Adaptation Discourses and Modes of Governance in Swiss Alpine Regions

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Abstract

Like other European countries, Switzerland has started to develop a national climate change adaptation strategy only rather recently. In contrast, Swiss cantonal (i.e., state-level) governments—in particular those in highly vulnerable mountain regions—have been more active in formulating and implementing adaptation measures. These measures, however, differ considerably with respect to scope, range, and mode within and across regions. In this paper, we analyze this variety of regional adaptation measures within the Swiss federalist political system looking specifically at three mountainous cantons in different parts of Switzerland. Particularly, we will try to explain the timely occurrence of these adaptation activities and the governance patterns that emanate from these activities at the regional level. For this purpose, we developed a dataset including all public (in the sense of ‘public policy’) adaptation measures in the three selected cantons for the period from 2001 to 2011 based on publicly available documentations such as legal documents, governmental and administrative reports, parliamentary minutes and press releases. The study shows that similar patterns over time in the occurrence of adaptation activities in the three regions can be observed. This similarity seems to be due to a trans-regional adaptation discourse shaped by the national and international policy agenda rather than by specific regional conditions such as the occurrence of locally explicit extreme events. The discussed or applied modes of governance in these adaptation activities, on the other hand, display some significant differences between the three regions. Most adaptation activities are information or research oriented with the cantonal government and its public administration being the main body in charge of the activities. However, the relevant fields of application (policy sectors) clearly reflect the topographical and socio-economic conditions in the three cantons.

Key words: Climate change; adaptation; agenda setting; policy instruments; governance; Switzerland


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1 Introduction

The United Nations Framework Convention requires all its members to “facilitate adequate adaptation to climate change” (Article 4). Furthermore, the Bali Action Plan identified adaptation as one of the key building blocks required for a strengthened future response to climate change. Whereas adaptation to climate change in the least developed and developing countries has become a major issue of international cooperation (as reflected in the Cancun Adaptation Framework), mitigating the impacts of climate change in developed countries is mainly seen as an issue of national and subnational policies so far (Ford & Berrang-Ford, 2011; Gagnon-Lebrun & Agrawala, 2006; Peltonen, Juhola, & Schuster, 2011). Switzerland, as a non-member of the European Union (EU), followed the approach of most EU member countries (Biesbroek et al., 2010; European Commission, 2009; Keskitalo, 2010; Massey & Bergsma, 2008; Swart et al., 2009) and started to develop a national adaptation strategy rather recently (Schweizerischer Bundesrat, 2012). In addition, cantonal (state-level) and local governments have developed their own strategies and measures to prepare for changing climate conditions without a given national framework. These subnational adaptation activities have partly been adopted in well-established policy sectors with their specific competences and responsibilities. Other adaptation activities at the subnational level go beyond established sectoral structures and signify new approaches to address changing climate conditions and their implications at the local and regional scale.

In this paper, we make a first attempt to systematize and analyzed these subnational climate change adaptation measures taken in Switzerland. We thereby specifically focus on Swiss alpine regions. Mountain areas, in particular the Alps, are considered among the most vulnerable areas to climate change in Europe (EEA, 2009). Temperature increases of around 2°C over the past 120 years are more than twice the average global warming, and projections expect an average temperature increase of around 4°C in the Swiss Alps by the year 2100 (Beniston & Goyette, 2007; CH2011, 2011; OcCC/ProClim, 2007). Potential impacts of temperature increases in Switzerland due to climate change include risks such as drought and water shortage in the summer, intensified rainfalls in winter with increased risks of erosion in mountain areas and flooding events in valleys and the midlands. Up to 95 percent of alpine glacier mass could disappear by 2100, with subsequent consequences for the water regime, affecting for example summer water supply or hydropower. Also, winter tourism will be negatively affected due to raising snow lines (IPCC, 2001b, 2007; OcCC, 2008).
We will address the following research questions:

1) What climate adaptation measures have been discussed or adopted in Swiss mountain regions over the period from the year 2001 to 2011?

2) What developments put the issue of climate change adaptation on the political agenda of the relevant political bodies in those regions?

3) What are the predominant modes of governance in those adaptation measures and how do they differ from traditional approaches to mitigate negative environmental impacts on society in those regions?

In the following Section 2, we introduce first a new database that systematizes all adaptation measures discussed or adopted in three selected mountain regions in Switzerland. The regions concern three cantons (states) of the Swiss federation with significant mountain areas: the Canton of Grisons located in eastern part of the Swiss Alps with a multifaceted and versatile climate; the Canton of Valais in the South of Switzerland with a high sensitivity to drought and the Canton of Vaud stretching from the Jura mountains in the west of Switzerland to the Alps with landscapes sensitive to both land-use and temperature changes.

Then, in Section 3, we analyze specific characteristics of the underlying agenda-setting processes and address the question of prioritization for adaptation measures in the selected regions. Specifically, we will discuss the policy problem of climate change adaptation in Switzerland in terms of Downs’ (1972) issue-attention-cycle approach. In Section 4, we assess the adaptation measures regarding their modes of governance. Using the inventory of adaptation measures introduced before, we will show how adaptation measures adopted in the three regions over the years from 2001 to 2011 differ considerably with respect to scope, responsibilities and policy instruments used across the three regions.
2 Database: Adaptation measures in Swiss alpine regions (2001-2011)

Our data focus on three particular mountain areas: the Canton of Grisons located in eastern part of the Swiss Alps with a multifaceted and versatile climate; the Canton of Valais in the South of Switzerland with a high sensitivity to drought and the Canton of Vaud stretching from the Jura mountains in west of Switzerland to the Alps with landscapes sensitive to both land-use and temperature changes. The three selected areas were predetermined by the wider interdisciplinary research project MOUNTLAND (Rigling et al., 2012), in which context this study was conducted. The selected study regions are geographically very different areas with distinct ecosystems and land use patterns. Accordingly, the regions might show different sensibilities to changing climate conditions and potentially resulting socio-economic and political implications. Also from a political-institutional perspective, the variance between the three study regions is significant. Due to this heterogeneity, the selection of the mountain areas is based on a selection strategy that aims at including the broad variety of ecological, socio-economic and political factors that could be relevant for climate change adaptation measures rather than on a comparative case study design (Bennett, 2004; Yin, 2009).

Unit of analysis: adaptation measure

The IPCC (2007) defines adaptation as the “adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities.” Hence, we define cantonal political adaptation activities as every activity explicitly aiming to the adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities initiated and guided by cantonal political actors as such as cantonal governments, administrations, and legislative bodies (parliaments).

Data sources

We used official documents (minutes of the parliament, administration reports, legislative programs, laws, legal ordinances, government reports, research reports, government strategies, and press releases) as primary sources to identify adaptation measures in the selected cantons. In a first step, we identified all the relevant documents containing explicit information on climate change and/or climate change adaptation using the key words used by Dupuis and Knoepfel (2011) in a previous study on Swiss national adaptation policies (Table 1).
Table 1: Key words used in document search

<table>
<thead>
<tr>
<th>Term</th>
<th>Key words for German documents</th>
<th>Key words for French documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation</td>
<td>Adaptation</td>
<td>adaptation</td>
</tr>
<tr>
<td>Climate</td>
<td>Klima*</td>
<td>climat*</td>
</tr>
<tr>
<td>Temperature</td>
<td>Temperatur*</td>
<td>température*</td>
</tr>
<tr>
<td>greenhouse gas (GHG)</td>
<td>Treibhausgas*</td>
<td>gaz à effet de serre (GES)</td>
</tr>
<tr>
<td>Warming</td>
<td>*erwärmung</td>
<td>échauffement, réchauffement</td>
</tr>
<tr>
<td>Adaption</td>
<td>Anpassung, Adaption</td>
<td>Accommodation, ajustement, rajustement, ajustage</td>
</tr>
</tbody>
</table>

Note: * = placeholder for additional letters (e.g., ‘Klimawandel’, ‘climatique’)

In a second step, every document matching with one of the key words was analyzed whether it contained information on adaptation activities in the sense defined above. The identified adaptation activities were then coded using qualitative content analysis (Mayring, 2000). Similar policy document analyses have been carried out for National Adaptation Strategies (NAS) (Biesbroek, et al., 2010; Gagnon-Lebrun & Agrawala, 2007; Massey & Bergsma, 2008). A short description of the primary data is provided in the next section.

**Typology and Variables**

**Policy process related variables:** In addition to the canton and the year in which an adaptation activity took place, we categorized the activities along their *durability* (permanent, temporary), *policy level* (strategy, program, project, measure, instrument) and the *current status* in the policy process (problem definition, agenda-setting, formulation and decision-making, implementation).

**Relevant sectors:** To identify the relevant sectors for our categorization we first listed the sectors identified by the federal government’s interdepartmental working group on adaptation to climate change (BAFU, 2010) and a recent survey on adaptation policies in the cantons (Bättig, Rageth, & Kaufmann, 2010). We then added the sectors identified by the European Environment Agency (EEA) for alpine regions (EEA, 2009). If a sector was mentioned to be important for Switzerland as well as the alpine regions in particular we included it as a relevant adaptation sector in our analysis.2

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2 Only one activity (migration) did not fit into the intersecting set.
Table 2: Adaptation policy sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Switzerland (BAFU 2010)</th>
<th>Alpine regions (EEA 2009)</th>
<th>Selected sectors for this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Households</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Agriculture</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tourism</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Energy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Natural Hazards /Disasters</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spatial Planning</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Zones / Sea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level Rise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign /Development</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scope and policy goals: For the purpose of examining the scope of adaptation activities we follow the IPCC (2001a) classification: we categorized the activities with respect to whether they aim to bear losses, share losses, modify the threat, prevent effects, change use, change location, research, or encourage behavioral change (see also Burton, 1996; OECD, 2008).

Actors: The documents analyzed contained only little information on the actors involved in the process leading to the particular adaptation activity. However, information on the actual political body in charge as well as the final legally binding responsibility for the activity—cantonal government, administration (including administrative unit), parliament, citizens (referendum)—and the main target population (civil society, economy/industry, scientific community, international actors, federation, communities, cantonal government, cantonal parliament, cantonal courts, and a residual category) were provided in almost all cases.

Policy instruments applied: From the broad variety of available policy instruments categorizations we followed the categorization by Howlett (2005) and Howlett and Ramesh (1995). This categorization has two main advantages. Firstly, the categorization follows a
gradual continuum from of high to no state involvement and, therefore, takes better account of mixed instruments involving both the state and non-state actors (compare also, Birkland, 1997; Hood & Margetts, 2007). Secondly, its basic categories of ‘voluntary’, ‘mixed’ and ‘compulsory’ instruments can be transferred to other commonly used typologies such as those using ‘carrots’, ‘sticks’ and ‘sermons’ (Bemelmans-Videc, Rist, & Vedung, 2003).

3 Problem perception and agenda setting

In Switzerland, especially mountainous regions face high risks due to high exposure and sensitivity to climate change. Since the mid-1980s an about three times higher warming than the global mean has been observed in mountainous regions (Agrawala, 2007; Beniston, 2005). In terms of climate change related risks, forecasts for Swiss mountain areas indicate two main challenges (EEA, 2009; OcCC, 2007): Firstly, droughts and water shortages in summer due to a decrease in precipitation of 5-40 percent are expected to lead to crop failures, hydropower shortages, and changes in biodiversity. Secondly, more frequent (5-25 percent) and heavier rainfalls (instead of snow) in winter are expected to lead to more erosion, natural hazards like spatial shifts of landslides, collapses of ice, more frequent and more severe flooding events, reduced stability of formerly firm rock, and higher water cycles at formerly frozen spots.

How environmental issues enter the political agenda has been a recurring question for political science research since Downs’ (1972) famous study on the rise and fall of environmentalism in the United States in the early 1970s. Downs argued that environmental issues go through cycles of public and—subsequently—governmental attention. On the one hand, the underlying ‘issue-attention cycle’ has its origins in specific characteristics of certain domestic policy problems. Problems undergoing such cycles are normally just of the concern of a minority of society; the suffering caused by the problem it’s a consequence of widespread benefits, either to the majority of society or a powerful minority; and the problem itself is not intrinsically exciting and, thus, with little newsworthiness. On the other hand, the issue-attention cycle is based on how the mass media interacts with the public, resulting in a sequence of issue-attention phases (the ‘issue-attention cycle’), processing from the ‘pre-problem stage’ to the ‘alarmed discovery and euphoric enthusiasm’ and ‘realizing the cost of significant progress’ stages to a ‘gradual decline of intense public interest’ and finally the ‘post-problem stage’ (Downs, 1972: 39-40).
In the following, we use this model of the issue-attention cycle to describe adaptation to climate change as a policy problem and then assess the timing of adaptation activities in the three selected mountain regions using our dataset introduced in Section 2.

**Characterization of adaptation as a policy problem**

Despite severe ecological impacts such as the loss of the major part of the Alp’s glaciers and the deglaciation of the permafrost (Haeberli & Beniston, 1998) as well as their negative consequences on hydrology, water management and natural hazards, climate change related risks are usually no prominent issue on the public’s agenda (if they are on the agenda at all). Adaptation issues are therefore a typical problem that attracts only punctual attention similar to Down’s (1972) specification of the nature of problems that run through issue-attention cycles: 1) the wide majority of the population is not immediately suffering from these conditions 2) At least part of the causes of the (potential) sufferings are a consequence of otherwise legitimate social and economic activities such as energy consumption and production, mobility, tourism, etc., and therefore closely connected to significant benefits to wide segments of the population. 3) Climate change related risks have typically very low probabilities of occurrence with regionally highly bounded impacts and, therefore, depict—particularly in the case of non-occurrence—“no intrinsically exciting qualities” (Downs, 1972: 41). The stage when such undesirable conditions actually exist but have not yet captured much public attention—despite expert knowledge on the likely causes and the potential consequences of these conditions—is called the ‘pre-problem stage’ (Downs, 1972: 39).

Dramatic events such as floods, avalanche disasters or mountain slides, on the other hand, create high public attention beyond the regional scale of the event and have repeatedly drawn broad public attention to severe weather patterns and their potential connection with changing climate conditions (Brulle, Carmichael, & Craig, 2012; Ratter, Philipp, & von Storch, 2012). In Switzerland, a number of extreme events in the recent years caused substantial damages and the question whether these events have become more frequent and more destructive as a result of climate change has become a recurring issue of scientific and public debate (IPCC, 2011; OcCC, 2003a). The most recent climate scenarios for Switzerland project the nature of extreme events to change, indicating more frequent, intense and longer lasting summer warm spells and heat waves, while the number of cold winter days and nights is expected to decrease. The frequency and intensity of precipitation events is associated with higher uncertainties but substantial changes cannot be ruled out, especially for a higher risk of
floods in the lowlands due to a shift from solid (snow) to liquid (rain) precipitation (CH2011, 2011: 8).

Extreme weather such as the ‘heat summer’ of 2003 (ProClim, 2005), the very dry months of June and July in 2006 and flooding events in 2005 and 2007 (BAFU, 2008; FOEN, 2008) were the major ones of a series of weather events in the last decade that can be described as ‘alarmed discoveries’ (Downs, 1972: 39). They triggered great public attention towards possible climate impacts on weather patterns in Switzerland and resulted in a series of detailed analyses and reports on the causes and consequences of these events (for an overview, see MeteoSwiss, 2012). Obviously, the perception and assessment of these events has not been accompanied with ‘euphoric enthusiasm’ as Downs (1972) describes as another characteristic of this particular stage of the issue-attention cycle. Rather, the analysis of the events and the evaluation of current and future precautionary measures were predominantly characterized by a scientific and engineering approach, often combined with an understanding of the human limitations in dealing with the forces of nature.

According to Downs (1972: 39-40), the next stage in the issue-attention cycle would be a phase of realizing the cost of significant progress to address the unfavorable conditions and their causes. With regard to climate change related risks in mountain regions, we have to distinguish here between different forms of climate related risks that result in unfavorable conditions for societies. In addition to the abrupt risks typically associated with changing climate conditions (mainly changing risks related to extreme weather events such as described above), also gradually changing climate conditions are increasingly expected to result in significant societal challenges. For example, water shortages are very likely to intensify competition between different water users such as agriculture, households and energy production as well as between water usage interests and environmental protection concerns. Or, related to the continuing growth of forests in Swiss mountain areas (due to land-use changes and a warmer climate), tensions between forest and landscape protection on the one hand and land-user interests (e.g., of the construction, agricultural and tourism sectors) could further accentuate.

Abrupt extreme events can indeed help to allocate new resources to policy programs (for the Swiss federal forest policy, e.g., see BAFU, 2012). However, it is in the nature of such extreme events that they are relatively rare and, as already mentioned, very local in their impacts. It is therefore not surprising that public attention decreases again after some time has relapsed since a disastrous event and its aftermath. According to Downs’ model of the issue-
attention cycle, this gradual decline of public interest in a problem can also be due to the broader realization of how difficult, and how costly, a solution to the problem would be (Downs, 1972: 40). Diffuse risks with expected longer-term impacts and high uncertainties, on the other hand, are usually costly when measures are taken but show typically no immediately noticeable benefits (Peters, 2005; Tompkins & Adger, 2005; Underdal, 2010; Viscusi & Zeckhauser, 2006). Especially when behavioral changes would be required (for example in land use, energy consumption or mobility), the public begins to realize quickly that possible solutions to the problem requires major sacrifices (at least by significant segments of society), resulting a shift of attention and problem perception and, thus, complicating and procrastinating societal action on the problem.

The final ‘post-problem stage’ is then typically characterized by the fact that the issue has meanwhile been replaced at the center of public concern, moving into a state of ‘prolonged limbo’ (Downs, 1972: 40). However, the issue can take different shape at this stage of the issue-attention cycle than in the “pre-problem stage”. If the ‘window of opportunity’ (Kingdon, 1997: 166-171) when public attention was high got used to establish new institutions, programs and policies, capacities to address the issue in the future could be increased.

**Issue attention and regional adaptation measures**

Already in November 1989, the Swiss Federal Council (the Swiss federal government) appointed an interdepartmental working group on the evolution of the climate system. The goal of this working group was to coordinate the climate change related activities of the federal administration and to develop mitigation and adaptation strategies with respect to climate change (BUWAL, 1994a). Although the main focus of this working group was on mitigation, adaptation issues were addressed too. A background report from the Federal Office for the Environment (BUWAL) addressed possible impacts of a warmer climate on forestry, agriculture, water, and natural hazards (BUWAL, 1994b). In the case of forestry, the report projected a change in the composition of tree species with uncertainties for future infestations by pests and the maintenance of protective forests. Changes for agricultural production were assumed, but uncertainties were yet seen as too high to describe specific impacts. Furthermore, the report linked a rise of the snow line, less precipitation in form of snow, reduced permafrost, and more pronounced glacier meltdowns to a projected reduction of energy production of river power stations as well as increased landslides, rock falls, floods, and mudflows.
The final BUWAL report from 1994 (BUWAL, 1994a) discusses indirect and direct impacts of global climate change on Switzerland. Indirect impacts for Switzerland are expected with regard to health issues (e.g., diffusion of pathogenic organisms) and climate change induced migration. Direct impacts are mainly expected in the mountain areas of the country due to higher climate sensitivities and higher economic and social vulnerabilities of those regions. With respect to the relevant policy sectors, the final report follows the background report but adds winter tourism as an example for the socio-economic impacts of climate change. However, both reports concentrate on mitigation activities and do not outline further adaptation activities.

In 1996, the Federal Council established the Organe consultatif sur les changements climatiques (Advisory Body on Climate Change, OcCC). The body has a scientific, coordinative, and consultative mandate by the Federal Departments of Home Affairs (FDHA) and of the Environment, Transport, Energy and Communication (DETEC) and is composed of representatives from research, the federal public administration and the private sector. Since 1998 OcCC has published several reports on climate change in Switzerland. Besides summaries of the IPCC reports (OcCC, 2002, 2008) several reports were published focusing particularly on adaptation. Specific reports addressed heavy precipitation (OcCC, 1998), heavy droughts (OcCC, 2000), extreme events (OcCC, 2003b), heat waves (OcCC, 2005), and impacts on socio-economic sectors more generally (OcCC, 2007).

Besides the activities of the OcCC, the federal government did not initiate or implement any further measures until August 2009 when the federal council mandated the Federal Department for Environment, Transport, Energy and Communications together with the Federal Department of Home Affairs, the Federal Department of Finance, the Federal Department of Economic Affairs, and the Federal Department of Defense, Civil Protection and Sport to assess climate related risks for Switzerland and to develop an adaptation strategy (BAFU, 2010). On March 2nd, 2012 the first part of the adaptation strategy was published. It deals with the goals, challenges, and fields of activity for climate change adaptation. Part two of the strategy is announced for late 2013 which should address specific measures and a detailed action plan (Schweizerischer Bundesrat, 2012).

However, although no overall federal strategy existed until very recently, several federal agencies addressed the issue of climate change adaptation recently in their ongoing activities. For instance the new forest program incorporated adaptation (BAFU, 2011) and a research project on adaptation for hydropower was launched in 2008 (Schweizerische
Furthermore, local and regional governments and administrations developed strategies, initiated or planned activities in order to address future climate change despite the absence of a national adaptation policy (Bättig, et al., 2010). However, the strategies and measures taken by subnational bodies differ substantially with respect to their adaptation activities. Only seven out of twenty-six cantons have developed an adaptation strategy so far. Furthermore, a recent questionnaire-based survey suggests that the Swiss cantons differ substantially with respect to measures and instruments addressing climate change (Bättig, et al., 2010). But no systematic overview of actual adaptation measures being discussed or adopted at the Swiss subnational level is available yet.

**Figure 1: Adaptation measures and national media attention**

![Figure 1](image)

Figure 1 illustrates the adaptation activities taken in the three selected regions as displayed in our data set. Over the years from 2001 to 2011, the three selected cantons have adopted adaptation measures with varying intensity over time. However, a similar pattern in all the three cantons can be observed: after only a few adaptation activities in the first half of the decade, the number of adopted adaptation measures sharply increased after 2007. This pattern could indicate that the adoption of adaptation measures in these regions is not necessarily connected to the occurrence of extreme events in the regions themselves but are at least partly linked to the national and international climate policy agenda. Figure 1 therefore also illustrates the timing of the climate policy reports that received the broadest public and political attention in Switzerland (IPCC AR3, OcCC 2003, IPCC AR4, CH2050 and CH2011). The national climate policy agenda is further displayed by the number of news
reports on the climate change topic in three major national newspapers. It is striking that the media attention time series shows almost exactly the same pattern as the number of adaptation measures adopted in the three cantons per year.

In the following section, we will examine further what characteristics the regional adaptation activities had, using some of the typologies introduced in Section 2.

4 Predominant modes of governance in the three regions

The concept of ‘governance’ has been applied in many different contexts with as many different meanings. In political science, the concept has been referred mainly in contrast to ‘hierarchical government’ emphasizing the consideration and inclusion of civil-society actors in policy-making and the use of market-based instruments (Evans, 2011; Kjaer, 2004). Governance approaches have been promoted extensively in order to support better acceptance of policies, overcome interest conflicts as well as implementation deficits. In this paper we understand ‘mode of governance’ as the prevailing cluster of political steering in a given policy area (Evans, 2011; Howlett, 2009; Howlett & Rayner, 2008; Lascoumes & Le Galès, 2005; Salamon, 2002). Hence, assessing, inventorying and categorizing policy instruments is a key prerequisite to understand the status quo and evolution of policies (Howlett, 2011).

Adaptation activities and instruments in the three regions

As introduced in Section 2, we classified adaptation activities in the selected regions based on the concept of Howlett (2005) and Howlett and Ramesh (1995). According this categorization of applied policy instruments, adaptation activities in the three regions concentrate heavily around information and exhortation activities (Figure 2). Information provision as a government activity is an instrument mainly intending to change behavior (based on informed choices) through the provision of additional knowledge. Concerning adaptation, most of the information activities compiled in our dataset are publications of research reports on expected climate change impacts, communications of current and planned government adaptation activities (sometimes as justifications towards the public and/or the cantonal parliament), and monitoring systems and information platforms (e.g., for natural hazard). Furthermore, so-called ‘fact sheets’ published by public authorities for the broader public and campaigning activities are included in this category. Such fact sheets concern very specific topics such as endangered animal species as well as rather campaigning activities to address climate change impacts more broadly (mainly in combination with climate change mitigation).
Figure 2: Adaptation policy instruments in the three Cantons

Economic approaches have been barely used thus far. A few cases of subsidies can be observed in the form of financial support of snow canons in the canton of Valais. Regulatory activities refer to regulations addressing the revision of hazard maps (Valais and Grisons), the ‘legalization’ of the production of artificial snow (Valais) and recent revisions of cantonal laws taking into account some selected aspects of climate change adaptation (such as the laws on forestry and on economic development, canton of Vaud). Overall, however, climate change only plays a very minor role in these legal revisions. Direct provisions are mainly connected to activities in the tourism sector in the canton of Vaud as well as to the establishment of an information system for natural hazards in Grisons. Natural hazard information and monitoring systems exist in other cantons too, but the Grisons system explicitly takes into account climate change. As mountain regions have a long tradition in managing natural hazards with relevant activities being continuously re-evaluated and integrating new expertise, it is possible that climate change adaptation is incorporated in those activities without explicit reference to climate change. The few voluntary activities are chuck provisions during dry summers organized by the cantonal farmers associations in collaboration with the cantonal administration of Grisons, a public event (named ‘Hotday’) at the University of Lausanne in collaboration with WWF, and a meeting of migrants—officially
supported by the canton—discussing climate change induced migration in the canton of Vaud (among other migration related topics).

Re-categorizing the activities into the degree of state involvement (Figure 3), *mixed approaches* (i.e., involving both the state as well as private actors) dominate the adaptation activities in the three cantons. This dominance is due to the many research projects carried out by private and public research organizations, initiated and financed by the cantonal authorities. The activities categorized as *compulsory measures* are mainly the activities classified as regulation and direct provision. Additionally, parliamentary requests and government respective responses were added to this category as they refer to institutionalized democratic processes. Once a parliamentary request has been handed over to the government, a governmental response to that request is mandatory. These specific regulations concerning parliamentary requests and motions explain to a wide extent the higher amount of compulsory activities in the canton of Vaud compared to the other two cantons.

**Figure 3: Level of state involvement**

Overall, our data shows a clear pattern of adaptation activities strongly focusing on information provision. The main goal of these activities is to assess the needs and outline policy opportunities under changing climatic conditions. This goal is mainly pursued by the initiation and continuation of research activities and environmental monitoring. In this sense, governance of adaptation in the three case study regions is primarily a state led activity. This characteristic is also demonstrated by the type of addressees of the collected adaptation
activities in the three cantons (Figure 4). Almost half of all activities address primarily the government and cantonal administration. The general public has the second largest share.

Figure 4: Addressees of adaptation activities

![Addressees of adaptation activities](image)

The dominance of the ‘state’ in these activities is also mirrored in how the authorities and responsibilities are distributed (Figure 5). In all cantons, activities are mostly guided by the cantonal administration. The higher number of parliamentary activities in the canton of Vaud derives, as mentioned before, from the higher number of parliamentary motions addressing climate change issues in this particular canton.

Figure 5: Political body in charge

![Political body in charge](image)

With respect to the final responsibility, adaptation activities are mainly in the hands of the cantonal governments (Figure 6). The administration and the parliament have an almost
equal but significantly smaller share. The wider public has not directly intervened in any of the three cantons using direct-democratic instruments such as popular initiatives and referendums, which are well-established political instruments also at the Swiss cantonal level.

**Figure 6: Final responsibility**

This pattern of final responsibilities—dominated by the cantonal governments and the respective public administrations—reflects the strong focus on informational activities for which for the very most part no approval neither from the parliament nor the people is needed. Consequently, we can conclude that most adaptation activities so far are out of the focus of a broader democratic process but rather matter of concern of the executive branch of government.

**Adaptation activities in relevant policy sectors**

Taken all three regions together, 45 percent of the coded adaptation activities address natural hazards and—due to strong links to flooding problems and hydropower issues—water-related issues. This result for the three regions is very consistent with the findings of a study by Massey and Bergesma (2008, 82) for the Swiss national level and seems quite typical for a country in the alpine region (ibid. p. 29). However, tourism—which is not reported as a separate category in Massey and Bergesma (2008)—appears as the second largest sector in our data (Figure 7). Previous research shows similar results: Winter tourism has been one of the most concerned sectors due to its strong vulnerability to weather events and climate conditions. Particularly relevant for Switzerland, reduced snow reliability has a direct economic impact (see also, Gagnon-Lebrun & Agrawala, 2007). In the cases of energy,
forestry and biodiversity, all cantons have carried out only few activities in the years from 2001 to 2011. This finding is in line with a questionnaire-based survey from the year 2008 (Bättig, et al., 2010), indicating rather low reported activities in those sectors with little political priority.

**Figure 7: Policy sectors (overall)**

The high relevance of the natural hazards, water and tourism sectors is also reflected in the regionally specific data (Figures 8-10). Yet some interesting regional differences become visible still. In the canton of Grisons, natural hazard and water-related adaptation activities dominate. The over-proportional focus on water in this canton might be related to concerns on hydropower. Tourism, on the other hand, is below the average taking into account the results from the other cantons. This might be due to relatively high altitudes and, therefore, less concerns about snow security.
In the canton of Valais, most adaptation activities focus on natural hazards, followed by tourism and water. The higher importance of tourism might arise from the concerns of tourist centers at lower altitudes and finds its expression in the debate on artificial snowing. The canton seems to follow here the very common strategy of aiming at maintaining mainly the status quo (Gagnon-Lebrun & Agrawala, 2007). The importance of the water sector in this particular canton can be explained by the recent correction and re-naturalization of the river Rhône. Concerns about droughts have played a rather minor role in the years covered by our data, which can at least partly be explained by the region’s traditional adaptation to arid climate conditions (EEA, 2009: 71-73).
The canton of Vaud differs substantially from the other two cantons. Firstly, adaptation activities in Vaud address substantially less frequently natural hazards than it is the case in other regions due to topographical conditions. Vaud is not an inner-alpine region—only some areas in the southeast are alpine and the Jura Mountains in the north of the canton are less affected by natural hazards. Tourism, on the other hand, has the largest share of adaptation activities in 2001-2011 resulting from concerns over snow insecurities. The offshoots of the Alps as well as the Jura Mountains are much less snow-safe than the inner-alpine regions. But the economy in both regions is traditionally strongly depended on winter tourism. Refocusing tourism, especially in the foothills of the Alps, has therefore become a major concern of the cantonal government. The canton, together with communities of the relevant areas, launched a program to diversify tourism in those regions. In contrast to the Valais region, tourism adaptation activities in the Vaud region rather seem to initiate a transition process than trying to prevent the status quo.

Figure 10: Policy sectors (Vaud)

A larger share of adaptive activities in the canton Vaud is also found with regard to forestry and biodiversity. Activities in forestry are mainly due to a revision of the cantonal forest law. In general, adaptation activities in forestry might be underrepresented in our data for all three cantons as protective forests play a major role for natural hazard prevention. The higher share of activities addressing biodiversity-related issues in the case of the canton of Vaud result from the publication of ‘fact sheets’ and research reports on the future environment (‘Nature Demain’) which is linked to efforts pushing forward the cantonal implementation of Agenda 21.
5 Discussion and conclusion

Even though climate change adaptation has entered the national political agenda only very recently (BAFU, 2010; Dupuis & Knoepfel, 2011; Schweizerischer Bundesrat, 2012), Swiss mountain regions have always been well versed in adapting to changing environmental conditions and related ecological and socio-economic risks (Mauch & Pfister, 2009). But addressing those risks effectively has always been politically challenging, particularly in areas were technical solutions alone (e.g., avalanche barriers, hillside supporting walls and other infrastructural provisions) are insufficient. Especially when social and economic implications are high (e.g., due to changed use zoning plans as a consequence of revised risks maps) or behavioral changes are required (e.g., restricted water use due to changing water availability or altered energy consumption as a consequence of climate change impacts on energy production), addressing such risks remains politically very challenging.

Regarding the timing of the observed adaptation measures in the three selected regions of Grisons, Valais and Vaud, we found very similar patterns of when adaptation activities were initiated by, mainly by the respective cantonal governments. Our results indicate this similarity in regional political agenda setting is rather due to a trans-regional adaptation discourse shaped by the national and international climate policy agenda than by specific regional conditions such as the occurrence of locally explicit extreme events.

With regard to the prevailing modes of governance, our data could suggests a predominance of rather ‘soft’ (meaning, little authoritative) forms of political steering in adaptation activities in the three cantons over the years from 2001 to 2011. By far the most adaptation activities are information-based with a mixed-mode of state-involvement. However, a closer look at the data reveals that such a conclusion might be misleading. Indeed, most adaptation activities are in the field of research mandates or information provision. Beyond research mandates to public and private research organizations, only very few cooperative and participatory activities were observed that usually combine with a more networked—and, thus, less authoritative form—of political steering.

An observed lack of stakeholder involvement is also reflected in the composition of the addressees of the relevant adaptation activities, which strongly mirrors a government bias in the adaptation activities compiled in our data set, combined with a the lack of public and parliamentary involvement in decision-making. In this sense, adaptation policy in the three cantons is primarily a state-led activity, only surrounded by a network of public and private actors. Furthermore, in the dominant sectors (natural hazards and tourism), adaptation
activities have started to be integrated in the existing regulatory frameworks dominated by
governments and the administrations. However, adaptation activities in the tourism sector in
the Canton of Vaud seem increasingly to follow the ‘network governance’ paradigm. The
canton and the directly concerned municipalities have launched a program to diversify
tourism in some regions. This program relies heavily on cooperative arrangements (e.g.,
collaboration of the communities, co-financing of the communities and the canton) in order to
further develop tourism in the region.

However, as adaptation activities are still in an early stage of development, it seems
generally too early to talk of established ‘modes of governance’ in the adaptation policies of
the three cantons we analyzed. Furthermore, the new federal adaptation strategy will set an
important framework for further cantonal adaptation policies and will have a crucial impact on
the future ‘mode of governance’ in this policy area. The federal strategy will also help
cantonal authorities to develop further their own strategies and adaptation activities, which,
for the moment, seem rather uncoordinated.

Our inventory seems to unravel current difficulties in translating the abstract goals of
adaptation—‘enhancing adaptive capacity’ and ‘reducing vulnerability’—into more concrete
objectives and policy measures. The main reason for this difficulties seems to be the lack of a
causal theory or model underlying the policy to be implemented (Birkland, 2005; Stone, 1989,
2002). Based on such models, different instruments or sets of instruments and their impact on
the policy problem are then reflected. The strong and sometimes exclusive focus on research
activities and information collection and provision seems to be an expression of perplexity by
public authorities in many areas of adaptation activities. A wide range of scholarship has
particularly stressed the important role of local and regional communities in addressing long-
term oriented policy challenges such as adapting to changing climate conditions (e.g., Adger,
2003; Dietz, Ostrom, & Stern, 2003; Meadowcroft, 2004). But municipalities and regions—
particularly in economically and structurally weak mountain regions—often lack the
institutional, organization and financial capacity to establish effective attenuation or
precautionary measures for climate change related risks (Adger et al., 2007; Agrawal &
Perrin, 2009). Therefore, finding appropriate institutional and procedural arrangements to
formulate and implement long-term oriented strategies and policies is crucial and continues to
be an important research area for environmental governance scholarship (Cash et al., 2006;
Meadowcroft, 2009; Sprinz, 2009; Young, 2002).
References


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