

## **How are climate change adaptation strategies put into practice? A case study comparison of natural hazard prevention.**

Karin Ingold, Institute of Environmental Decisions, ETH Zurich, Switzerland<sup>1</sup>

Climate change affects increasingly the management of natural resources and has diverse impacts of environmental, social and economic nature. To take this complexity into account, climate change adaptation policies consider the principle of sustainable development. Sustainability is an integrative concept which should insure a long-term and multi-sectoral response to climate change. But the question appears if sustainable development is only retained at the conceptual level or effectively implemented in practice.

This paper pursues this question by comparing three projects addressing natural hazard in Swiss mountains. The aim is to investigate how sustainable development is perceived by involved stakeholders and implemented in practice. Two dimensions are thus taken into account: the type of actors participating in these projects and their preferences and interests. The first dimension thus analyzes if diverse actors representing the environmental, economic and social arenas are integrated; the second dimension investigates if different interests and preferences in the sense of sustainability were incorporated in the design and implementation of climate change adaptation. Data were gathered through a standardized survey among all actors involved in the three projects. Preliminary results show that sustainability receives diverse weight and interest in the different cases.

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<sup>1</sup> Contact information: Karin Ingold, Institute for Environmental Decisions, ETH Zurich, Universitätsstr. 22, CH-8092 Zurich, Switzerland; +41 44 632 41 27; kingold@ethz.ch

## **Introduction**

Mountain regions are very sensitive to climate change impacts. Extreme topographic and ecological conditions magnify the effects of temperature rise on the frequency of extreme events such as floods and droughts (IPCC 2007). Concerned regions react through the introduction of measures and policies in resource management. The design of such policies is mostly located at a lower institutional level affecting local systems and regional communities (Wilson 2006). It is furthermore characterized by the inclusion of state and non-state actors: in the sense of sustainable development, a shift towards horizontal actors' integration and cross-sectoral participation can thus be observed (Bolleyer and Börzel 2010; Jänicke and Jörgens 2006).

In this article we focus on the question how principles of sustainable development are implemented in practice through resource management and climate change adaptation policies. Based on three case studies in Swiss mountain regions, we compare how actors representing different sectors are integrated in the design of adaptation measures. We adopt a network approach investigating collaboration relations among stakeholders and analyzing to what extent state and non-state actors are interconnected. To assess the implementation of the sustainability principle we therefore categorize the concerned actors in three groups: environment, economy and civil society representatives. The aim is to investigate if all three categories are equally represented and if this representation is influenced by resource conflicts that rose during the studied processes.

The paper is structured as follows: in the next section, the core concepts of multi-level governance are introduced to analyze sustainable principles in climate change adaptation and resource management policies. In section three, the integration of actors is then defined as the dependent variable of this research. We therefore adopt a network approach. The following section contains the case study and data presentation. In the fifth section, the empirical analysis is split in two parts: first, actors' integration is assessed through a formal social network analysis; second, factors affecting differences between the studied cases in actors' integration are observed and compared. Finally, this paper concludes with a discussion about the definition and perception of sustainability principles and their implementation in practice.

## **Climate change adaptation and sustainability**

Adaptation of human societies to global changes, especially climate change, depends, among other factors, on the degree of adaptive capacity and vulnerability of the region (Smit and Wandel 2006). If this issue is very prominent in development studies, recently more and more

scholars are interested in adaptive capacity of communities in industrialized countries too (Davies 2006; Wall and Marzall 2006).

Numerous definitions of adaptation to climate change exist. More generally, Brooks (2003, 8) defines adaptation as “adjustments in a system’s behavior and characteristics that enhance its ability to cope with external stress”. More directly linked to the climate change context, Pielke (1998, 159) describes adaptation as “adjustments in individual groups and institutional behavior in order to reduce society’s vulnerability to climate”. Several new strategies of resource management have the scope to adapt to climate changes focusing on the integration of actors groups and the rearrangement of institutional settings (Newig et al. 2010). These strategies are often of a cross-sectoral nature and thus incorporate principles of sustainable development trying to combine economic and environmental concerns with those from the civil society.

The principle of sustainability was linked to climate change and natural resource issues since its early definitions. An important milestone for this is placed on the international scene in 1987. The UN World Commission on Environment and Development chaired by Gro Harlem Brundtland published the report "Our Common Future" (Brundtland 1987). This report, known worldwide as the "Brundtland Report", postulates that environmental protection and economic growth can be only understood as an inseparable unit. Two major concepts of sustainability are found in adaptation and resource strategies: first, the integrative approach linking environmental and economic issues with concerns of the civil society. And second, the long-term and inter-generational perspective.

Impacts of climate change affect mostly local communities. On local levels, the attention is shifted from the vertical (levels of decision) to the horizontal axis where state and non-state actors representing different sectors are integrated in policy-making (Bolleyer and Börzel 2010). In that case, sustainable development means more than environmental protection. To satisfy material and immaterial needs, climate change adaptation should reflect the interaction between the three dimensions environment, economy and society.

Besides the interaction of the three above mentioned dimensions, the long-term perspective is a second key concept of sustainability crucial in adaptation policies. Climate change impacts on natural resources are of incremental nature, causing fundamental long-lasting changes and thus asking for action ranging from short- and middle-term to inter-generational. Adaptation policies can thus take different forms: based on their timing, they can be anticipatory or reactive, and depending on their degree of spontaneity they can be autonomous or planned (Fankhauser et al. 1999). Especially when coping with natural

hazards, the incorporation of sustainability consists a challenge. In natural hazard prevention, the term *prevention* may be somehow miss-leading, as most natural hazard policies are the reactions of major events such as floods and droughts, but should prevent the concerned region from a repetition of such events. Thus, short term action is needed what might be in contradiction with the two above introduced concepts of sustainability: first, the integration of a multitude of actors representing different sectors makes a participatory planning that asks for time and resources necessary. And second, the adoption of a long-term perspective should be coordinated with short-term or ad hoc action.

Despite this challenge, most current adaptation strategies in resource management follow the principle of sustainable development. It can be qualified as a hierarchically and formally introduced principle. The aim of this paper is however to investigate how sustainability is perceived by concerned stakeholders and implemented in practice. More concretely, the question is raised if and how actors representing the three groups (environment, economy and civil society) are integrated in the design of local natural hazard policies.

### **Analyzing governance structures through a network approach**

Sustainable adaptation and resource management policies have also been analyzed through the lens of multilevel governance. Conceptual tools have been developed to study collaborative modes of governing on local levels (Bolleyer and Börzel 2010; Scharpf 2001). Governance scholars talk about horizontal actors' integration where political authority can be reallocated sideways from the state to non-state actors (Hooghe and Marks 2003), often through non-hierarchical and negotiated exchanges between different types of actors (Bolleyer and Börzel 2010; Eckberg and Joas 2004).

To investigate the integration of actors representing different levels and sectors, recent resource management and adaptation studies have applied a network approach (see for example Ingold et al. 2010; Hirschi in press; Prell et al. 2007; Crona and Bodin 2006). The aim of such approaches is to concentrate on structural patterns among actors involved in policy design and implementation. Integration of a single actor or a group of actors in a policy process can be assessed in network terms through its connectivity to others. One prominent concept to study actors' connectivity is the one of centrality developed by Freeman (1979). Degree centrality takes into account the ties an actor directly shares with the other actors in the network. It looks at the local structure an actor is embedded in (; Ansell

2003). In policy networks in general, and sustainable resource management in particular, actors with high degree centrality have better and direct access to information and have conditions to participate in decision-making.

But theoretically, an actor with high degree centrality might be linked to many others, but irrelevant or peripheral actors, what would reduce its integration in the policy process. The eigenvector centrality measure tries to control for this bias: *eigenvector centrality* is where the centrality of other nodes (based on a geodesic distance measure) an actor is tied to contributes to its own centrality. It is thus a global measure to evaluate an actors integration in the network.

One can synthesize the contribution of both centrality measures – degree and eigenvector- for this present research as follows: We consider that the more central an actor is, the better he is integrated and can thus influence decision-making and instrument design in the respective resource management policy. And from a sustainability point of view, actors representing economic, environmental or civil society concerns should thus be equally central.

Most resource management and environmental governance studies applying a formal network analysis concentrate on networks as independent variables. They ask about the impact of networks on outputs and outcomes in resource policies. More concretely, they address questions about the impact of relational patterns on collective learning (Newig et al. 2010), on the quality of management and collaboration (Hirschi, in press; Prell et al. 2007), or on policy acceptance (Hirschi and Ingold, forthcoming). Here, however, the question is a different one concentrating on network patterns in order to investigate if the principle of sustainability is put in practice: Is the formal principle of sustainability respected and all three actor categories (economy, environment and civil society) equally represented? Or are there other factors affecting actor centrality and thus stakeholder integration?

### **Cases and data**

Three resource management projects are compared here. All of them aim – in a more or less explicit way- the adaptation to climate change impacts in mountain regions.

The first two cases are situated along the river Rhone in the southern Swiss canton of Valais. The primary impact of climate change in this region will be a rise in temperature and a change in precipitation patterns (Beniston 2004). Increased melting of glacier and snow cover and heavier rain falls are expected to produce a considerable transformation of the

runoff regime. In turn, higher sediment and debris transportation will magnify the consequences of more frequent natural disasters, including floods, landslides, mud flows, and soil erosion (Frei *et al.* 2007, Beniston 2004). In 1987, 1993 and 2000 the study region's local communities experienced severe floods that caused costly damages to infrastructure and agricultural land.

The first case consists in the *Priority Measures Visp (PM Visp)*. It is a natural hazard protection project which concerns the small industrial town of Visp. This town is traversed by the Rhone and acts as an important traffic corridor linking the country's northern and southern parts. Land use in the periurban municipalities south and east of Visp (Lalden, Brigerbad and Visperterminen) is characterized by riparian and hill-side agriculture.

The aim of the PM Visp is to protect the region's local communities from a hundred-year flood event with an estimated spatial impact of more than 1'000 ha and damages of more than 2 billion Euros. The undertaking includes three technical measures: widening the riverbed to increase runoff capacity in Baltschieder and Lalden; lowering the riverbed to increase water throughput capacity in Visp; and dam fortifications in the whole area. PM measures started in 2002 and construction in 2009. The project is expected to be completed in 2013.

The second case of interest here is a project for the elaboration of a *Regional Development Concept (RDC)*. Still located in the upper part of the canton of Valais, the RDC concerns a much larger area, ranging from the historical town Brig in the north to Salgesch in the south of the upper Valais. RDC elaboration aimed at defining long-term regional development objectives to take anticipatory climate adaptation measures. Three working groups – nature, landscape and tourism; business and industry; and spatial planning, infrastructure and transport – involving more than 40 state and non-state organizations worked on key RDC for almost five years before priority measures and long term objectives could be agreed on in 2006.

The third case is a natural park project in the western part of Switzerland. The *Parc Jura Vaudois (PJV)* is located on the high plateau of the Valley de Joux that lies just at the border to France on about 1000m of altitude. It stretches over around 35km (20km in Switzerland) from south-west down to north-east. In the north and the south, the valley is delimited by two mountain ranges. Due to its remote location, this region is still very rural with some signs of early industrial production. The valley is composed of three municipalities. Agriculture and forestry have a comparably large impact on economy, but its

share in employment is decreasing. The industrial sector takes the largest share in employment with many firms specialized in watch making and fine mechanics.

Regional predictions about the impact of climate change expect summers to become lot drier and precipitations to shift into the period of autumn and spring. Farmers will need to irrigate fields on a regular base which might cause conflicts on resource usage since water is a scarce resource in the region already today. Summering areas in higher altitudes will be particularly affected by dry seasons as they are very difficult to access and infrastructures (e.g. irrigation systems) are lacking.

The PJV was already founded in 1971 and its first aim was to protect the typical scenic beauty of the region. Today, the PJV is a candidate for the “regional nature park”-label, a new federal instrument aiming the regional promotion combined with socio-economic and nature protection goals (FOEN 2009). This candidature signifies a shift in the parks objectives: besides the conservation of cultural heritage, other concerns such as soft tourism and the promotion of regional products became important. The issue of climate change adaptation is in this case just one of several concerns, however here as well a central one: The conservation of the typical wooded-pasture landscape is a major goal of the park. Besides land-use changes, wooded-pastures are also highly sensitive to temperature rise and changes in precipitation patterns. The integrated management of the PJV should thus conciliate conflicts between resource use and nature protection that may arise or be fostered through climate change impacts.

For the definition of the key actors in the three case studies, we rely on the classical combination of decisional and reputational approaches. In line with Knoke et al. (1996, 7), formal organizations, rather than individuals, stand in the foreground of today’s politics. Therefore, actors in this research are defined as organizations integrated in the policy design of the three resource projects. Following the decisional approach, actors formally implicated in the decision-making of regional resource management policies are indentified. This first list was completed by actors who were mentioned as very powerful by 2-5 interviewed experts in each region. In the end, we had a set of 39 actors for the PJV, and 38 and 35 respectively for the PM Visp and the RDC. Each actor received a standardized questionnaire via regular mail. The response rate ranged between 65% and 75% for the three cases, what is considerable for a postal survey.

All three projects have in common that the introduction of the principal of sustainability was formally defined by authorities. In the case of the PM Visp, the Federal Agency of the

Environment (BAFU) attached its financial support to the condition of implementing a participatory process integrating different state and non-state actors for the design of measures and procedures. The same is true for the attribution of park labels – here in the case of PJV, where again the BAFU asks for coordination among actors representing different decisional levels and sectors. And finally also for the RDC, the canton asked for the creation of different working groups representing economic, political, social and environmental concerns. To investigate if this formal sustainability principle was implemented in practice and following the conceptual sustainability types presented above, we categorized the actors as follows:

**Table 1: Actors per case and group**

<b>Case</b>	<b>Overall</b>	<b>Economy</b>	<b>Civil Society</b>	<b>Environment</b>
<b>PM Visp</b>	N=38	N= 18	N=13	N=7
<b>RDC</b>	N=35	N=11	N=19	N=5
<b>PJV</b>	N=39	N=10	N=17	N=12

The questionnaire was split in two parts: the first part concerned questions about the relational profile of every actor. More concretely, and to conduct a formal social network analysis (SNA), survey participants were asked to indicate collaboration relations they share with all identified actors of the studied project.

The second part of the survey consisted of a set of questions related to the content of the respective project. More concretely, the different objectives and goals were identified for every project and actors could express their position towards the respective issue. More details about this survey are outlined in the analysis.

### **Analysis**

The survey results are presented here in three different sections. First, actors' integration is operationalized by centrality measures of the three actors' groups in the collaboration network. Then, the evaluation of case specific objectives is presented. And finally, both results are put in relation with each other.

### *Comparison of centrality measures in the collaboration network*

Survey participants were asked to indicate the collaboration relations they share with all identified actors in their project.

**Table 2 Comparison of centrality measures among the three projects**

Case	Measure	Economy	Civil Society	Environment
PM Visp	Ndegree	Mean = 0.2	<b>Mean = 0.23</b>	<i>Mean = 0.15</i>
		Max = 0.5	Max = 0.65	Max = 0.27
		Min = 0	Min = 0	Min = 0
	Neigenvektor	Mean = 0.19	<b>Mean = 0.21</b>	<i>Mean = 0.14</i>
		Max = 0.41	Max = 0.52	Max = 0.22
		Min = 0	Min = 0	Min = 0
RDC	Ndegree	<b>Mean = 0.33</b>	<i>Mean = 0.32</i>	Mean = 0.33
		Max = 0.94	Max = 0.79	Max = 0.68
		Min = 0.06	Min = 0.06	Min = 0.12
	Neigenvektor	<i>Mean = 0.2</i>	<b>Mean = 0.22</b>	Mean = 0.21
		Max = 0.46	Max = 0.43	Max = 0.35
		Min = 0.05	Min = 0.06	Min = 0.1
PJV	Ndegree	Mean = 0.19	<b>Mean = 0.22</b>	<i>Mean = 0.17</i>
		Max = 0.68	Max = 0.68	Max = 0.66
		Min = 0	Min = 0.03	Min = 0
	Neigenvektor	Mean = 0.17	<b>Mean = 0.21</b>	<i>Mean = 0.16</i>
		Max = 0.47	Max = 0.52	Max = 0.46
		Min = 0	Min = 0.03	Min = 0

In table 2, the mean, maximum and minimum values of the normalized centrality measures for each actor group are displayed. We remember that degree centrality is a local measure and refers to the direct relations an actor shares with others. The higher the mean normalized degree centrality of a group, the better this group is connected within the project and thus integrated in the project design. Except for the RDC, the group representing civil society concerns, mainly composed by political municipalities, displays the highest degree centrality measure and the environment group the lowest. The RDC seems a special case, where private sector representatives are the most directly connected to others.

Eigenvector centralities draw a similar picture, even if they express another type of relation. Eigenvector centrality takes into account the centrality measures of actors an individual is tied to. The higher the score, the more an actor is linked to central others. Here again, the civil society group obtains the highest, the environmental group the lowest mean value. The RDC displays a special structure: civil society representatives are the most related

to central others whereas economic actors obtain the lowest score. This is the exact opposite to the degree centrality results displayed above. The civil society group is thus less directly linked than the other two groups, they seem however to invest in selective ties to central others.

In general, the outlined mean values are relatively close among the three groups, but maximum and minimum values give a better idea, how centralities are spread among the members of a group. And still we can conclude that actors representing the three groups are not equally embedded in the collaboration network of the three projects. The question remains, if in the case of the PM Visp and the PJV, the relatively low centrality of environmentalists is related to a minor attention to environmental concerns, or if other factors may explain this difference in group representation.

### ***Crucial issues for sustainable climate change adaptation***

In this section, the objectives of the respective projects and how they are evaluated by the involved actors are studied more in depth. The final aim is to investigate if actors' integration in the project design, above operationalized through degree and eigenvector centralities, might be the result of conflicts among actors about specific objectives the three projects should meet. For that reason, the different goals of the projects were derived from the official project documents and more deeply elaborated through expert interviews in the three case study regions. In table 3, the different goals and related survey questions are outlined. Survey participants could state if they (partially) agree or (partially) disagree with the statements presented in the questionnaires (see third column of table 3).

**Table 3 Project impact on relevant issues**

<b>Case</b>	<b>Impact of the project on</b>	<b>Survey question/statements</b>
<b>PM Visp</b>	Local agriculture	One consequence of the PM Visp are excessive losses in agricultural land.
	Protection of humans from natural hazards	The PM Visp reaches a considerable protection of human life from natural hazards.
	Protection of infrastructure from natural hazards	The PM Visp does concentrate too much on infrastructure than on human life protection.
	Promotion of local economy	The project promotes the local economy (e.g. construction firms) considerably.
	Natural resource protection	The PM Visp largely neglects natural resource and landscape protection.
<b>RDC</b>	Natural hazard protection (Project goals)	The RDC does not reach its main goal, namely a sustainable and long-term protection of the region from natural hazards through regional planning measures.
	Economy vs. Nature	The RDC does promote local economy and tourism and neglects nature protection issues.
	Agriculture	Agricultural concerns were not enough taken into account in the elaboration of the RDC.
<b>PJV</b>	Droughts (water for agriculture)	The PJV does not solve the water supply problems of the region that might increase in the future due to climate change impacts. [mainly an issue in agriculture]
	Local tourism	The PJV is nothing else than local tourism promotion.
	Wooded pasture preservation	The PJV does not insure the conservation of wooded-pastures.
	Local economy	The PJV contributes fundamentally to the promotion of the local economy.
	Scenic beauty	The PJV does not insure the conservation of the scenic beauty and the cultural heritage in the region.

For the PM Visp - besides some few outliers - all actors agreed that the project does promote local economy and meets its goal of human protection from natural hazard (Appendix 2). Almost all actors disagreed that the PM Visp does rather protect infrastructure than humans from natural hazards and that nature conservation is neglected. The only statement splitting the survey participants is the one of extensive losses of agricultural land as a consequence of the project. One of the three technical measures for natural hazard protection is the widening of the riverbed to increase runoff capacity. Two rural municipalities with long agricultural

traditions are affected by this measure, what may explain the conflicts that arise between different actors participating in the project design.

For the RDC, only few issues were evaluated as project goals are more generally formulated and soft measures implemented (Appendix 3). Conflicts among actors are thus pronounced only to a lesser extent. Actors seem to agree largely on the fact that the RDC does not meet its main goal, e.g. sustainable and long-term protection of the region from natural hazards through regional planning measures. Even if this result is very interesting, it does not seem to raise conflicts among actors why we do not go into further detail here. Actors are split when it comes to evaluate the project's impact on the local economy, on nature protection and on the local agriculture.

Finally, most actors involved in the PJV project disagree that the integrated management of the park is only about local tourism promotion and that wooded-pasture and scenic beauty is not insured (Appendix 4). This last statement is very important as the PJV region is characterized by wooded-pasture and typical agricultural infrastructures. The protection of this environmental and cultural heritage was the decisive reason for the creation of the park. Most actors agree that the PJV promotes the local economy. And as in the two other cases, major conflicts among actors arise around one single issue. Survey participants did evaluate very unequally the statement that the PJV does not solve the water scarcity problem. This issue is of major interest for the local agriculture that suffers most from water shortage. Similar to the PM Visp case, agricultural issues seem to split actors also in the park project; and similar to the RDC case, the main climate change impacts seem not to be addressed in the PJV case either.

In a next step, the three most conflictive issues in each region are selected and the evaluation of the three actors' groups separately displayed (Appendix 5). It is one way to investigate if conflict lines separate the three groups in their issue evaluation or if group membership does not play any role when it comes to value the project objectives.

### ***Relating actors' integration to the principle of sustainability***

At first sight, there seems to be a relation between the evaluation of conflictive issues and the integration into the respective project. For the PM and the PJV, environmentalists did differently evaluate the agricultural issue than the other two groups, and are considerably less integrated in the project design following their centrality measures.

In the PJV case, economists (where agriculture plays an important role) and social society representatives (mainly municipalities) seem to agree that the PJV does not solve the water

scarcity problem. However, both groups are better integrated following their centralities in the collaboration network than the environmentalists, who do not agree on the water scarcity issue. The same is true for the PM Visp where environmentalists do not agree with the statement that the project causes considerable loss of agricultural land. Again, the economy and civil society groups are more critical towards these issues.

One would however expect that actors that question one of the major objectives of the project would be poorly integrated. In the two above outlined projects however, the contrary is the case. But we did not investigate the causality or correlation between the issue evaluation and actors' integration – as one could imagine that integration may also have an influence on how stakeholders appreciate the project goals.

Related to the PJV and the PM Visp, one explanation could be that this disagreement on one specific objective influenced private sector and agriculture representatives to become more active in the network. They engaged in collaborative tie creation what would explain this co-existence of high centrality measures and disagreement on a major project goal.

The RDC case is more nuanced. The economy group agrees that agricultural concerns were not taken enough into account in the project. This group displays a relatively high degree centrality: again, high network activity might be the consequence of this disagreement with one main objective of the project. Private sector and local agriculture representative thus engaged in tie creation to spread their opinion on this crucial issue. The civil society does not agree that agricultural concerns are not enough taken into account by the RDC. This group has the highest eigenvector centrality in the network: they thus choose not to engage in a high quantity of direct but in more strategic links. In general, conflict lines are not very pronounced in the RDC why this project might be characterized by a more equilibrated representation of the three actors' groups.

## **Conclusion and outlook**

Even if the principle of sustainability is introduced in all three case studies presented here, the three actor groups are not equally represented in the studied processes. A more in depth analysis of crucial issues showed that the reason for this might lay in the evaluation of crucial objectives the respective project should meet. One can observe a tendency that actors' integration in the projects, here assessed through actors' centrality in the collaboration network, is related to conflict lines that appear on relevant topics, interestingly related to agricultural issues in all three case studies. Conflicts that split actors in the three

sustainability groups (environment, economy and civil society) are thus not directly linked to the issue of natural hazard protection. Integration seems rather depending on conflicts about traditional issues such as the role of agriculture in the concerned region.

Next research steps will consist in investigating about the causality between the implementation of the sustainability principle and actors' assessment of project objectives. Here, we mainly concentrated on how issue evaluation influences network action; however, one could as well imagine that the relational profile an actor displays may influence its project perception.

Furthermore, this study showed the added value of a formal network analysis to assess the representation of actors' groups in resource management projects. Collaboration ties an actor shares seem to give a good impression on how an actor is integrated in a specific policy design. Linking structural patterns with actors' perception of a project seems thus a fruitful approach when one wants to investigate conflict lines among stakeholders' groups in the sense of sustainability.

And finally, the aim of this research was to investigate if and how the principle of sustainability is put in practice by means of actor integration. But the final objective would consist in studying if such actor integration has an effect on a project's output and outcomes. This would allow conclusions about the question if – from a long-term perspective – the principle of sustainability is put in practice when it comes to adapt to climate change effects through natural hazard prevention.

**Actors Priority Measures Visp**

		Category
ARE	Bundesamt für Raumentwicklung	2
BAFU	Bundesamt für Umwelt	3
BFE	Budensamt für Energie	2
BLW	Bundesamt für Landwirtschaft	1
DDRK	Direktion Dritte Rhonekorrektur	2
DIR-VIS	Direktion Baukommission Visp	2
DSM	DSM Nutritional Production	1
EG-AUS	Einwohnergemeinde Ausserberg	2
EG-BAL	Einwohnergemeinde Baltschieder	2
EG-BGL	Einwohnergemeinde Brig-Glis	2
EG-LAL	Einwohnergemeinde Lalden	2
EG-RAR	Einwohnergemeinde Raron	2
EG-VIS	Einwohnergemeinde Visp	2
ENALP	EnAlpin Wallis AG	1
FMV	FMV SA	1
HZP	Hunziker Zarn und Partner AG	1
IBA	Ingenieure Bodenmann-Andenmatten und Partner	1
ITC	Ingenieurbüro Teyseeire & Candolfi AG	1
JFF	Jäggi Flussbau und Flussmorphologie	1
LON	Lonza SA	1
MIN	Minerve (Walliser Hochwasser Management)	2
NPA	Niederer + Pozzi AG	1
OLK	Oberwalliser Landwirtschaftskammer	1
PRO	ProNatura OW	3
PRON	ProNat Umweltingeneure AG	1
SGAS	Swissgas SA	1
SECO	Staatssekretariat für Wirtschaft	1
VCS	VCS OW	2
VöV	Verein öffentlicher Verkehr OW	3
VS-DLJFW	Dienststelle für Jagd, Fischerei und Widltiere	3
VS-DLR	Dienststelle für Raumplanung	2
VS-DLW	Dienststelle für Landwirtschaft	1
VS-DLVF	Dienststelle für Verkehrsfragen	1
VS-SNG	Sektion Naturgefahren	2
VS-SKFLOW	Sektion Kantonsstrassen und Flussbau OW	1
WLL	Wasserbaulabor Lausanne	1
WSV	Walliser kanotnaler Sportfischer Verband	2
WWF	WWF OW	3

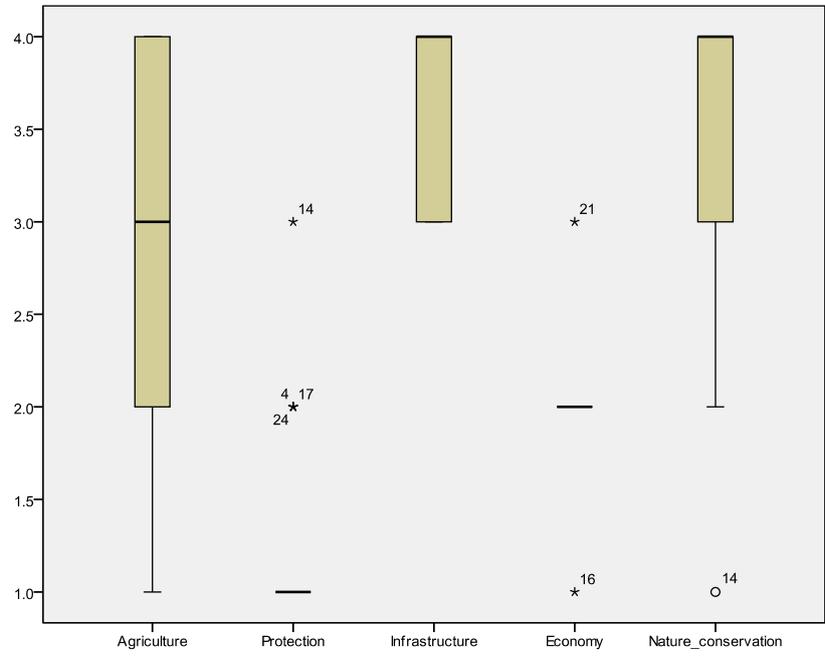
## **Actors Regional Development Concept**

## **Actors PJV – Regional nature park**

N= 22

1= completely agree; 2= partially agree; 3= partially disagree; 4= completely disagree

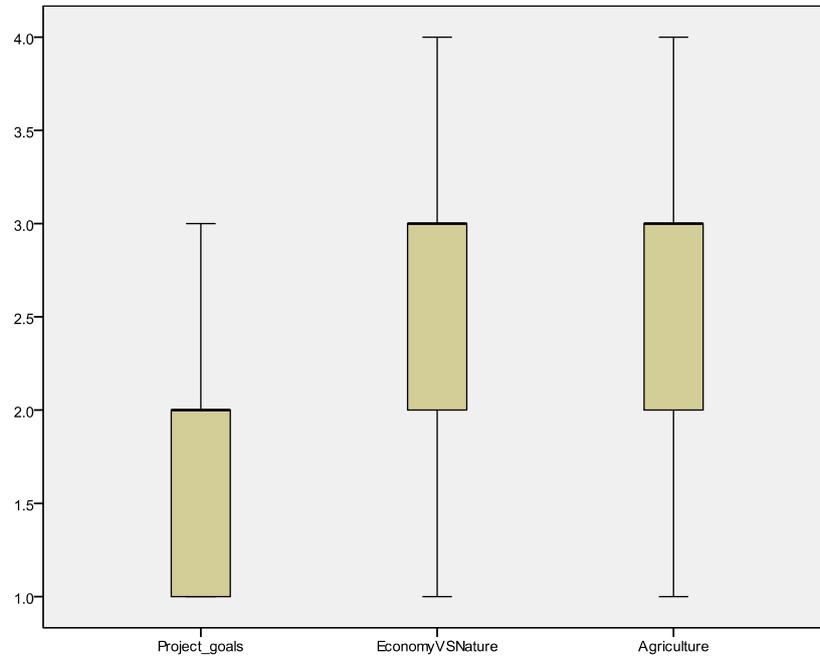
Boxplot of Visp objective evaluation



N= 19

1= completely agree; 2= partially agree; 3= partially disagree; 4= completely disagree

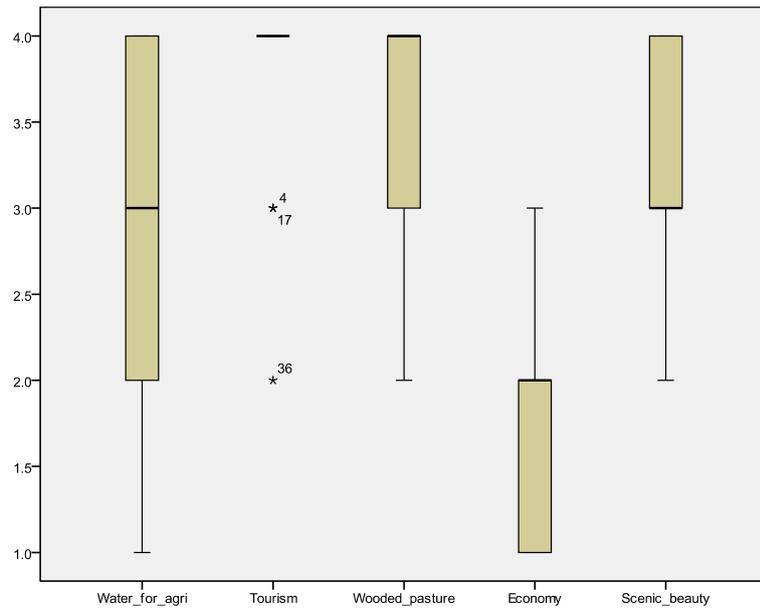
Boxplot of RDC objective evaluation



N= 15

1= completely agree; 2= partially agree; 3= partially disagree; 4= completely disagree

Boxplot of PJV objective evaluation



## Appendix 5

## Evaluation of project objectives per actor group in the three cases

PM Visp N= 22

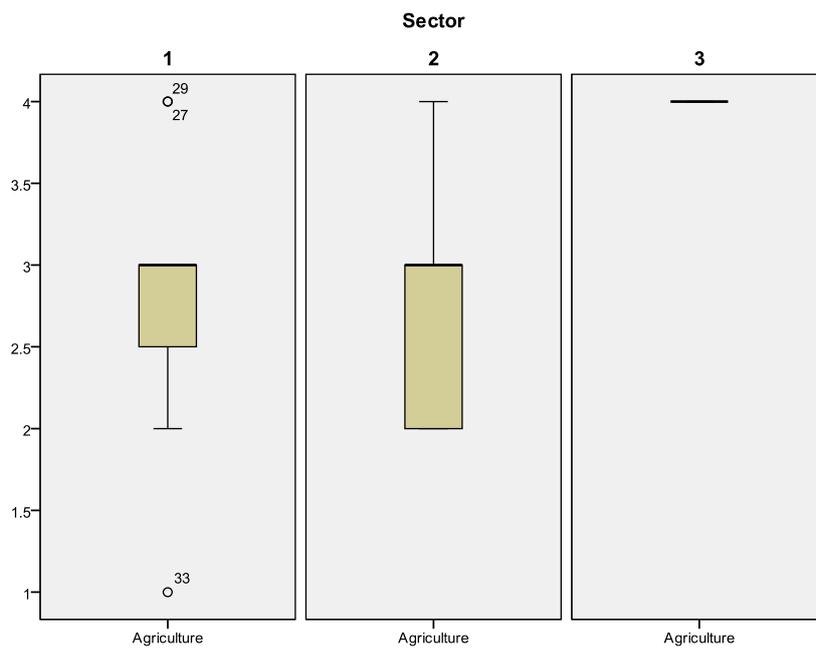
RDC N= 19

PJV N=15

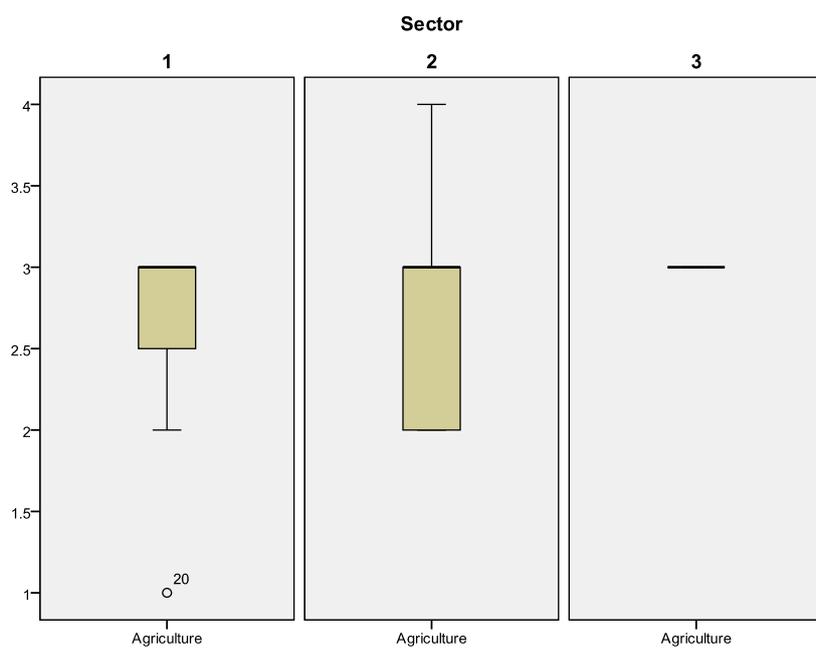
1= completely agree; 2= partially agree; 3= partially disagree; 4= completely disagree

Sector 1 = economy; sector 2 = civil society; sector 3 = environment

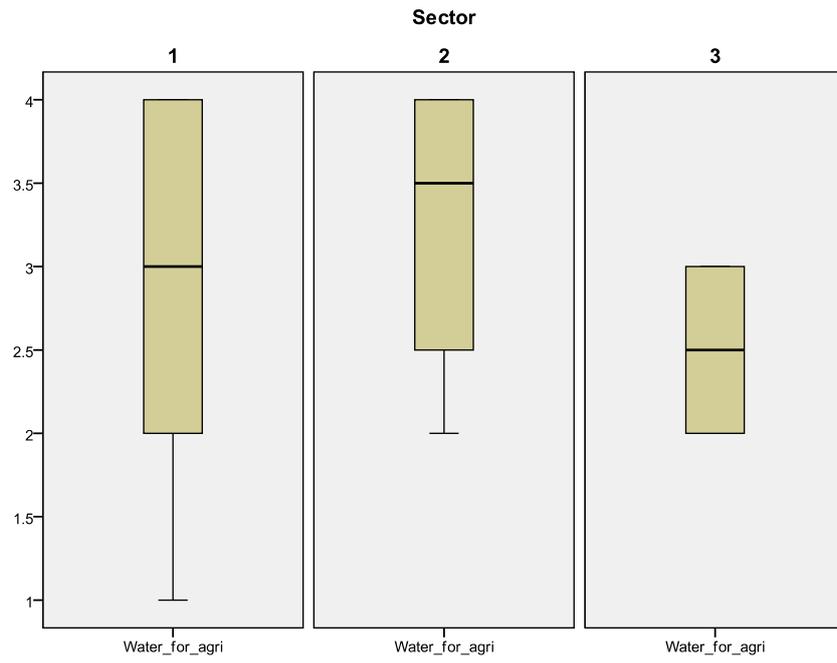
### Boxplot of Visp objective evaluation



### Boxplot of RDC objective evaluation



# Boxplot of PJV objective evaluation



## References

- Ansell, Ch., 2003. Community Embeddedness and Collaborative Governance in San Francisco Bay Area Environmental Movement. In: Diani, M., and McAdam, D. (Eds.), *Social movements and networks: relational approaches to collective action*. Oxford: Comparative Politics.
- Beniston, M., 2004. *Climatic change and its impacts – An overview focusing on Switzerland*. Dordrecht/Boston/London: Kluwer academic publishers.
- Bolleyer, N., and Börzel, T., 2010. Non-hierarchical policy coordination in multilevel systems. *European Political Science Review*, 2 (2), 157-185.
- Brooks, N., 2003. *Vulnerability, Risk and Adaptation: A Conceptual Framework*. Working Paper 38. University of East Anglia: Tyndall Centre for Climate Change Research.
- Brundtland, G.H, 1987. Our Common Future. Cambridge University Press: *Environmental Conservation*, 14.
- Davies, A.R., 2005. Local Action for Climate Change: Transnational Networks and the Irish Experience. *Local Environment* 10(1): 21-40.
- Eckerberg, K., and Joas M., 2004. Multi-level Environmental Governance: A Concept Under Stress? *Local Environment*, 9 (5), 405-12.
- Fankhauser, S., Smith, J.B, and Tol, R.S.J., 1999. *The Costs of Adapting to Climate Change*. GEF Working paper 16, Washington.
- FOEN. 2009. Pärke von nationaler Bedeutung: Produktelabel. Richtlinie zur Verleihung und Verwendung des Produktelabels. Bern: Federal Office for the Environment.
- Freeman, L.C., 1979. Centrality in Social Networks: I. Conceptual Clarification. *Social Networks* Vol. 1: 215-239.
- Frei, C., Calanca, P., Schär, Ch., et al. 2007. *Klimänderung und die Schweiz 2050 – Erwartete Auswirkungen auf Umwelt, Gesellschaft und Wirtschaft*. Bern: OeCC/Proclim.

- Hirschi, Ch., 2010. Strengthening Regional Cohesion: Collaborative Networks and Sustainable Development in Swiss Rural Areas. *Ecology and Society* (Special Feature: Social Network Analysis in Natural Resource Governance). In press.
- Hirschi, Ch., and Ingold, K., forthcoming. *Local Networks in Natural Resource Management: Does Integration Foster Policy Acceptance*. Presented at the Berlin Conference on Global Environmental Change. Berlin, 6-8 October 2010.
- Hooghe, L., and Marks, G. 2003. Unravelling the Central Stat, but How? Types of Multi-level Governance. *American Political Science Review* 97(2), 223-43.
- Ingold, K., Balsiger, J., and Hirschi, Ch., 2010. Climate Change in Mountain Regions: How Local Communities Adapt to Extreme Events. *Local Environment* 15 (7):651-61.
- IPCC, 2007. *Summary for Policymakers*, Contribution of Working Group I. Available from: [www.ipcc.ch](http://www.ipcc.ch).
- Jänicke, M., and Jörgens, H., 2006. New Approaches to Environmental Governance. In: Jänicke, M., and Jacob, Klaus (Eds.), *Environmental Governance in Global Perspective. New Approaches to Ecological Modernisation*. Berlin: Freie Universität Berlin, Department of Political and Social Sciences, 167-209.
- Knoke, D., Pappi, F.U., Broadbent, J., and Tsujinaka, Y., 1996. *Comparing Policy Networks—labour Politics in the US, Germany and Japan*. Cambridge: Cambridge University Press.
- Newig, J., Günther, D., and Pahl-Wostl, C., 2010. Neurons in the Network. Learning in Governance Networks in the Context of Environmental Management. *Ecology and Society*. In press.
- Pielke, R.A.J, 1998. Rethinking the role of adaptation in climate policy. *Global Environmental Change*, 8, 159-170.

- Prell, Ch., Hubacek, K., and Reed M., 2007. Stakeholder Analysis and Social Network Analysis in Natural Resource Management. *Society and Natural Resources* 22 (6):501-18.
- Scharpf, F.W., 2001. European governance: common concerns vs. the challenge of diversity. In: Joerges, C., Meny, Y., and Weilder, J.H.H (Eds.), *Responses to the European Commission's White Paper on Governance*. Florence: European University Institute.
- Smit, B., and Wandel, J. 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16, 282-292.
- Wall, E., and Marzall, K., 2006. Adaptive Capacity for Climate Change in Canadian Rural Communities. *Local Environment*, 11(4), 373-397.
- Wilson, E., 2006. Adapting to Climate Change at the Local Level: The Spatial Planning Response. *Local Environment*, 11(6), 609-625.