influences of actors on ES exist without any regulation scheme or are not foreseen in legally binding laws, respectively regulatory deficits and thereby it is acting in an informal manner, i.e. increasing extend of ski touring in forests or climbing activities and the influence on ES. Further relevant informal direct influence is gained by customary law (Interview 1V-1; 1V-2; 1G-8) or voluntary agreements between different user of ES, i.e. voluntary waiver to enter sensitive areas during winter season where grouse species live (Frenzel, 2004, p.650; Scheuermann, 1999, pp. 79-80).

Indirect influence of users on ES is targeting either regulators or other users. Regarding regulators, it occurs within the political-administrative system by formal participation of actors by compliance to the binding rules. For instance, in spatial planning land users have formal influence to raise an objection in land use plans of the municipality level (§ 3, German Building Code, 2017) or house and property owner can appeal against danger zone planning in the municipality (§11/4, Austrian Forest Act, 1975). Associations as well as individual users are often members of advisory boards of authorities as experts or as affected party, i.e. local avalanche commission or advisory board for hunting (§58/58a, Tyrolean Hunting Act, 2004). In the French case study, the development of a local forest development strategy is made by a committee including forest owners, professional forest users, association of forest users and environment protection (L. 123-2, French Forest code, 2020). All kind of political elections on different political levels empower users to indirectly influence the ES by elected political parties according to their political agenda (Krott, 2001, p.85). Users' indirect and informal influence on ES through regulators takes place without any binding rule by voluntary information to regulators or participation on voluntary processes of regulator. Here, users can provide targeted information or expertise or hide it as well as give aimed misinformation (Krott et al., 2014, p.39).

The users' direct formal influence on ES through other users is applied by the legally binding law and is primarily affected by the property rights (Weiss, 1999, p.283; Schlager and Ostrom, 1992). The direct formal influence of users on ES causes trade-offs and feedback effects by competition about different services which affect other users indirectly. In informal ways users can influence other users' behaviour by providing (mis)-information or giving incentives, i.e. in the PAR Brenner region forest owner steering ski touring activities by narrow clear cut trails (Interview 1V-2).

1.4. Regulators' influence on ES by political instruments

Regulators' direct influence on ES is constrained due to limited formal regulative instruments for direct acting. For instance, the Austrian avalanche and torrent control is empowered to implement artificial structures to protect against avalanches or rock fall (§102/5, Austrian Forest Act, 1975). In Bavaria the

district watershed authorities are responsible for that task in protective forest recovery programme areas (Bavarian State Ministry for Food, Agriculture and Forestry, 2.2.2). Blue lights and containment regulators are authorized to block roads, to evacuate areas or to prohibit land use activities in case of natural disasters or increasing endangerment (Interview 1V-2; 1G-8; 1V/G-3; 6-2; 6-3). Informal direct influence by regulators is exerted without any binding rule and seldom come upon in practice.

Even greater potential to influence ES for regulators is given by indirectly affecting instruments to change users' behaviour. Several political instruments are available for regulators to fulfil their tasks. Regulative instruments are binding rules and most common for political hierarchical steering (Krott, 2001, p.169). Those who are affected are stipulated how they have to act in the ecosystem, for instance by country-specific binding rules in regard to protective forests. Regulating instruments are often reaching limits due to the fact that they represent general rules for individual issues (Krott, 2001, p.177). Economic instruments influence actors by exchanging economic values (Krott, 2001, p.146). In forestry economic incentives and disincentives as subsidies or taxes are applied, i.e. for harvesting damaged timber caused by bark beetles on steep slopes or tending of young stands in protection forests in Bavaria (Bavarian State Ministry for Food, Agriculture and Forestry, 2018, 4.3.1.1). Regulators provide a broad set of information to different users, for instance consulting of forest owners, danger zone plans for municipalities and citizen, public relations to increase awareness of the protective function of forests or of natural hazards (Interview 1V-1; 1V/G-4; 6-3; 6-5) and other measures with the capability to change the behaviour of users by provided information (Krott, 2001, p.115). As mentioned before, implementing participatory processes by regulators to users means a cooperative instrument which enables regulators to influence ecosystem services indirectly. The German Mountain forest initiative is good practice example of implementing cooperative instruments as 'new modes of governance in Bavaria's alpine forests' (Böhling and Arzberger, 2014). The application of political instruments is a formal intervention and often used as combination of more than one instrument. The informal direct and indirect steering of regulators to user or other regulators is depending on power processes, for instance, the capabilities to control the compliance to regulative rules continuously.

2. Users and regulators

Knowledge transfer from the RIU model's point of view is an actor-centered and an actor-driven process by interests and power resources of the actors. The social network analysis concept of D.T2.1.2 and the applied concept of D.T2.2.2 surveyed a first compilation about the actors' composition in each PAR. Additionally, the decision structures in alpine hazard management define the actors' roles and the institutional setting in which actors are embedded and possible influence of actors to the ecosystem services. Resulting from this and the snowball sampling identification of actors we extended the amount of actors to those who are possible knowledge recipients, allies or integrators. Thus, we also included actors with distance to the case study areas but with direct reference to interests of actors who are representing these interests on different administrative levels as collective actors or organized interest groups. The formation of actor's categories increases the comprehensibility of the complex actors' composition in the PAR's and facilitates the identification of possible allies of actors. Additionally, existing conflicts of interests of actors as well as the definition of complementary interests of actors or contradicting interests of actors is easier to detect by using categories. This first step of the RIU process is complemented by a detailed register of actors per category where the selection of each assigned individual actor can be conducted.

2.1. Categories of users

The survey of actors in alpine natural hazard management at the user side is especially extended to supra regional active associations or companies. The following description for each category of 'users' is illustrated with examples of the Austrian PAR Brenner region.

Category of user	Description	Examples
Forest owner	Owner of forest properties with protection function	Private forest owner, state owned forests, monastery forests, community forests, forests of agricultural communities
Consumer in endangered zones	Direct or indirect consumption of ES in endangered zones	Tourists, Alpine club
Producers in endangered zones	Realize income and revenue by producing goods and services by using ES direct or indirect in endangered zones	Touristic companies, artisan firms, energy producer, industry
Consumer – traffic Infrastructure	Direct consumption of traffic infrastructure facilities in the case study area	Automobile associations, private and commercial transport
Provider traffic Infrastructure	Offer traffic infrastructure like roads, highways, railroads in the case study area	Highway operators, railroad operators, ASFINAG, ÖBB
Environmental actors	Intervene in different ES in the case study area for nature conservation goals	Austrian alpine club, nature conservation union Tyrol, other environmental NGO's
Citizen	People who are living in the case study area and benefits on different ES	Individual citizen
Alpine grazing/ agriculture	All kinds of farming in the case study area	Individual farmers, farmers associations, farmers board
Hunter	Regular hunting representatives in the area	Hunting tenures, regional hunting associations, local hunting association, individual hunters

Table 4: Description of categories of user

2.2. Categories of regulators

The categories of regulators include different levels of the administrative system and their subordinated agencies which have to represent the same interests. From the perspective of institutionalism, the right of the final decision in certain issues is the crucial component, i.e. the Austrian federal ministry for sustainability and tourism in jurisdiction of the Austrian forestry technology services for torrent and avalanche control as direct federal agency is also included. Examples of the PAR Brenner region should outline the actors' category representatives.

Category of regulators	Description	Examples
Municipalities	Perceive public tasks on the municipality level	Municipality as construction authority on the lower level
State agencies for hunting	Perceive public tasks for hunting issues on all administrative levels	Office of the Tyrolean government, department agricultural school system, hunting and fishing

State agencies for traffic, infrastructure, spatial planning, regional development	Perceive public tasks in traffic, infrastructure, spatial planning, regional development issues on all administrative levels	Austrian federal ministry for sustainability and tourism, section VII
State agencies for agriculture	Perceive public tasks in agricultural issues on all administrative levels	Austrian federal ministry for sustainability and tourism, section II
State agencies of environment	Perceive public tasks in environmental issues on all administrative levels	Austrian federal ministry for sustainability and tourism, section III
State agencies for forests	Perceive public tasks in forest related issues on all administrative levels	District forest service Steinach a.B.
State agencies of protection of risks	Perceive public tasks in risk protection issues on all administrative levels	Forestry technology services for torrent and avalanche control
State agencies of financing	Budgeting of state agencies on different administrative levels	Austrian federal ministry of finance, section II
Construction-companies	Private companies realizing income and revenue by constructing artificial protection measurements	National and regional active companies
Media	Inform the public about natural hazards in general, current events disasters, alerts and risks	Newspapers (Tiroler Tageszeitung), social media, television stations
Risk transfer – private/public	Institutions for financial cushioning of socio-economic losses (early recondition costs, reconstruction costs) as result of natural disasters	Austrian disaster relief funds
Containment/ blue lights	Civil protection agencies and voluntary organisations for emergency provisions and intervention	Office of the Tyrolean government, department society, health and social issues – division civil protection, major of the municipality, mountain rescue, police, fire brigade

Table 5: Description of categories of regulator

2.3. Different interests in ES

The variety of different interests in ES becomes clear by the actors' natural hazards related perspective where each actor with a set of different goals, objectives or conditions is willing to enforce his interests. Actors perspectives to ES may be one dimensional, multidimensional or to other actors' interests be congruent, supporting or conflicting. If actors are asked to formulate their interests, they are often not being entirely clear about the own interests. It might be that actors are facing for the first time a direct question to reveal their interests. Sometimes, an actor is not able to assess how his interests could be affected by specific hypothetical questions in an ad-hoc interview situation and he cannot estimate which effects will be arising for his own situation. There is no doubt that green prevention measures

will affect forests. But often it is unclear, also for scientists, how it will have impacts on other ES like wood provision. Each statement of an actor in this situation includes major uncertainties and he is, at the best, able to give an estimation of own interest. In this situation and equally as “strategic actors”, actors often want to hide their real interests (Schusser, 2013, p.45). Given this fact, it is less evident to want to observe interests directly (Krott 2005). Instead we are able to determine the behavior of actors during observations in many given situations and settings (Krott, 2005, pp. 7-11). ‘How the actor behaves and what he does are indicators that show his interests’ (Schusser, 2013, p.215). Thus, we will draw conclusions related to the interests of actors based on different indicators which typically represent an interest in an ES. As an example, planting *picea abies* only in protection forests even though other species are site-specific tree species which have more protective effect but less growth of wood mass, indicates an interest in wood provision and rarely in green prevention. In France, planting pine trees by the national forest office to fix the soil is revealing the main interest of this state agency in green prevention without giving a priority to the biodiversity aspects.

Interests of actors often depend on surrounding conditions and are not precisely predictable for each actor or a category of actors. It has to be exactly examined in which circumstances a relevant actor expresses his interests and if an ES can contribute or opposes to this interest. For instance, farmers are in the dichotomy to tourism. Some who are benefiting from tourism will have a strong interest in tourism. Others feel disturbed by tourists on their own property in case of damaging meadows. The concrete circumstance of an actor also plays a determining role regarding his own perception of his influence on ES. Someone who brought in preliminary work, i.e. by planting trees, will not have a feeling as consumer of ES but rather as a producer of timber and in order to that he will have a strong interest in wood provision as specific ES. Individual settings and circumstances as well as self-perception of actors as pure cognitive processes are the main reasons why interest measuring in the present report is to be seen relational.

The decision structures in alpine hazard management distinguish between the different roles of actors as regulators or users, which determines the way they are able to act to achieve their goals, objectives and conditions and what kind of power sources are available for them to enforce the related interests in ES. Additionally, each actor can have different social roles depending on individual properties he has or tasks he has to fulfill. This means that an actor could be at the same time regulator and user as well as that he can belong to more than one category of actors. The role of municipalities is an illustrative example. In the PAR Val Ferret, the municipality of Courmayeur perceives public tasks of building authority, social welfare or registration office as self-government or as an assumption of administrative tasks of superordinate levels of government (Municipality of Courmayeur, 2019b). For natural hazard management and the corresponding network analysis and therefore the interest analysis this municipality assumes further roles as civil protection authority (Municipality of Courmayeur, 2019b), forest owner in Val Ferret with around 695 ha of forests (Interview 6-6) or producer in endangered zones as sole shareholder of the tourism operator Centro Servizi Courmayeur (Municipality of Courmayeur, 2019a). It is important to understand that in such a case the actor can have divergent interests with strong contradictions or “irrational” behavior compared to other social roles and affiliations to different actor categories. One of these contradictions is seen in Val Ferret where the mayor is head of civil protection with personal liability in case of personal injuries or material damages. Closing the high endangered road in Val Ferret in winter season against avalanche risks or debris flows in summer is an appropriate mean to avoid such damages. On the other hand, keeping the street open is essential for the municipality as touristic operator to create income or at least to support the tourism companies in the Val Ferret (Interview 6-2; 6-3; 6-5). In the case of France, the interviews revealed that the mayor in one municipality adhered to the ‘Parc des Baronnies` is also a farmer and he has agricultural activities and interests with his family. There is a need for tailored selection of scientific

findings according to the actual social role of the mayor and which finding supports his interest at the moment. This differentiation between actors is essential for a successful knowledge transfer process and have to be carefully examined.

2.4. Alternative risk strategies

The GreenRisk4Alps project wants to implement innovative ecosystem and forestry-based risk management strategies for natural hazards and new mitigation alternatives. Researchers are strongly committed to reach the aims by developing these alternative risk management strategies by using scientific methods and standards as good scientific practice (Stevanov et al., 2013, p.21). From the perspective of the majority of practitioners, researchers have to answer the question: What is the influence of the different strategies on my interests in ES? Only few practitioners will ask if the strategy in general is able and sufficiently effective to achieve the aim of the project? The latter are those who are affected by the natural hazards that occurred or those who have the public task to mitigate or manage such natural hazards and occurring risks. Actors often rely on information of scientists and will draw conclusions from this information for their own behavior and acting. But actors want to have as much precise information as possible about the impact of strategies on their interests. If such information is not available, the probability of rejection of measures is increasing. Researchers instead often cannot say precisely which impact the alternative risk strategy will have. Uncertainties and ignorance about scientific interrelationships occur often. They also use technical language or use incomprehensible scales as well as limiting conditions for scientific findings which is difficult to understand for practitioners (Böcher and Krott, 2016, pp. 1-10).

During the research process scientists are requested to take possible impacts of their innovative results to relevant ES into account. There is a need for an appraisal of consequences and impacts on it. Additionally, scientists have to provide understandable information and to apply appropriate scales for practitioners. The tables 'evaluation of different interests in ES' (tables 8-13) suggests to give percentages of impact or at least specifications on a scale with minor, middle and high impact. Such information supports the knowledge transfer due to the possible prediction of actor's behavior in regard to the applied strategy and increases the chance to find supporting allies or to find opponents of the aimed strategy. Apart from this, it allows that scientific findings could be reviewed about their practical implementation possibility and it reduces the effort for integration measures for unenforceable strategies.

3. Analyzing and assessing interests

3.1. Evaluation of the actors' interests

The survey aims to have a complete network analysis in the field of natural hazard management to examine relevant interactions for knowledge transfer between involved actors. This procedure forms the reality at best and it guarantees objectivity from a secured distance of personal feelings or observations of each surveyor (Hasanagas, 2004, p.51). For this purpose, we make use of three different data sources to identify relevant actors, (i) participatory observations, (ii) document analysis and (iii) interviews. For the identification of actors, we applied the snowball sampling method. If we get hints according to the data collection guide questions 4.1 and 4.2 the actor would be incorporated to the networks survey. We verified the collected data by the triangulation of the different data sources. Additionally, we extended the networks to those actors who are advocating the interests on higher levels of political-administrative system as organized interest groups. Regulators are extended to those actors who are influencing other actor's tasks, goals or capabilities to do that indirectly (for instance state agencies for financing by budgetary sovereignty to other state agencies). Interests of actors are specified by ES and evaluated in a relational scale scheme following table 6.

Interest	Regulator	User
+++	Priority interest – main interest which is clear indicated in the criteria's	Priority interest – main interest which is clear indicated in the criteria's
++	Main interest - legal mandate, public task, indicated in the criteria's	Main interest - task of the organisation, secure individual or collective well-being (security, basic material for a good life, good social relations)
+	Limited interest – derived legal mandate or public task; mentioned in the criteria's	Limited interest – mentioned in the criteria's
0	No criteria	No criteria
-	Influences own interest – mentioned in the criteria's	Influences own interest – mentioned in the criteria's
--	Influences own main interest	Influences own main interest
---	Influences own priority interest	Influences own priority interest

Table 6: Evaluation of interests of actors

For each ES we used the list of criteria (table 7) to check the degree of commitment of the respective ES of an actor by indicators. The latter did not follow a conclusive list, instead it aims to a logical and empirically verifiable choice of indicators fitting to the available data and the relational significance. We did not restrict the survey to a specific period of data origin as a consequence of the snowball sampling design and, for instance, long-term effects of forestry interventions. But we checked the current significance and validity of the data.

Criteria	Indicator example
Activities from the past/current activities	<ul style="list-style-type: none"> ● Plantation activities in the forest, especially species with high protective effect and climate adaptability ● Yearly area of thinning
Legal/statutory dimension	<ul style="list-style-type: none"> ● Forest act ● Water act ● Nature conservation law
Scientific/theoretical/empirical foundation	<ul style="list-style-type: none"> ● Reports of other projects ● Scientific papers and books ● Natural science based coherencies and dependencies
Description of other actors	<ul style="list-style-type: none"> ● About goals, objectives, conditions, tasks and activities from the past/current activities of the described actor by: <ul style="list-style-type: none"> ○ Interviews and observations ○ Websites ○ Annual reports ○ Published brochures and information material
Self-description	<ul style="list-style-type: none"> ● Own websites ● Own annual Reports ● Self-published brochures and information material ● Interviews and observations

Table 7: List of criterias

For instance, to evaluate the forest owner interest in the PAR Brenner region we did interviews with the district forest office and the local and the municipality forest inspectors (Interview 1V-2; 1V7G-4; 1G-8, description of other actors). This data was triangulated by results of participatory observations (Interview/observation 1V-1, Forsttagsatzung) and document analysis (presentations of Forsttagsatzung of the last 6 years providing information in regard to indicators).

3.2. Results' summary of different interests in ES

The relational evaluation of interests points out where interests of actors are located and give information about their intensity. It provides also information about coherent interests of actors or opponents of the own interest. Accordingly, the tables enable the operators to find supporting allies who have complementary interests as well as conflicts of interests.

The following tables 8-13 'evaluation of different interests in ES in the PAR' serves the actors' network and the interest structure in all PAR of the GR4A project. We generally applied 12 regulator and 9 user categories to map interests of actors. Regarding the 21 categories of actors, we specified a detailed actor's list which includes all relevant individual and collective actors for the PAR's. In the example of the PAR Brenner region (table 8), the ES green prevention is a main interest of state agencies of protection; forests; traffic, infrastructure, spatial planning and regional development at the user side. At the regulator side consumer in endangered zones; producers in endangered zones; consumer – traffic infrastructure; provider traffic Infrastructure; environmental actors and citizen have also main interests in the ES green prevention. All assigned actors of the mentioned categories are potential allies for scientific findings which will support this interest from a subjective perspective of an actor. Potential opponents gained a minus (-) evaluation like state agencies of environment. Their representatives revealed that afforestation in high mountain areas often affect biodiversity negatively because mountain pastureland comprises a higher density of locally adapted crop plants and animal species (Interview 1V/G-9). Additionally, we have to consider interactions in nature and occurring trade-offs between ES. Hunters have a priority interest in game provision and high game densities. But game species (roe deer, red deer, chamois) can affect green prevention efforts negatively by browsing and debarking if game densities are too high. Both interests cannot be fulfilled simultaneously in the same extent. Hunters and also forest owner of attractive hunting grounds, resulting in high tenancies of a hunt are potential opponents of actors interested in green prevention. In the French case, where there is a considerable area dedicated to agriculture, the interest of hunters in increasing game provision is also against the one of farmers whose lands are highly affected by boars. Beyond that, interests of actors sometimes depend on individual circumstances. Farmers support green prevention (often by maintaining/ cultivating alpine pasture land instead of fallow land use and therefore increasing risk of natural hazards like avalanches) efforts as long as they will not lose alpine pasture land due to afforestation or losing grazing rights in protective forests (interview 1V-2; 1V/G-3). In such a case it is not possible to give a clear evaluation. Therefore, we assessed it with plus/minus (+/-).

All research findings should be reviewed under the questions "which interest of actors will be affected by that positively or negatively and which interest of actors can affect the findings during implementation by trade-offs or interactions in nature?". All levels of the administrative system or organized interest representatives have been taken into account by selecting and implementing alternative risk strategies and stakeholder involvement processes for the purpose of transferring research results into actors practice.

Regulator													Interest in	Alternative risk-strategies (%)	User									
Containment/blue lights	Risk Transfer		Media	Construction-companies	State agencies							Municipalities			Forest-owner	Consumer in endangered zones	Producer in endangered zones	Consumer – traffic infrastructure	Provider traffic infrastructure	Environmental actors	Citizen	Alpine grazing / agriculture	Hunter	
	Private	Public			Financing	Protection of risks	Forests	Environment	Agriculture	Traffic, infrastructure, spatial planning, regional development	Hunting													
													Regulating ES											
+	-	++	++	0	+	++	++	-	+/-	++	-	+	Green prevention	0 - 100	+/-	++	++	++	++	++	++	++	+/-	0
++	-	++	++	++	+	+++	+	--	+/-	++	0	+++	Technical prevention	0 - 100	0	+/-	+	+++	+++	-	++	-	0	
+++	-	++	++	0	0	+	0	++	0	--	0	---	Reduction of land use in risk zones	0 - 100	+/-	---	---	---	---	+	---	-	0	
													Provisioning ES											
0	0	0	0	0	+	0	++	0	--	+	+/-	0	Wood provision	0 - 100	+++	0	+	0	0	0	++	--	--	
0	0	0	0	0	0	--	--	0	--	0	++	0	Game provision	0 - 100	++	0	0	0	0	-	0	0	+++	
0	0	0	0	0	+	--	0	0	+++	+	+/-	0	Grass for feeding	0 - 100	-	0	0	0	0	0	+	+++	+	
0	0	0	0	0	0	++	++	++	++	+	0	+	Water provision	0 - 100	++	+	+	0	0	+	++	++	0	
													Supporting ES											
0	0	0	0	0	0	0	+	++	+	+/-	+	0	Biodiversity	0 - 100	+	+	0	0	0	++	+	+	+/-	
0	0	0	0	0	0	0	0	+++	+	+/-	+	0	Habitats	0 - 100	0	0	0	0	0	+	+	+	+	
													Cultural ES											
0	0	0	0	0	0	0	+	++	++	0	0	++	Aesthetics of cultural landscapes	0 - 100	+	+++	++	0	0	++	++	++	+	
0	0	0	0	0	+	+	0	-	+	++	0	++	Tourism	0 - 100	-	+++	+++	0	0	++	+/-	+/-	0	
0	0	0	0	0	0	0	0	-	0	0	-	++	Outdoor recreation	0 - 100	-	+++	++	0	0	++	++	+/-	-	

Table 8: Evaluation of different interests in ES in the PAR Brenner region (Austria)

Containment/blue lights	Risk Transfer		Media	Construction-companies	Regulator							Municipalities	Interest in	Alternative risk strategies (%)	User										
	Private	Public			State agencies										Forest-owner	Consumer in endangered zones	Producer in endangered zones	Consumer – traffic infrastructure	Provider traffic infrastructure	Environmental actors	Citizen	Alpine grazing / agriculture	Hunter		
					Financing	Protection of risks	Forests	Environment	Agriculture	Traffic, infrastructure, spatial planning, regional development	Hunting														
													Regulating ES												
++	-	++	+	0	+	++	+++	+/-	-	++	0	++	Green prevention	0 - 100	+/-	++	++	++	++	++	++	++	++	+/-	0
+++	-	++	+	++	+	++	+	--	+/-	++	0	++	Technical prevention	0 - 100	-	+/-	++	+++	+++	+++	+/-	++	-	0	0
++	-	++	+	0	0	++	0	++	0	++	0	+/-	Reduction of land use in risk zones	0 - 100	-	--	---	---	---	---	++	---	-	0/-	0
													Provisioning ES												
0	0	0	0	0	+	0	++	0	--	0	0	0	Wood provision	0 - 100	++	0	0/++	0	0	0	+	++	--	--	0
0	0	0	0	0	0	--	--	0	--	0	++	0	Game provision	0 - 100	++	0	0	0	0	0	0/-	+/-	---	+++	0
0	0	0	0	0	0	--	0	0	+++	+	0	0	Grass for feeding	0 - 100	0/+	0	0	0	0	0	+	+	+++	+	0
++	0	0	0	0	0	+	++	++	++	+	0	++	Water provision	0 - 100	+	+	+	0	0	0	+	++	++	0	0
													Supporting ES												
0	0	0	0	+	+	0	+	+++	+	+/-	+	+	Biodiversity	0 - 100	+	+	0	0	0	0	++	++	+	+/-	0
0	0	0	0	0	0	0	0	+++	+	+/-	+	+	Habitats	0 - 100	0	+	0	0	0	0	+++	++	+	+	0
													Cultural ES												
0	0	0	0	0	0	0	0	++	++	0/+	0	++	Aesthetics of cultural landscapes	0 - 100	+	+++	+++	0	0	0	++	++	++	+	0
0	0	0	0	0	+	0	++	0	+	++	0	++	Tourism	0 - 100	-	+++	+++	0	0	0	+	++	+/-	0	0
0	0	0	0	0	0	0	++	0	0	+	--	++	Outdoor recreation	0 - 100	-	+++	++	0	0	0	++	++	+/-	--	0

Table 9: Evaluation of different interests in ES in the PAR Parc des Baronnies (France)

Regulator													Interest in	Alternative risk strategies (%)	User								
Containment/blue lights	Risk Transfer		Media	Construction-companies	State agencies							Municipalities			Forest-owner	Consumer in endangered zones	Producer in endangered zones	Consumer – traffic Infrastructure	Provider traffic Infrastructure	Environmental actors	Citizen	Alpine grazing / agriculture	Hunter
	Private	Public			Financing	Protection of risks	Forest	Environment	Agriculture	Traffic, infrastructure spatial planning, regional development	Hunting												
													Regulating ES										
+	0	+	++	0	+	++	+++	-	+/-	++	-	+	Green prevention	0 - 100	+/-	+	++	+	+	++	+	+/-	0
++	0	+	++	++	++	++	+	--	+/-	++	0	+++	Technical prevention	0 - 100	0	+	++	+++	++	-	++	0	0
++	0	+	++	0	0	++	0	++	0	-	0	---	Reduction of land use in risk zones	0 - 100	+/-	---	---	---	---	+	---	-	0
													Provisioning ES										
0	0	0	0	0	0	0	++	0	0	0	-	0	Wood provision	0 - 100	+++	0	0	0	0	0	+	0	--
0	0	0	0	0	0	--	--	0	-	0	++	0	Game provision	0 - 100	++	0	0	0	0	0	0	0	+++
0	0	0	0	0	0	-	0	0	++	0	0	0	Grass for feeding	0 - 100	+/-	0	0	0	0	0	+	++	+
0	0	0	0	0	0	+++	++	++	+	0	0	+	Water provision	0 - 100	++	+	+	0	0	+	++	+	0
													Supporting ES										
0	0	0	0	0	0	0	++	+++	0	0	+	0	Biodiversity	0 - 100	+	+	0	0	0	+++	+	0	+/-
0	0	0	0	0	0	0	+	+++	0	0	+	0	Habitats	0 - 100	0	0	0	0	0	+++	+	0	+
													Cultural ES										
0	0	0	0	0	0	0	+	++	+	0	0	+++	Aesthetics of cultural landscapes	0 - 100	+	+++	++	0	0	++	++	+	+
0	0	0	0	0	++	0	0	--	+	++	0	+++	Tourism	0 - 100	-	+++	+++	0	0	-	+/-	+/-	0
0	0	0	0	0	0	0	0	--	0	0	-	++	Outdoor recreation	0 - 100	-	+++	+++	0	0	-	++	+/-	-

Table 10: Evaluation of different interests in ES in the PAR Oberammergau (Germany)

Regulator													Interest in	Alternative risk strategies (%)	User								
Containment/blue lights	Risk Transfer		Media	Construction-companies	State agencies							Municipalities			Forest-owner	Consumer in endangered zones	Producer in endangered zones	Consumer – traffic Infrastructure	Provider traffic Infrastructure	Environmental actors	Citizen	Alpine grazing / agriculture	Hunter
	Private	Public			Financing	Protection of risks	Forest	Environment	Agriculture	Traffic, infrastructure spatial planning, regional development	Hunting												
													Regulating ES										
+	0	+	++	0	+	++	++	-	+/-	++	-	+	Green prevention	0 - 100	+/-	+	++	+	+	++	+	+/-	0
++	0	+	++	++	++	++	+	--	+/-	++	0	+++	Technical prevention	0 - 100	0	+	++	++	+++	-	++	0	0
+++	0	+	++	0	0	++	0	++	0	-	0	---	Reduction of land use in risk zones	0 - 100	+/-	---	---	---	---	+	---	-	0
													Provisioning ES										
0	0	0	0	0	0	0	++	0	0	0	-	0	Wood provision	0 - 100	+++	0	0	0	0	0	+	0	-
0	0	0	0	0	0	--	--	0	-	0	++	0	Game provision	0 - 100	+	0	0	0	0	0	0	0	+++
0	0	0	0	0	0	-	0	0	++	0	0	0	Grass for feeding	0 - 100	+/-	0	0	0	0	0	+	++	+
0	0	0	0	0	0	+++	++	++	+	0	0	+	Water provision	0 - 100	++	+	+	0	0	+	++	+	0
													Supporting ES										
0	0	0	0	0	0	0	++	+++	0	0	+	0	Biodiversity	0 - 100	+	+	0	0	0	+++	+	0	+/-
0	0	0	0	0	0	0	+	+++	0	0	+	0	Habitats	0 - 100	0	0	0	0	0	+++	+	0	+
													Cultural ES										
0	0	0	0	0	0	0	+	++	+	0	0	+++	Aesthetics of cultural landscapes	0 - 100	+	+++	++	0	0	++	++	+	+
0	0	0	0	0	++	0	0	--	+	++	0	+++	Tourism	0 - 100	-	+++	+++	0	0	-	+/-	+/-	0
0	0	0	0	0	0	0	0	--	0	0	-	++	Outdoor recreation	0 - 100	-	+++	+++	0	0	-	++	+/-	-

Table 11: Evaluation of different interests in ES in the PAR Southern Wipptal (Italy)

Regulator													Interest in	Alternative risk strategies (%)	User								
Containment/blue lights	Risk Transfer		Media	Construction-companies	State agencies						Municipalities	Forest-owner			Consumer in endangered zones	Producer in endangered zones	Consumer – traffic Infrastructure	Provider traffic Infrastructure	Environmental actors	Citizen	Alpine grazing / agriculture	Hunter	
	Private	Public			Financing	Protection of risks	Forest	Environment	Agriculture	Traffic, infrastructure spatial planning, regional development			Hunting										
													Regulating ES										
+	0	+	+++	0	0	+	+	-	-	+	-	+	Green prevention	0 - 100	+/-	++	++	+	+	++	+	+/-	0
++	0	+	+++	++	++	+++	+	--	-	++	0	+++	Technical prevention	0 - 100	0	+	++	+++	+++	-	+++	0	0
+++	0	+	+++	0	0	++	0	++	0	-	0	---	Reduction of land use in risk zones	0 - 100	+/-	---	---	---	---	+	---	-	0
													Provisioning ES										
0	0	0	0	0	0	0	++	0	0	0	-	0	Wood provision	0 - 100	+	0	0	0	0	0	+	0	--
0	0	0	0	0	0	--	--	0	-	0	++	0	Game provision	0 - 100	++	0	0	0	0	0	0	0	+++
0	0	0	0	0	0	--	0	0	++	0	0	0	Grass for feeding	0 - 100	0	0	0	0	0	0	+	++	+
0	0	0	0	0	0	++	++	++	+	0	0	+	Water provision	0 - 100	++	+	+	0	0	+	++	+	0
													Supporting ES										
0	0	0	0	0	0	0	+	+++	0	0	+	0	Biodiversity	0 - 100	+	+	0	0	0	++	+	0	+/-
0	0	0	0	0	0	0	0	+++	0	0	+	0	Habitats	0 - 100	0	0	0	0	0	+	+	0	+
													Cultural ES										
0	0	0	0	0	0	0	+	++	+	0	0	++	Aesthetics of cultural landscapes	0 - 100	+	+++	++	0	0	++	++	+	+
0	0	0	0	0	+++	0	0	-	+	++	0	+++	Tourism	0 - 100	-	+++	+++	0	0	+	+/-	+/-	0
0	0	0	0	0	0	0	0	-	0	0	-	+++	Outdoor recreation	0 - 100	-	+++	+++	0	0	+	++	+/-	-

Table 12: Evaluation of different interests in ES in the PAR Val Ferret (Italy)

Regulator													Interest in	Alternat ive risk strate- gies (%)	User									
Contain- ment/ blue lights	Risk Transfer		Me- dia	Con- struc- tion- com- panies	State agencies						Mu- nici- palities	Fo- rest- own- er			Con- sumer in endan- gered zones	Produce r in en- dangere d zones	Con- sumer – traffic Infra- structure	Provide r traffic Infra- structure	Envi- ron- mental actors	Ci- tizen	Alpine grazing / agricul- ture	Hunter		
	Pri- vate	Pub- lic			Fi- nanc- ing	Pro- tec- tion of risks	Fo- rests	Envi- ron- ment	Agri- cul- ture	Traffic, infrastruc- ture, spatial planning, regional development													Hun- ting	
													Regulati ng ES											
0	0	+	++	0	++	++	+++	++	+	++	0	+	Green preven- tion	0 - 100	++	0	++	++	++	++	+	+/-	+	
+/-	0	+	++	++	++	++	+	++	++	++	0	++	Technical preven- tion	0 - 100	++	-	+++	++	++	++	++	++	+/-	0
++	0	+	++	0	0	++	++	++	-	+	+	++	Reduc- tion of land use in risk zones	0 - 100	-	-	-	0	0	++	+/-	-	--	
													Provi- sioning ES											
0	0	0	0	0	++	+/-	++	+	0	++	-	0	Wood provision	0 - 100	+++	--	--	-	-	-	+	0	+/-	
0	0	0	0	0	+	0	+/-	+	--	0	+++	0	Game provision	0 - 100	-	-	0	0	-	+/-	+/-	--	+++	
0	0	0	0	0	0	0	+	0	+++	++	++	0	Grass for feeding	0 - 100	0	0	++	0	0	+/-	+	+++	++	
0	0	+	0	++	++	++	++	++	++	++	0	+	Water provision	0 - 100	++	+	++	0	0	++	++	+	+	
													Suppor- ting ES											
0	0	0	0	0	+	++	++	+++	+	++	++	0	Biodi- versity	0 - 100	+/-	++	+/-	0	0	++	+	+/-	++	
0	0	0	0	-	+	++	++	+++	--	++	++	0	Habitats	0 - 100	--	+	+/-	0	-	+++	+	+/-	++	
													Cultural ES											
0	0	0	0	0	0	0	0	+	++	++	0	++	Aesthetics of cultural land- scapes	0 - 100	0	+++	++	+	++	++	++	+	++	
-	0	0	0	+/-	+	-	-	--	+/-	++	-	+++	Tourism	0 - 100	-	++	+++	-	-	--	+/-	---	--	
-	0	0	0	+/-	0	-	-	+/-	-	++	-	++	Outdoor recrea- tion	0 - 100	---	++	+++	-	-	--	++	---	---	

Table 13: Evaluation of different interests in ES in the PAR Kranjska Gora (Italy)

4. Conclusion

The report on 'Comparative decision structure analysis in the PAR' broadens the actor and the social network analysis concept of D.T2.1.2 to a methodological approach for a successful knowledge transfer processes from science to practice by the identification and the evaluation of actors interest. The identified actors and interest constellations differ considerably from more or less dichotomy, like in Parc des Baronnies (France) or in Val Ferret (Italy), to multidimensional issues like in the Brenner region, in the PAR Oberammergau (Germany) or in the PAR Southern Wipptal (Italy). Here, the main interests of hunters, farmers, forest owner, tourists or provider of traffic infrastructure as users oppose to regulators' main interests by several rivalling issues. In contrast, in Val Ferret, the protection of citizens and tourists due to regulators on the one hand and the realization of income by tourism in endangered zones by users on the other hand, present the main interests of the involved actors. In this case the challenging task is to create tailored strategies for successful knowledge transfer in regard to different social roles, for instance, the municipality of Courmayeur. That means scientific results have to be carefully selected and if necessary, adapted to the needs of the actors' role in a bi-directional process. This process requires time and resources for the activities of integration (expert rounds, face-to-face meetings, workshops, ...etc.) as well as research until a tailored research product is released (Böcher and Krott, 2010, pp. 43-50).

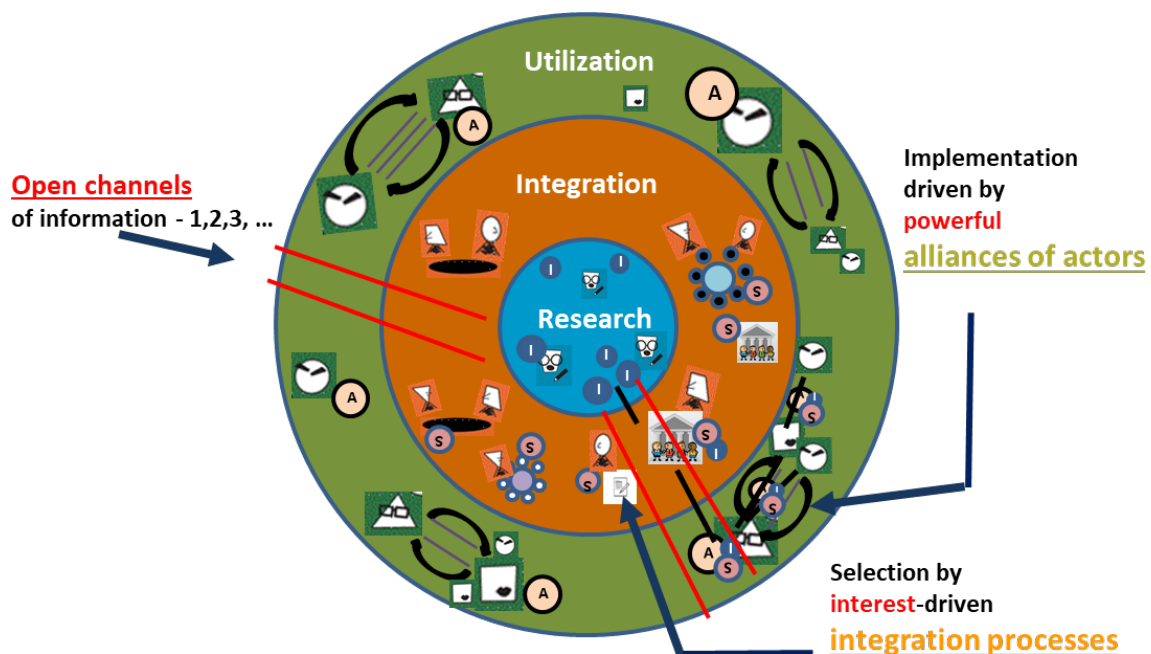


Figure 6: RIU model in 3 circles

According to the RIU model, actors' interests and power resources determine the actors' selection of scientific results to act in practice. Each actor is striving to accomplish his goals and interests by developing his own political strategy. For actors, research findings are bricks which could be included or consciously not included into the strategies of actors. The final assessment of the usefulness of these bricks is only made by practitioners, namely the actors of the different categories of users and regulators and their individual preferences. The latter are taken up by the RIU model and anticipated in the integration process by developing tailored knowledge transfer strategies and its bidirectional orientation. This means, 'the demand of the practice for science-based solutions is investigated and used for the selection of research questions' and 'scientific research results are selected according to

their relevance to the practical solution' (Böcher and Krott, 2016, pp. 33-34). Hereby actors' interests in practice are connected to scientific knowledge and field research by the integration process.

Based on the results of this first step of the RIU process, the D.T2.5.2 focuses on the capability of actors to enforce scientific results into practice by using their own power sources. The outcomes of both analysis enables RIU practitioners to establish a tailored strategy for successful knowledge transfer by (i) opening information channels; (ii) selecting integration procedures; (iii) finding alliances of actors.

5. References

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