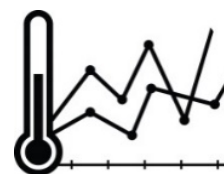




## ACTION GROUP 8, EUSALP

To improve risk management and to better manage climate change,  
including major natural risks prevention



## MAINSTREAMING CCA AND DRR IN THE ALPINE MACRO-REGION

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80 million people, 7 countries, 48 regions,  
mountains and plains addressing together  
common challenges and opportunities



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## Executive Summary

This report summarizes findings of the study on Governance of climate adaptation in the countries of the Alpine macro region on mainstreaming and scaling climate change adaptation (CCA) and disaster risk reduction (DRR). The task of strengthening the coherence of these two fields was elaborated by collecting good practice examples of different governance elements (policies, measures, actors, knowledge and interactions) on various governance levels, bringing together CCA and DRR. The examples fulfill the assessment criteria to bring added value for both fields: exploit common ground between long-term perspectives and uncertainty issues relevant to CCA, as well as the risk management cycle relevant to DRR. In addition, multi-level governance approaches and linkages between several governance elements were beneficial attributes to be selected as a good practice example. The selection of the cases was organized in a collaborative process with members of EUSALP AG 8 (To improve risk management and to better manage climate change, including major natural risks prevention). The report therefore depicts case studies relevant for the coherence of CCA in Austria, Germany, France, Italy, Liechtenstein, Slovenia and Switzerland and summarizes challenges, success factors and lessons learnt. By a transnational comparison, a guideline for the scope of each case study is provided. The collection shows that there are already several approaches to strengthen the coherence of DRR and CCA. This report supports the dissemination of lessons learnt across the EUSALP region.

## Acknowledgements

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## Index

1	Introduction .....	1
2	Global and European policy background .....	1
3	Definitions and conceptual frameworks .....	2
4	Coherence of CCA and DRR .....	4
5	Research aims and approach .....	4
5.1	Selection criteria for case studies enhancing coherence between CCA and DRR .....	5
5.2	Selection procedure of good practice cases .....	6
5.3	Transnational comparison .....	7
6	Results .....	8
6.1	Overview of case studies .....	8
6.2	Results on transnational comparison and lessons learnt .....	10
	AT - LURK AG .....	12
	AT - KLAR! Regions .....	16
	CH - GRIMSEL .....	20
	CH - Flood corridors .....	25
	DE - KLIWA .....	29
	DE - AP2020plus .....	34
	FR - GIRN-Alpes .....	38
	FR - MRN .....	44
	IT - Isola Vicentina .....	49
	IT - LIFE FRANCA .....	53
	LI - National Adaptation Strategy .....	57
	LI - Revision of hazard and risk map .....	61
	SI - MASPREM .....	64
	SI - VIPAVA .....	68
	References .....	73



## List of figures

Figure 1: Similarities and differences between CCA and DRR, own figure, based on Mercer, 2010, IFRC, 2013, ISDR et al., 2011.....	3
Figure 2: Selection of case studies, own figure. ....	6
Figure 3: Framework for transnational comparison, own figure. ....	7
Figure 4: Overview of selected case studies, own figure. ....	9
Figure 5: Transnational comparison of cases, own figure.....	9

*Figures of chapter 6 on results are provided for each case study independently and include a list of references in each section.*

## List of tables

Table 1: Good practice cases for mainstreaming DRR & CCA.....	8
Table 2: Explanatory framework for the assignment of case studies to the matrix Good practice cases for mainstreaming DRR & CCA.....	10

## List of abbreviations

BMNT	Bundesministerium für Nachhaltigkeit und Tourismus, Austrian Federal Ministry for Sustainability and Tourism
BOKU	University of Natural Resources and Life Sciences, Vienna; Universität für Bodenkultur Wien
CCA	Climate change adaptation
COP	UN Conference of the Parties
COP21	UN Conference on climate change, 2015
ERDF	European Regional Development Fund
EUSALP	EU Strategy for the Alpine Region

Case study specific abbreviations, e.g. for institutions or regions are included in the description of the case study.

## 1 Introduction

International frameworks already recognized the need to link climate change adaptation (CCA) and disaster risk reduction (DRR), as for example the IPCC special report on “Managing the Risks of Extreme Events to Advance Climate Change Adaptation (IPCC, 2012). Nonetheless, differences between the fields of climate change adaptation (CCA) and disaster risk reduction (DRR) exist. Mainly, these stem from the historical development of these fields with its inherent communities and backgrounds, different European and national governmental institutions and knowledge platforms. As Leitner et al. (2018) note, fragmentation still persists, despite efforts to intensify collaboration and communication over the last decades between these two fields. Therefore, intentions to find coherence between the two fields of climate change adaptation and disaster risk reduction activities are still relevant in recent political agendas (EEA, 2017).

The goal to promote coherence is also acknowledged in the European macro-region EUSALP. Within the EUSALP Action Group 8 “To improve risk management and to better manage climate change, including major natural risks prevention”, the following aims are being supported: Risk governance, adaptation to climate change and mainstreaming climate adaptation and risk management.

In line with this, the study on “Governance of climate adaptation in the countries of the Alpine macro region”, explores activities that address both CCA and DRR, by collaboratively selecting and analyzing practice cases within the member states of EUSALP: Austria (AT), Switzerland (CH), Germany (DE), France (FR), Italy (IT), Liechtenstein (LI), Slovenia (SI).

## 2 Global and European policy background

From an international point of view, key events and frameworks on an international level addressing climate change started in 1989 with the first milestone of UNFCCC – United Nations Framework Convention on Climate change – and the establishment of the Intergovernmental Panel on Climate Change (IPCC) reporting on climate science issues. In the same decade, the Earth Summit in Rio 1992 (UN Conference on Environment and Development) marks an essential step towards an international agreement on tackling environmental problems.

Building on this, other key events were following, like the Adoption of the Kyoto Protocol in 1997, the world’s first treaty on reducing greenhouse gas emissions or Bali Road Map and Action Plan, in 2007, sharing a comprehensive long-term vision to mitigation and adaptation. Following the path-breaking year 2015, including the COP 21 “Paris Agreement”, combating climate change and the Agreement of the Sustainable Development Goals (SDG’s) (for further information on milestones of the UNFCCC, see [unfccc.int/timeline](http://unfccc.int/timeline)), further progress has been made in terms of international agreements regarding climate change adaptation.

Besides that, key agreements for DRR were the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities Disasters (HFA) with its current successor for the period 2015-2030, the Sendai Framework. It is a voluntary, non-binding agreement, aiming at “The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries” (Sendai Framework for Disaster Risk Reduction 2015-2030, 2015). The HFA 2 explicitly addresses the need to foster collaboration and coherence of disaster risk reduction and climate change (notably priority 28, b and c).

In addition to the above-mentioned international frameworks, the following prominent frameworks contributing to CCA and DRR were identified (ISDR, EUR-OPA, & Council of Europe, 2011):

- The EU’s White Paper ‘Adapting to Climate Change: Towards a European framework for action’; (2009)
- The EU Water Framework Directive on establishing a framework for community action in the field of water policy (DIRECTIVE 2000/60/EC)
- The EU Flood Framework Directive on the assessment and management of flood risks (DIRECTIVE 2007/60/EC) and
- EU Civil protection, prevention of disasters (Council Decision 2007/779/ EC)

As it has been recognized important to promote the exchange of knowledge on CCA and DRR, the European forum for disaster risk reduction (EFDRR) and a Working Group on CCA and DRR was established in 2010. In 2013, the European Commission adopted the EU strategy on adaptation to climate change, which promotes actions by member states to adopt comprehensive adaptation strategies ([https://ec.europa.eu/clima/sites/clima/files/docs/eu\\_strategy\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/docs/eu_strategy_en.pdf)). The strategy also supports adaptation in cities through the “Covenant of Mayors for Climate and Energy” initiative. The strategy furthermore aims at addressing better informed decision-making and developed the European climate adaptation platform (Climate-ADAPT). The platform is a web-based knowledge base which is hosted by the European Environment Agency (EEA). Furthermore, the strategy aims at harmonizing adaptation actions and included DRR as pillar for effective governance of CCA (EFDRR, European forum for disaster risk reduction, 2013).

### 3 Definitions and conceptual frameworks

When it comes to finding coherence between two fields, clarity of conceptual frameworks and definitions is needed. The following chapter provides a brief overview on conceptual frameworks and the state of the art on the coherence of CCA and DRR. A prominent definition of climate change adaptation was established by the IPCC AR5 (2014, p.5 ) defines climate change adaptation as:

*“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects”<sup>1</sup>.*

Taking up this idea, climate change adaptation can have a variety of forms. According to Glavovic and Bruce (2014, p.3°) the following forms exist:

- Anticipatory adaptation, which is proactive and is put into place before climate change impacts happened.
- Reactive adaptation follows an experiences impact.
- Private adaptation is moved by individuals, households and private entities
- Public adaptation is driven by governments, or partnerships with non-state actors
- Autonomous adaptation includes adjustments which were non-consciously or non-deliberately a response to climate change.
- Planned adaptation is an intentional and deliberate choice to anticipate climate change.

Meanwhile a common definition of disaster risk reduction (DRR), following the terminology used by UNISDR (2009, p. 10) is:

*“[...] the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events”.*

Closely related to DRR is the management of disasters, which is “(t)he systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” (UNISDR, 2009, 10). This report refers to the cycle of integrated risk management, which is characterized by three phases: Response – Recovery – Preparedness (FOCP, 2014, p. 11).

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<sup>1</sup> This definition was also used in the IPCC Special Report on “Managing the risk of extreme events and disasters to advance climate change adaptation” (IPCC, 2012).

## Similarities and differences

As the debate of bringing together CCA and DRR has already started a few decades ago, similarities and differences between the two fields, challenges and barriers have already been scrutinized (e.g. Mercer, 2010, IFRC, 2013, ISDR et al., 2011; Birkmann and Pardoe, 2014). The following commonalities and differences were identified (Figure 1):

### Similarities:

A main commonality is that both fields are cross-cutting issues and aim at strengthening resilience (Leitner et al., 2018). Furthermore, CCA and DRR commonly aim to reduce negative impacts of natural hazards and climate change on people, ecosystems and infrastructure (IFRC, 2013). **Goal and conceptual understanding:** Both fields share the common goal to reduce vulnerability and exposure, strengthen the capacities for resilience and to contribute to sustainable development. Besides that, they share common understanding of the components of risk and processes of building resilience. As risk is defined as the product of exposure and vulnerability to hazards and/or effects of climate change (IFRC, 2013). Besides that, both concepts acknowledge that other societal and environmental trends (e.g. urbanization, environmental degradation, the globalization of markets) are associated with exposure and vulnerability.

### Differences:

- **Type of hazard:** While DRR deals with all types of hazards, from climate- and weather-related events to geophysical and ecological events, climate change adaptation aims to reduce risks to climate-related hazards associated with gradual changes in the average climate conditions (e.g. sea level rise, changes in mean temperature and changes in precipitation patterns) and extreme weather events with increased frequency and severity. Commonly, CCA and DRR address concerns in managing climate-related risks (IFRC, 2013).
- **Spatial scale:** Strategies by DRR usually highlight community's ability to cope with natural hazards (Mercer, 2010; Wisner, Blaikie, Cannon, & Davis, 2004), and therefore address the local scale. Contrary to that, CCA strategies are often very broad, offering strategies from local to global scales, with climate scientists mostly designing global models assessing global trends based on universal laws (Mercer, 2010).
- **Temporal scale:** Disaster risk management measures tend to address existing risks, rather than considering long-term trends, which are usually recognized by climate change adaptation.

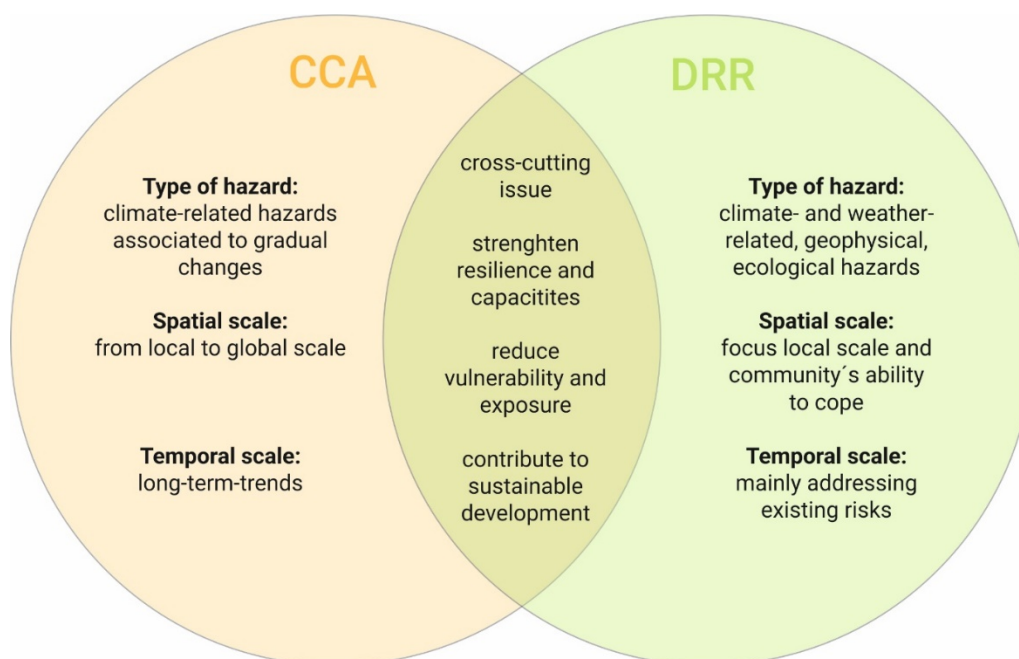


Figure 1: Similarities and differences between CCA and DRR, own figure, based on Mercer, 2010, IFRC, 2013, ISDR et al., 2011.

## 4 Coherence of CCA and DRR

As stated above, divergence exists especially in terms of spatial, temporal and functional scales. Understanding these differences is crucial to link CCA and DRR and develop applicable strategies. While issues related to climate change have primarily been studied on a global scale (e.g. global circulation models, global impact models), disaster risk reduction focused on studying local and regional phenomena (EFDRR, European forum for disaster risk reduction, 2013). Mercer (2010) points out that the combination of different scales on which the two fields primarily act, needs further improvements.

A useful approach therefore is mainstreaming. Mainstreaming means to consider and address risks related to the fields of disaster risk reduction and climate change adaptation in processes of policy-making, planning, budgeting, implementation and monitoring (IFRC, 2013). Mainstreaming reflects a concept, also used for the combination of CCA and DRR in policies, strategies and tools on various levels (European, national and sub-national), which are continually transferred into practice. According to Leitner et al. (2018), mainstreaming in this context is also related to issues of reducing social inequalities, increasing ecosystem protection and to support good governance. Some challenges of mainstreaming are for instance bureaucratic organizational processes, lack of capacity and knowledge, high staff turnover, ineffective procedures and the lack of funding for cross-cutting initiatives (IFRC, 2013). In addition, approaches to mainstream DRR and CCA often produce “soft” results over long-term periods, instead of “hard” solutions, possibly leading to mainstreaming fatigue (ibid.).

## 5 Research aims and approach

The aim of this study is to support the European macro region EUSALP, and especially AG8, in addressing the issue of climate change adaptation, by analyzing good practice examples and entry points on the coherence of CCA and DRR. This report focuses on mainstreaming and scaling CCA and DRR, and is embedded in the study “Governance of climate adaptation in the countries of the Alpine macro region”. The project is connected to other topic-related projects, platforms and boards going in line with the schedule and aims of AG8. The starting points for the task of mainstreaming and scaling are the following reports and studies:

- “Risk Governance in the Case of Overload and Residual Risk: Status Quo and Possible Improvements in the EUSALP region” (Schneiderbauer et al. 2018), based on literature review and expert questionnaires, also including questions considering climate change depicts the status quo regarding risk governance.
- “Status quo of risk governance in natural hazard management in the Alpine countries” (Schindelegger & Kanonier, 2019), with the scope of evaluating comparative risk governance profiles for countries and per hazard type in the context of spatial planning, structural preventive measures and disaster control (civil protection).
- PLANALP: Report on the State of the Alps 7 – Good practice examples of natural hazard risk governance (Schindelegger, 2019).
- The Interreg Alpine Space project GoApply – Multidimensional governance of climate change adaptation in policy making and practice (<https://www.alpine-space.eu/projects/goapply/en>) aimed among other things at mapping and comparing national adaptation governance systems. Within the project, engaging with EUSALP was accomplished by contributing findings of the countries France, Slovenia and Liechtenstein to the framework of GoApply. The main results are available at [www.alpine-space.eu/projects/goapply/en/project-results](http://www.alpine-space.eu/projects/goapply/en/project-results). Visualisation was supported by AG8 and includes the mapping results of all seven Alpine countries (available here: [www.wsl.ch/gov-vis-cca/](http://www.wsl.ch/gov-vis-cca/)), some illustrations are also included in this report.

## 5.1 Selection criteria for case studies enhancing coherence between CCA and DRR

The need to enhance coherence between CCA and DRR is outlined by EEA (EEA, 2017 p. 116) and builds the basis for the development of selection criteria for this project and the case studies. The following categories of governance items are available for selecting the cases in order to give a substantial overview of governance types:

- I. **Policies: Stand-alone climate change adaptation policies** and important **sector policies** with explicit **integration of adaptation concerns**, focusing on natural hazard management. Policies in this case are arranged in the three types 1) Legislation, laws, regulations 2) strategies, action plans, political resolutions 3) funding programs, financing schemes (e.g. pilot programs).
- II. **Measures** include all **activities, actions, initiatives, projects, procedures** and **events implementing adaptation** (planned, running, implemented). Measures are either defined as **“soft”** (e.g. information provision, knowledge generation, communication), **“grey”** (“hard”, structural, technological) or **“green”** (ecosystem-based) **adaptation measures**.
- III. **Actors** can be **individuals** and **collectives** (incl. organizations, agencies, working groups, networks) from **public administration, politics, research & science, business & industry** and **civil society**. **Actors** have relevant **roles, responsibilities** or **mandates** in adaptation processes.
- IV. **Knowledge:** Important knowledge and information resources for adaptation in the given case, e.g. climate scenarios, impact / vulnerability / risk analysis, tools, work aids, decision support systems, climate services, information portals, etc. Knowledge is provided by basic and applied **research**, by **monitoring and evaluation**, or by tapping **local experiences and expertise**; **produced** and **used** by actors.

Furthermore, it is highly appreciated that interactions are implemented. **Interactions** refer to **processes** and **practices** of adaptation and can be defined as **interrelations** between i) policies, ii) measures, iii) actors, iv) knowledge. The following types of interactions are included: **Information** (e.g. for the development of an adaptation policy, for priority setting among adaptation options, for implementing concrete adaptation measures), **deciding, decision-making** (incl. political adoption of an adaptation act or a strategy, formal and informal decisions regarding adaptation), **implementation** (e.g. of adaptation strategies, action plans and measures), **reporting, monitoring, and evaluation** (tracking and assessing adaptation progress), **funding and financing** (e.g. of adaptation measures, awareness raising campaigns, research and knowledge generation).

**For selecting the case studies, the following criteria were obligatory:**

- enhanced coherence and cooperation were stimulated deliberately and was not obtained by coincidence
- added value for both CCA and DRR in the activities undertaken;
- cases find and exploit common ground between: long-term perspective and uncertainty - points of CCA, risk management cycle- focus point of DRR
- Non-mandatory but beneficial: Multi-level governance (examples cut across / align two or more levels) and Linkages between several governance elements (policies, measures, actors, knowledge, interactions)

## 5.2 Selection procedure of good practice cases

By carefully selecting the criteria, the selection procedure started with a broad collection of examples, searching for case studies combining topics of climate change adaptation CCA and disaster risk reduction DRR (Figure 2). The first step of the compilation was supported by a student's project, held at the University of Natural Resources and Life Sciences<sup>2</sup>. The collection was then complemented by systematically searching for good practice examples in topic-related databases (e.g. PreventionWeb), strategies (national adaptation strategies and action plans) and reports (e.g. EEA reports). The cases were supposed to fulfil the following criteria:

Criteria for good practice between CCA and DRR

- **Strategies and policies:** Proposed adaptation, risk mitigation and transfer strategies, policies, instruments help in both coping with extreme events and considering possible long-term strategies.
- **Measures:** Already implemented measures with respect to both CCA and DRR objectives.
- **Actors:** Organisations are integrated and coordinated, and have a mandate for this. Roles and responsibilities are clearly defined. Gaps have been identified and addressed.
- **Knowledge:** includes Data and knowledge use: Knowledge and data such as hazard and risk data are available and used in combination with climate projections and scenarios in a similar fashion across both communities.
- **Methods and tools:** Methods and tools for risk assessment, planning and evaluation/monitoring include consideration of uncertainty of climate change.

The cases were assessed according to the criteria and a set of pre-selected good practice cases (two case studies per country) was presented to the members of AG8. The final decision on good practice examples (see Table 1) was done in accordance with AG8 members.

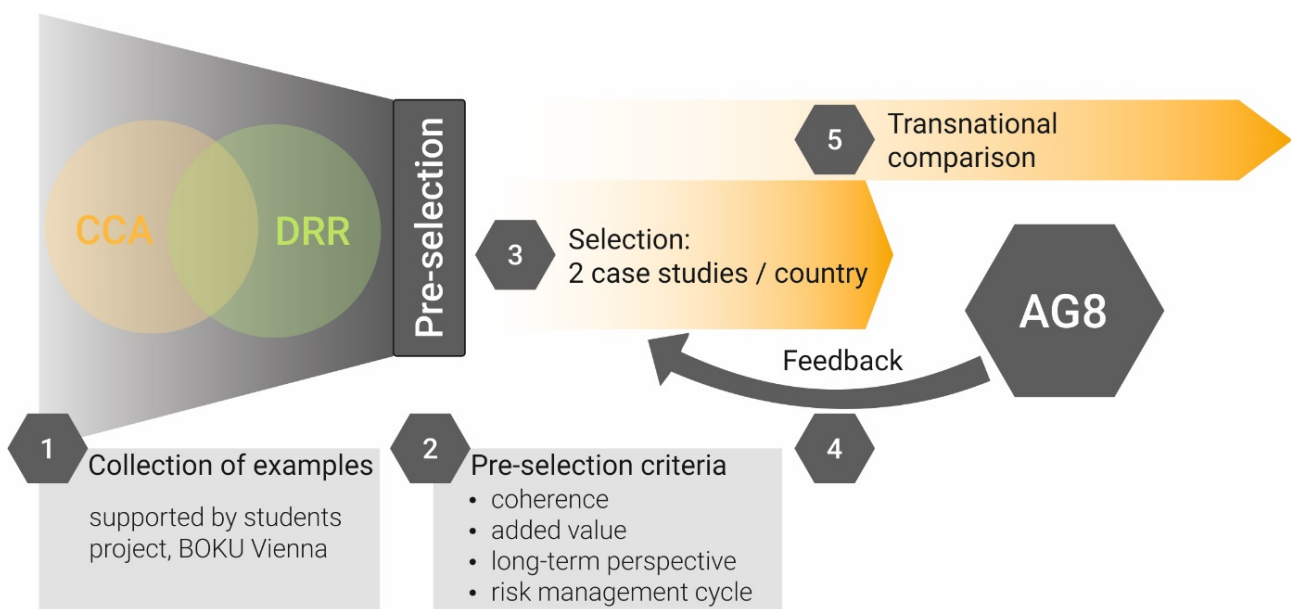
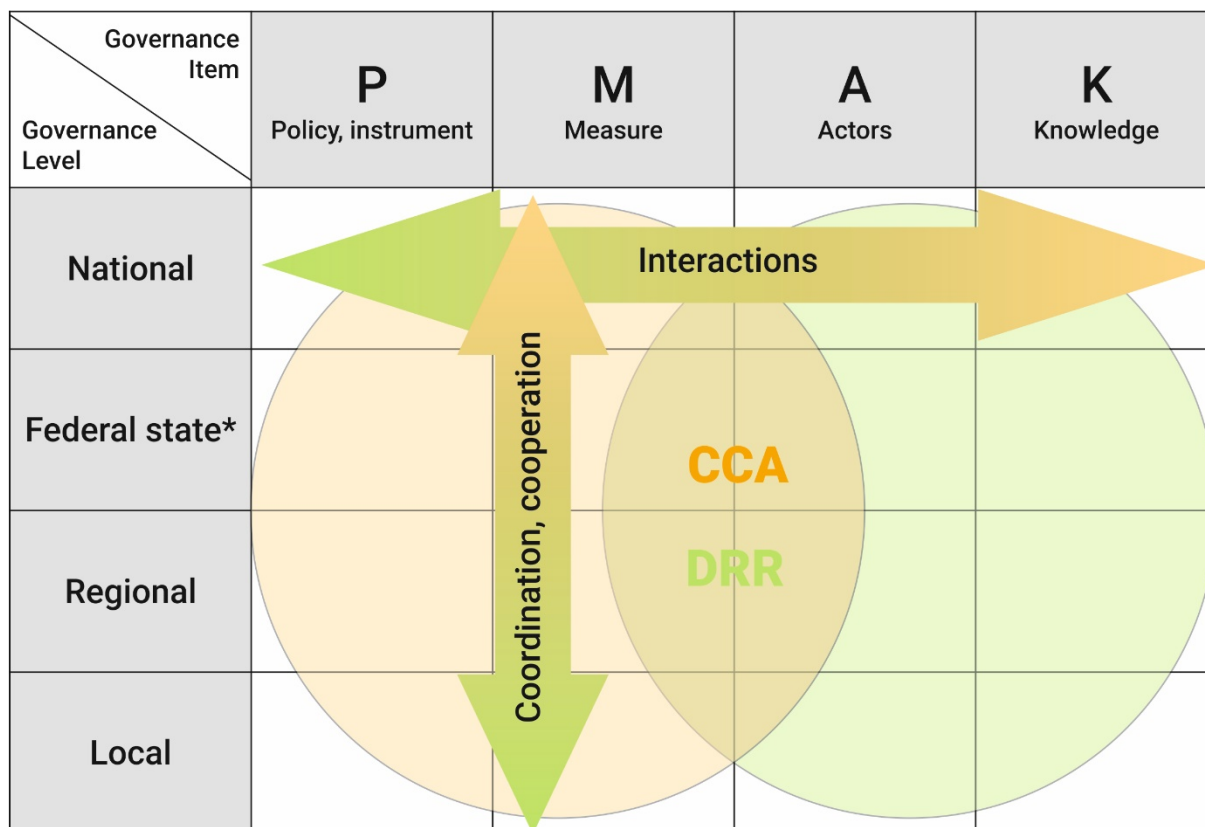


Figure 2: Selection of case studies, own figure.

<sup>2</sup> Title of lecture: Global Aspects in Landscape Planning, Summer Term, 2018.

### 5.3 Transnational comparison

Based on good practice examples from the EUSALP countries, a transnational comparison was elaborated together with AG8 members. The comparison was arranged according to the framework depicted in Figure 3. The matrix allows for a classification of the cases into certain governance levels (national, federal state, regional and local) and governance items (policies, measures, actors and knowledge). As described in chapter 5.1. coordination and cooperation as well as interactions between the various fields were not mandatory, but beneficial. Therefore, the selected case studies most frequently could not be assigned to a single field, but are addressing a variety of governance levels and/ or types.



\* Land, canton, province etc.

Figure 3: Framework for transnational comparison, own figure.

## 6 Results

The results show the collection of case studies, describing and analyzing them according to the selection criteria, and the transnational comparison. Chapter 6 provides the list of cases and shows the geographic distribution over the Alpine region (Figure 4). The cases vary in detail due to differences in project size, the current status of the projects and programs and in scale. While some programs are operating on the national scale, some are focusing on a few municipalities or a valley. Due to these fundamental differences, a comparison at such was not applied. Instead, a transnational comparison following the framework depicted in Figure 3 was chosen. The description of good practice cases on the coherence between CCA and DRR also received feedback from AG8 members and project coordinators. Within the description, a statement for the suitability / eligibility of the case according to the good practice criteria (chapter), and a description of challenges, success factors and lessons learnt is given.

### 6.1 Overview of case studies

Table 1: Good practice cases for mainstreaming DRR & CCA

Country	Short title	Title (english)	Title (original language)	Funding
AT	LURK AG	Working group on "Self-Responsible Risk Precaution" and Natural Hazards Climate Check tool	LandesumweltreferentInnenkonferenz (LURK) Arbeitsgruppe Eigenvorsorge und Naturgefahren-Klima-Check tool	National
AT	KLAR! Regions	Climate Change Adaptation Model Regions for Austria	KLAR! Regionen – Klimawandel-Anpassungs-Modell-Regionen Österreich	National
CH	GRIMSEL	CCA Pilot program: Climate adaptation strategy Grimsel area	Pilotprojekt für eine klimaangepasste Schweiz: Klimaadaptionsstrategie Grimselgebiet	National
CH	Flood corridors	CCA Pilot program: Guideline for solutions to secure areas for flood corridors	Pilotprojekt für eine klimaangepasste Schweiz: Lösungsansätze zur Sicherung von Flächen für Hochwasserkorridore	National
DE	KLIWA	Climate change and consequences for water management	Klimaveränderung und Wasserwirtschaft	National
DE	AP2020+	Bavarian flood protection action program 2020plus & climate change factor	Hochwasserschutz Aktionsprogramm 2020plus – Bayerns Schutzstrategie Ausweiten – Intensivieren - Beschleunigen	National
FR	GIRN-Alps	Interregional cooperation program: Integrated risk management in the French Alps	Opération CIMA-POIA "Territoires Alpains de gestion intégrée des risques naturels dans les Alpes"	EU co-financed
FR	MRN	Association by the French insurance market to address natural risk knowledge and prevention	Mission risques naturels	National
IT	Isola Vicentina	Mainstreaming CCA in municipal water management for flood protection	Piano Comunale delle Acque di Isola Vicentina	EU
IT	LIFE FRANCA	LIFE FRANCA – Flood risk anticipation and communication in the Alps	LIFE FRANCA – anticipiamo le alluvioni	EU, Life
LI	NAS	National Adaptation Strategy Liechtenstein (2018)	Anpassungsstrategie an den Klimawandel in Liechtenstein	National
LI	Revision of hazard maps	Country-wide revision of hazard and risk maps	Laufende Überprüfung und periodische Aktualisierung der Gefahrenkarten	National
SI	MASPREM	Landslide prediction system for rainfall-induced landslides in SLO	Sistem opozarjanja na nevarnost proženja zemeljskih plazov v Sloveniji (Masprem)	National
SI	Vipava	Part of BeWater project – River basin adaptation plans (RBAPs)	Part of BeWater project – River basin adaptation plans (RBAPs)	EU

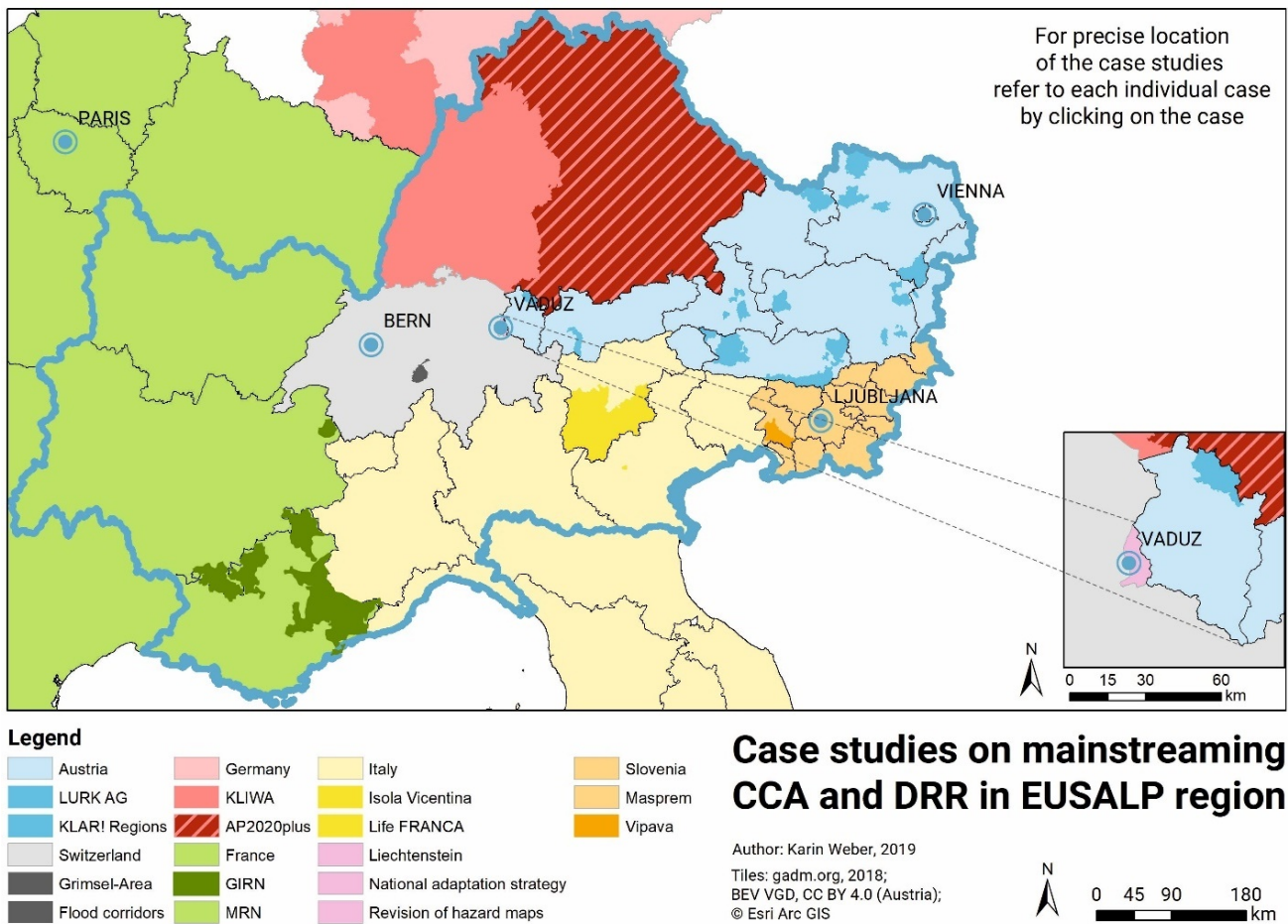


Figure 4: Overview of selected case studies, own figure.

Governance Level	Governance Item			
	P Policy, instrument	M Measure	A Actors	K Knowledge
National	NAS CCA (LI) REVISION OF HAZARD MAPS (LI) KLAR (AT)	MASPREM (SI)		MASPREM (SI) MRN (FR)
Federal state*	FLOOD CORRIDORS (CH) AP2020+ (DE)		KLIWA (DE) LURK AG (AT)	MRN (FR)
Regional		GIRN (FR) FRANCA (IT) VIPAVA (SI)		KLIWA (DE) FRANCA (IT) GIRN (FR) VIPAVA (SI)
Local	FLOOD CORRIDORS (CH) GRIMSEL (CH) ISOLA VICENTINA (IT) LURK AG (AT)		GRIMSEL (CH)	ISOLA VICENTINA (IT)

\* Land, canton, province etc.

Figure 5: Transnational comparison of cases, own figure.

## 6.2 Results on transnational comparison and lessons learnt

The transnational comparison was elaborated at the 7<sup>th</sup> EUSALP meeting in 2019 together with AG8 members. In order to find the most suitable results, the members were split up into two working groups and were asked to assign the most relevant aspects for mainstreaming CCA and DRR within the cases of their own countries according to the matrix. The results of both groups were summarized, after being validated by the project team. The assignment gives a broad overview of the governance types the cases belong to and can therefore serve as a guidance tool for the reader of this report to find good practice examples for the specific field of interest. Figure 5 shows in which field of the framework, the example was identified as a good practice example for the coherence of CCA and DRR.

Lessons learnt were identified for each case study separately, and were collected during the 7<sup>th</sup> EUSALP AG8 meeting. The members of the group identified the most relevant lessons learnt. It was acknowledged that **collaborative and participative approaches** are not only going to gain in relevance concerning the issue of CCA and DRR, but proved to be an important procedure already, if implemented in an early stage of the project and addressing decision-makers, stakeholders and the local population (mentioned by the following projects: AP2020plus, LURK AG, Grimsel Area, LIFE FRANCA, Vipava and GIRN).

The relevance of **local scale** was another important topic acknowledged by the members. Not only are local adaptation strategies effective tools to promote CCA and DRR, but developing scenarios on the local scale were important tools to enable action on **various sectors** as for example in spatial planning or water management (MASPREM, LIFE FRANCA). In this context, the **importance of cross-cutting issues** was approved, including the need to consider residual risk and overload and also incorporate economical, ecological and social interactions (AP2020plus).

Equally important were lessons learnt and positive implications due to **knowledge transfer** between regions, stakeholders and the public (KLAR!, GIRN, MRN). The **temporal scale** was issued by raising the critical question of dealing with uncertainties of models and scenarios (KLIWA), which is further connected to estimations of risk-induced **costs** and insurance options for natural hazards and climate change (MRN).

Table 2: Explanatory framework for the assignment of case studies to the matrix Good practice cases for mainstreaming DRR & CCA

Country	Short title	Explanation for the assignment in Figure 5
AT	LURK AG	<p><b>actors (national/federal state level):</b> multi-level, cross-sectoral working group – cross-sectoral (national) and federal government and administrations on federal state level</p> <p><b>measures (national/federal state level):</b> implementation of the working group (see point “actors”)</p> <p><b>knowledge /local:</b> tool – “Climate Check Natural Hazards” voluntary check tool for municipalities “; Methods and tools: Methods and tools for risk assessment, planning and evaluation/monitoring include consideration of future climatic developments and their uncertainty</p>
AT	KLAR! Regions	<p><b>policy/regional:</b> regions develop their own adaptation strategies; model regions under the umbrella of Austrian National Adaptation Strategy (NAS)</p> <p><b>measures/ regional, local:</b> implementation of strategy on level of KLAR! regions (regional) and municipalities (local)</p> <p><b>actors (regional and local level):</b> responsible for implementation KLAR! regions and their municipalities and registered association, public companies. They are coordinated by: Environmental Agency Austria (Umweltbundesamt Österreich, UBA), and get support from Austrian Meteorological Organisation (Zentralanstalt für Meteorologie und Geodynamik, ZAMG), climate coordinators of the federal state governments. Each KLAR! region has its own Climate adaptation manager (KAM)</p>
CH	GRIMSEL	<p><b>measure/policy (local level):</b> Implementation of measures on the local level. Cross-sectoral consideration e.g. railway, tourism, steering group; integration of the measures into the overall socio-economic context of the region, local level: Grimsel region (2 municipalities)</p> <p><b>actors:</b> collaboration between regional / local level: steering group</p>

Country	Short title	Explanation for the assignment in Figure 5
CH	Flood corridors	<b>policy</b> – guideline to secure areas for flood corridors (not legally binding); for federal (cantons) and local level (municipalities), legislation: spatial planning procedures and hydraulic engineering projects
DE	KLIWA	<b>knowledge (regional)</b> - research project to collect data on climate-related issues – 44 study areas and 11 KLIWA regions. <b>actors (federal, regional)</b> - cooperation between three federal states (with several administrative districts) and German Meteorological Service
DE	AP2020+	<b>policy (federal level)</b> : Bavarian flood protection program AP2020plus with measures of technical flood protection, natural retention and risk management cycle, flood risk dialogue, <b>federal level</b> – for whole Bavaria <b>measures (regional level)</b> : concrete measures such as flood polders or retention areas for catchment areas (regional level) are part of the program, measures for adapting protective structures to general climate change factor;
FR	GIRN-Alps	<b>policy</b> (regional level) – funding on <b>regional level</b> / in the alpine space for projects of integrated natural risk management <b>measure (regional)</b> : TAGIRN regions implementing measures of CCA and DRR <b>knowledge</b> : platform for regions – Science Decision Action, connect communities and actors, disseminate knowledge and expertise, to develop effective projects and tools
FR	MRN	<b>actors</b> – public private partnerships, building networks between insurance profession and (national, federal state) + public stakeholders, meaning public private partnerships <b>knowledge</b> : observation and monitoring of hazards, risks and exposure, awareness raising, information sharing country-wide, and/or for specific areas with high exposure to natural hazards and climate change impacts
IT	Isola Vicentina	<b>policy/local level</b> Municipal Water Management Plan in one municipality; also measures, but the MWMP is mainly about cooperation and coordination, developing strategies; <b>measures (local)</b> : Plan defines measures twinning cities: <b>knowledge and actors on local level</b> transfer to other municipalities (Andrano/IT, Agueda/PT)
IT	LIFE FRANCA	<b>knowledge/regional</b> - platform for different audiences and knowledge distribution e.g. workshops; expert seminars, development of a handbook, educational activities in the province Trentino <b>actors</b> (regional)– participatory process including citizens, students, administrators, experts. Several project partners contribute to the project
LI	Revision of hazard maps	<b>policy</b> : done <b>nationwide</b> for each municipality, legally binding instrument for national and municipal offices. Basis for the development of protection measures and spatial planning
LI	NAS	<b>policy: national</b> strategy in several sectors (e.g. water management, natural hazards, spatial planning), development of measures – action plan
SI	MASPREM	<b>knowledge/national and local</b> : landslide prediction system for Slovenia (national level) – and online tool. And precise prediction for 14 municipalities Warning system (measures on local level) not implemented yet, therefore rather a knowledge-element
SI	Vipava	<b>measure: regional</b> project, River Basin Adaptation Plan, consisting of measures <b>policy, regional</b> : river basin adaptation plan on regional level (river basin, several municipalities), BeWater project framework for development of the River basin adaptation plan



# AUSTRIA

## WORKING GROUP 'SELF-RESPONSIBLE RISK PRECAUTION' (LURK AG) & 'NATURAL HAZARDS CLIMATE CHECK TOOL'

- \* The **working group on individual risk precaution** (LURK AG) was installed to implement cross-cutting NAS recommendations for enhancement of DRR in municipalities, especially with regards to self-precaution.
- \* **Municipalities are a central player for prevention** against natural hazards and climate-driven extreme weather events and are a central contact point for the local population.
- \* LURK AG is a newly formed, temporary, joint multi-level working group of federal government and administrations on federal state level aligning members from CCA and DRR policy fields.
- \* It has developed a concept and procedure for the **"Natural Hazards Check Climate Change"** for municipalities (based on Flood Risk Audit Scheme in Germany). This tool addresses municipalities with the idea to apply a voluntary, non-public, expert-guided self-assessment for risks related to climate change and natural hazards.

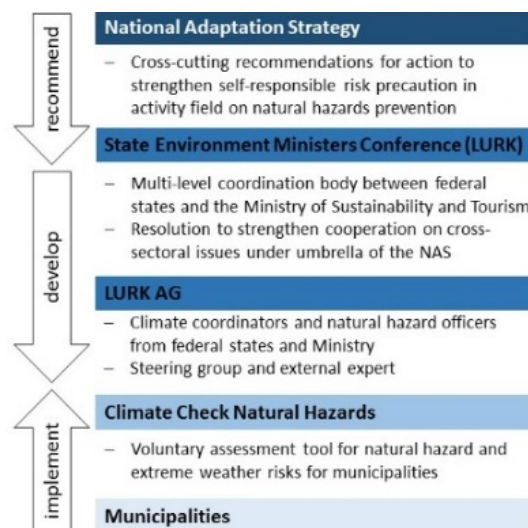


Figure 1: Context, stages and levels of the LURK AG and the Natural Hazards Climate Change Check tool; own figure.

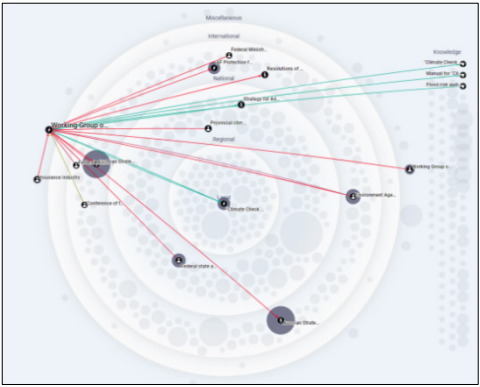
## DESCRIPTION

Several recommendations for action in the **Austrian NAS aim at the promotion of self-responsibility and individual risk preparedness** towards natural hazards. In order to further strengthen cooperation between the federal government and the state governments in the field of climate adaptation, the Conference of State Environment Ministers together with the responsible Austrian Federal Ministry for Sustainability and Tourism (Österreichisches Bundesministerium für Nachhaltigkeit und Tourismus, BMNT) decided in its resolution from 29th May 2015 to identify and select cross-sectoral measures of high complexity from the Austrian NAS, whose **successful implementation requires close vertical and cross-sectoral cooperation**. The LURK AG is a **non-formalized multi-level governance body** for common deliberations on environmental policy issues between the nine **Austrian federal states and the national state**. Recognizing that municipalities are key players in prevention against natural hazards and central contact points for the local population, the **LURK AG 'Eigenvorsorge' was installed in 2017** and decided to develop a consultation, sensitization and advisory tool to strengthen risk precaution measures of municipalities and private citizens. Building on the **principle of voluntary cooperation**, the Working Group is an innovative multi-level and cross-sectoral governance format that aligns actors from the national level and state levels **representing the two policy fields climate adaptation and natural hazard management**. Chaired by the Head of the Department Torrent and Avalanche Control and Protection Forest Policy (Wildbach- und Lawinenverbauung und Schutzwaldpolitik, WLW) of the BMNT, members were climate change coordinators of the BMNT and the state governments, flood risk and natural hazard management officers of federal and state administrations, plus representatives of the insurance industry, academia and the Environment Agency Austria (Umweltbundesamt Österreich, UBA). Inspired by the model of the German flood audit schemes by the German Association for Water, Wastewater and Waste (Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V., DWA), the group has developed a tool and implementation concept for a **so-called "Natural Hazards Check Climate Change" for Austrian municipalities. The tool consists of a set of 33 indicators**, translated in easily understandable questions that evaluate the level of municipal risk preparedness. It covers a broad range of weather-/ climate-driven natural hazards as well as extreme weather hazards (heat, drought, snow burden, storm, hail, lightning) in an integrated way. The ultimate goal is a voluntary, systematic check of all Austrian municipalities, carried out jointly by

specialized personnel and municipal decision-makers, **to support municipalities in strengthening their risk preparedness measures.** The working group has also developed an implementation concept and initiated a governance model for the country-wide launch of the measures.

**Status and outlook:** The tool is currently being tested in pilot municipalities. Financed in a first phase by the Federal Ministry (BMNT), the Environment Agency has been contracted to implement the training of a first pool of check coordinators. The trainees are being recruited from the natural hazard and climate adaptation expert community. As of July 2019, the first training course has already been carried out.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<p><b>Coherence and cooperation between CCA and DRR stimulated deliberately</b></p>	<p>Coherence was strived for deliberately already by formulating respective cross-sectoral recommend-dations for action in the Austrian National Adaptation Strategy, by the resolution of the LURK AG, which explicitly calls for cooperation across sectors under the umbrella of the Austrian national adaptation strategy (NAS), and by the joint decision of the working group to develop a tool that tackles both natural hazards and extreme weather risks in an integrated way. The working group deliberately involved members from both policy communities.</p>
<p><b>Added value for both CCA and DRR</b></p>	<p>The LURK AG entered a completely new stage of adaptation and risk management counselling by developing a tool for municipal guidance which displays a substantial added value in comparison to existing instruments, as well as a useful complement to them.</p>
<p><b>CCA: Uncertainty and long-term perspective considered</b></p>	<p>By addressing risks from natural hazards and extreme events against the background of climate change.</p>
<p><b>DRR: Risk management cycle considered</b></p>	<p>Because the check tool contributes to risk prevention of municipalities by increasing their risk preparedness.</p>
<p><b>Linkages between several governance levels and/or elements</b></p>	<p>The LURK AG links several governance levels (national, state, municipal), policies and measures, for details see Figure 1 and 2.</p>  <p>Figure 2: Visualization of the governance network of the Working Group on Self-Responsible Risk Precaution – (framed here as a measure)          (© GoApply project: Mapping Governance of Climate Adaptation in the Alpine Space;  <a href="https://www.wsl.ch/gov-vis-cca/">https://www.wsl.ch/gov-vis-cca/</a>)</p>

## CHALLENGES

- \* **Heterogeneous composition of the Working Group:** Participants came from different administrative sectors and levels of government, with different levels of knowledge and different areas of expertise. This caused a broad variety of different motivations and adaptation-related expertise among the participants, which made it more difficult to collaborate towards a mutually agreed goal. It was, therefore, a challenge to establish a common understanding by all participating sectors as well as a mutual consent about the goals and measures, which was aggravated by the fact that participation tended to be volatile, participants did not always appear prepared to meetings, and either willingness or capacity to put effort in the joint process sometimes met upon limitations.

- \* **Lack of political or legal definition of 'self-responsible risk precaution':** A common understanding needed to be agreed first. Especially the question whether and why 'self-reliance' is not redundant with existing measures by established institutions hampered communication and led to discussions. Due to this unclear definition, some participants underestimated the possible political consequences of the joint product, i.e. the "natural hazards climate change check" tool. In effect, differences about the strategic direction and the intended final product occurred and at some points put the process at risk.
- \* **Lack of time and workforce:** Time was a crucial factor because influential actors from key sectors have full schedules and often cannot participate in workshops, which hinders the process. This additionally conflicts with external time pressure to progress with the process, because the longer its duration, the higher the risk that important actors drop out due to restrictions in time capacity. Adding to that, the available workforce constrained the process. Interviewees reported that members of the steering group considerably exceeded their available work resources because the efforts required for process management were underestimated.

## SUCCESS FACTORS

- \* **Benefits for both involved sectors:** Both the topic of "self-responsible risk precaution" and the idea for the concrete product were equally attractive to the participating actors from both policy communities, climate adaptation and disaster risk reduction, because they were in line with their respective sectoral interests and agendas. A crucial factor in that regard was the decision to extend the coverage of the initial German flood risk audit tool to assess both, risks from natural hazards and climate change-driven extreme weather events, which allowed both communities to identify with the jointly developed product. In addition, all participants were motivated by the perspective to take a new step in policy counselling through the common development of a risk assessment tool for municipalities, and by the positive feeling of joint cross-sectoral efforts towards "something that matters".
- \* **Key actors making determined efforts to push cooperation:** Leadership by committed key actors was crucial to integrate a broad spectrum of actors from different sectors and levels and to guide them towards a productive common output. Without these individual efforts, the working group would not have been able to overcome multi-level and cross-sectoral governance barriers, to agree on a common topic, and to yield tangible results. Constant personal efforts in convincing participants also account for the fact that consensual decisions could be achieved.
- \* **Official resolutions in the context of implementing the Austrian NAS:** Through the formal support provided by the national adaptation strategy and related resolutions of the LURK, the whole process experienced increased legitimization, a coherent frame of reference, and willingness of actors from different sectoral backgrounds to cooperate.
- \* **Building on existing practice examples:** The existence of the German Flood Audit, which served as a blueprint for the Austrian assessment tool, allowed building on a field-tested model and available practice experiences. This greatly facilitated the work process and fostered motivation and acceptance of the product by the working group. A common excursion to Germany, which sparked the idea to develop a climate risk audit based on the German model, was a critical turning point from sceptical resistance to motivated support among the participants.

## LESSONS LEARNT

- \* **The format can serve as a role model for future Austrian NAS implementation:** Overall, the working group on self-responsible risk precaution represents an innovative governance format that could be exemplary for future horizontal adaptation governance. Such cross-sector and multi-level working are a suitable approach for implementing complex and cross-cutting issues addressed by, e.g., the national adaptation strategy or risk management policies. Similar new cooperative groups should, however, form around existing institutions (e.g. Working Group 'Heat', ISDR platform) in order to exploit synergies and reduce scepticism.
- \* **Horizontal governance thrives on a network of established players with individual initiative:** If such a network does not exist, it must be developed first. Here, it is important to note that governance is only an extension, not the opposite of traditional hierarchic and sectoral government. Establishing such networks and achieving coherence needs pro-active leadership by a committed person acting as 'care-taker', plus the formal power and courage to commit budget to the process.

- \* **Practicability is essential: have a precise idea and product:** This is not only a critical precondition for the effective work of a cooperative governance body it also motivates participants better than an abstract and product-less 'idea workshop'. In order to do so, existing good practice experiences should be used to build on, instead of 're-inventing the wheel'. Any 'armchair reasoning' should be avoided strictly in favor of a clear concept and of as much simplification as possible – this increases the acceptance across all participating sectors. To succeed, these precise ideas need to meet committed actors and an open-minded (non-saturated) clientele with the capacity to engage.
- \* **Jointly developed product should display substantial added value:** To be successful and avoid questioning the competence of existing institutions or other sectors, joint implementation activities, or jointly developed products, should not be a concurrence or threat to existing measures or instruments, but rather a useful complement to those.

## ADDITIONAL INFORMATION

**NATURAL HAZARDS CHECK CLIMATE CHANGE:** The main purpose of the check tool is to function as a sensitization, counselling and advisory instrument to support municipalities in strengthening their risk preparedness. The tool consists of a set of 33 indicators (Figure 2), translated in easily understandable questions, to evaluate the level of municipal risk preparedness within five assessment fields: i) municipal hazard & risk profile, precautionary measures related to ii) land use, iii) construction, iv) behavior, and v) risk precaution. The concept allows integrated coverage of weather-/climate-driven hydrological, gravitational and meteorological hazards as well as extreme weather hazards such as heat, drought, snow burden, storm, hail, and lightning. The tool shall be applied by qualified external personnel ('check coordinators') together with municipal decision-makers during an on-site visit (1-2 days). Municipalities are then provided with an evaluation report employing indicator profiles, traffic light scales and diagrams, providing the basis for development of measures to increase risk preparedness of municipalities. A first training of check coordinators has already been carried in July 2019. The working group continues to work towards solutions to a number of open questions (e.g., executive body, costs and co-financing, further training of 'auditors', standards for implementation, etc.) related to the governance structure for the implementation.

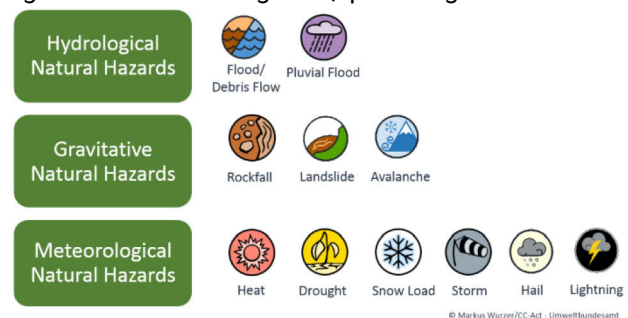


Figure 3: Hazard categories and hazard types covered by the tool  
Braun J., Skolaut C., 2018: Natural Hazard Check – For the municipality - Guidelines. EUSALP Action Group 8;  
© hazard pictograms: Markus Wurzer/CC-Act – Umweltbundesamt

## Sources and Figures

- Braun, J. & Skolaut, C. (2018): Naturgefahren-Check –Für die Gemeinde –Leitfaden. EUSALP Action Group 8.
- Lexner, W.; Buschmann, D. & Strahlhofer, L. (2018): Climate Adaptation Governance in Austria: Country Report Austria (WP1) of the GoApply project. [https://www.alpine-space.eu/projects/goapply/results/results\\_revised/goapply\\_d.t1.1.1\\_wp1\\_country-report-austria\\_uba-at\\_final.pdf](https://www.alpine-space.eu/projects/goapply/results/results_revised/goapply_d.t1.1.1_wp1_country-report-austria_uba-at_final.pdf)
- Lexner, W. & Buschmann, D. (2018): Case study reports on the mainstreaming of climate adaptation: Country Report Austria (WP2) of the GoApply project. [https://www.alpine-space.eu/projects/goapply/results/results\\_revised/goapply\\_d.t2.1.1\\_wp2\\_case-study-reports\\_austria\\_uba-at\\_dec-2018.pdf](https://www.alpine-space.eu/projects/goapply/results/results_revised/goapply_d.t2.1.1_wp2_case-study-reports_austria_uba-at_dec-2018.pdf)
- Figures:** Figure 1: Procedure LURK AG and Natural Hazards Climate Check tool (ILAP, 2019)
- Figure 2: Visualisation of the governance network of the Working Group on Self-Responsible Risk Precaution – (framed here as a measure)© GoApply project: Mapping Governance of Climate Adaptation in the Alpine Space (<https://www.wsl.ch/gov-vis-cca/>)
- Figure 3: Results Check for the natural hazard types pluvial flood, rockfall and storm (source: Braun J., Skolaut C., (2018): Natural Hazard Check – For the municipality - Guidelines. EUSALP Action Group 8)

## Links and contact

LandesumweltreferentInnenkonferenz (LURK): <https://www.wien.gv.at/umweltschutz/lurk.html>

# AUSTRIA

## KLAR!

### CLIMATE CHANGE ADAPTATION MODEL REGIONS

- \* Europe wide unique pilot program funded by the Climate and Energy Fund (Klima- und Energiefonds, Österreich, KLIEN) in Austria.
- \* Offers a process-oriented approach for regions and municipalities to raise awareness for CCA and trigger concrete actions.
- \* To date, 44 Austrian regions are supported with funding for the implementation of concrete adaptation measures
- \* Currently, 20 model regions are implementing their adaptation measures, and 24 additional regions approved in the second call are elaborating their regional adaptation concepts.
- \* Several model regions are implementing measures to adapt to climate change-driven natural hazards. One example is South Carinthia (Südkärnten – eh KLAR!), which has prioritised several measures targeted at Disaster Risk Reduction.



Figure 1: Klar! Logo  
(© Climate and Energy Fund, 2019)

## DESCRIPTION

The pilot program KLAR! – Climate change adaptation model regions for Austria – was initiated in 2016 and provides public funding for the development of regional adaptation concepts and the implementation of regional and local adaptation measures. The program is financed by the Climate and Energy Fund (KLIEN). It aims to support Austrian regions and municipalities to implement measures for climate change adaptation in a systematic way. Therefore, each model region needs to install a climate adaptation manager, develop an adaptation concept and establish a regional governance structure. The process is organised in distinct phases: i) application of model regions, ii) preparation of a detailed adaptation concept with a minimum of 10 concrete measures, iii) implementation phase and monitoring (2 years), and iv) dissemination of good practices, re-adjustment of measures and continuation. 20 model regions approved in the first funding period are currently in the implementation phase (2019-2021). In spring 2019, 24 new model regions have been selected under the 2<sup>nd</sup> call of the program and are currently elaborating their adaptation concepts

(Figure 2). As of July 2019, altogether thus 44 climate adaptation model regions are active in Austria, covering 358 municipalities with 926,000 inhabitants, which corresponds to 10.6% of the Austrian population. The KLAR! program provides funding for the regional adaptation managers, awareness building and communication activities as well as the implementation of adaptation measures in various sectors, whereas the participating municipalities have to contribute 25% co-financing.

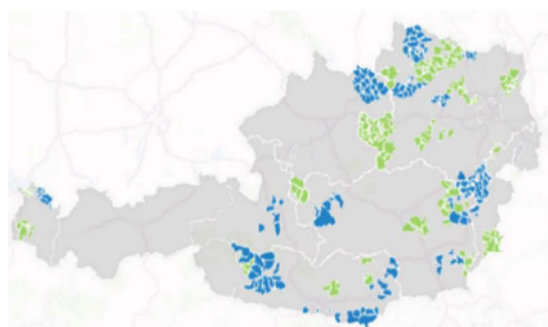


Figure 2: KLAR! Regions in Austria  
(© Climate and Energy Fund Austria)

A service platform operated by the Environment Agency Austria (Umweltbundesamt Österreich, UBA) and the Austrian Meteorological Organisation (Zentralanstalt für Meteorologie und Geodynamik, ZAMG) supports the KLAR! regions with customized information packages, capacity-building measures, direct counselling and through network meetings promoting peer-to-peer learning. Additional actors involved are the KLAR! program management at the federal level, the ministerial unit responsible for NAS coordination, and the designated climate coordinators of the federal state governments. The project-executing body must be a public legal entity, i.e. a municipality or an alliance of municipalities, a public company, or a registered association.

In addition to the necessary climate protection activities, it is necessary for municipalities to react to climate change impacts with measures in their own areas of responsibility, such as zoning and land use planning,

water supply, municipal roads or emergency response and rescue services. Municipalities are also increasingly required to take into account the long-term effects of climate change in current decisions and investments, e.g. in municipal infrastructure or forestry, in order to avoid cost-intensive maladaptive decisions. KLAR! enables Austria's regions to adapt to the effects of climate change at an early stage and with a view into the future, in order to reduce the damage potential and to maintain the quality of life in the community in the long term.

The adaptation measures implemented within the KLAR! model regions respond to a variety of climate change impacts and address a diversity of sectors. Most prominently, awareness raising, "climate-fit" forestry and agriculture and disaster risk reduction measures are applied. The core topics are issues related to heat / rising temperatures, drought and heavy precipitation. Nonetheless, KLAR! model regions effectively consider the need for cross-cutting adaptation measures and cross-sectoral cooperation. A main emphasis is up to now put on so-called 'soft' measures (such as communication, education, building a knowledge base), as compared to 'green' (nature-based) and 'grey' (structural, technological) measures.

**Status and outlook:** Currently, 20 already 'experienced' model regions are working on implementing their adaptation measures, which is to be followed by efforts for institutionalising adaptation processes in the long term as well as by the dissemination of achievements and experiences. In addition, 24 newly approved model regions have started to develop their adaptation concepts. In the future, it is planned to also offer separate funding for implementation of 'green' and 'grey' measures requiring investments.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	KLAR! model regions are promoting climate adaptation by facilitating sector-related and cross-sectoral measures, including e.g. water management, natural hazards management and land use, which are often linked to disaster risk management. Measures tackling climate-driven hazard processes and extreme events responding to growing problem pressure are explicitly encouraged by the program the service platform
<b>Added value for both CCA and DRR:</b>	A certain amount of climate adaptation measures implemented is also related to risk reduction related to natural hazards, e.g. measures of flood retention or emergency response. This creates synergies for both fields of action. Nonetheless, not every region mainly focuses on disaster risk management in its narrow sense, depending on the specific climate risks in the given regional contexts.
<b>CCA: Uncertainty and long-term perspective considered</b>	KLAR! model regions, e.g. South Carinthia (see additional information) take uncertainty and long-term perspective into account to assess climate-related impacts and to plan anticipatory measures. The regions are supported by climate scenario-based fact sheets projecting climate change trends up to 2050.
<b>DRR: Risk management cycle considered</b>	The risk management cycle is considered for measures taking disaster risk management into account, e.g. measures of flood retention. This is the case, for example, for the KLAR! region South Carinthia. The measures are planned and carried out in cooperation with responsible hazard management authorities, who are used to working with the risk management cycle concept.
<b>Linkage between several governance levels and/or elements</b>	The federal level is the funding body and provides the service platform, which supports the regional level with know-how, customized information packages and the organization of networking workshops for the KLAR! managers. The adaptation concepts of the model regions must consider the National Adaptation Strategy and the adaptation strategies of the federal states. This requires a constant exchange with the national and the federal state level. The implementation of measures lies in the responsibility of the KLAR! region and its municipalities. Knowledge transfer and learning between regions as well as between municipalities in each region is a core feature of the program (see Figure 3).

## CHALLENGES

- \* **Legal responsibilities:** Especially in the implementation of DRR measures at municipal level, one repeatedly comes across the different legal responsibilities: What are the options for action for the mayor? What are the responsibilities of the district commissioner? What are the roles of the state-level and federal authorities? Each acting person must be aware of these different responsibilities, which should be clearly defined. Thus, the KLAR! regions in Carinthia are helping municipalities to keep their alarm plans and responsibilities up-to-date and available at all times.
- \* **Undesirable impact on other sectors:** The planning and implementation of adaptation measures is a challenging task: a large number of fields of action, actors and levels of responsibility must be taken into account. At the implementation level, unpredictable interactions may occur and the benefits in one area can lead to undesirable consequences in another. In order to defuse possible conflicts and exploit emerging synergies, intensive cooperation and coordination beyond disciplinary and institutional boundaries are essential.
- \* **Avoidance of maladaptation:** Maladaptation refers to measures that are predominantly reactive and, as mere symptom combat, are only promising in the short-term, but counterproductive in the long term. Maladaptation can increase the vulnerability of other people, regions or sectors to the effects of climate change, have negative (side) effects on other areas, counteract mitigation, and can be ineffective, difficult to correct or to re-adjust.

## SUCCESS FACTORS

- \* **Installment of regional adaptation managers:** There are currently 44 KLAR! regions in Austria either in the implementation or concept development phase. For this purpose, CCA managers have been set up in the regions to act as central contact persons and 'change agents' for the communities involved and beyond, and to coordinate the formulation and implementation of adaptation measures in their region. The manager must be rooted in the region, accepted by the public and used to working with the local and regional authorities.
- \* **Exchange at all and across levels:** Networking at and across all levels, i.e. horizontally as well as vertically, is essential to implement climate change adaptation and DRR in municipalities and regions and to avoid maladaptation.
- \* **Service Platform: A service platform** has been set up that provides regional climate information, advices on adaptation actions and helps to prevent maladaptation. It further supports KLAR!-regions in elaborating and implementing the adaptation concept by providing information materials, conducting peer-to-peer workshops and carrying out advisory services. The service platform consists of experts from the UBA Austria the ZAMG.

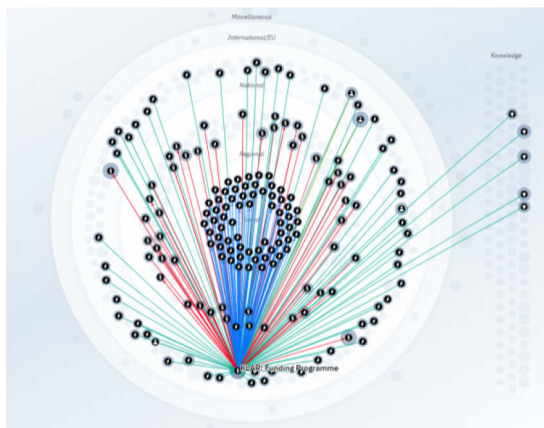


Figure 3: Online visualization of the KLAR! program governance network  
(© GoApply project: Mapping Governance of Climate Adaptation in the Alpine Space; <https://www.wsl.ch/gov-vis-cca/>)

## LESSONS LEARNT

- \* **Bottom-up approach necessary in climate change adaptation:** In contrast to climate protection, where many measures can be regulated and implemented top-down, the municipalities play a crucial role in implementing climate change adaptation measures that respond to specific local climate impacts and vulnerabilities, which requires a bottom-up approach to priority-setting. With many communities facing similar challenges, not just in DRR, it makes perfect sense to team up in model regions, to pool resources, to install a common manager who, as a care taker, drives adaptation in the region, and to leverage synergies.

- \* **Public incentives plus soft coercion:** The KLAR! program combines incentives for regional adaptation with 'soft coercion' through binding funding requirements, while at the same time promoting a bottom-up approach to the choice and prioritisation of adaptation measures, so that these are adequate to respond to specific regional climate change problems. Through mandatory funding conditions, however, the program can create a degree of liability that non-binding adaptation strategies cannot. For example, model region receiving funding from KLAR! are required to perform a regional vulnerability analysis, to work with long-term climate scenarios, to set up adaptation concepts with defined roles and responsibilities for each measure, and to monitor and report about progress. All this is beneficial for good practice in adaptation.

## ADDITIONAL INFORMATION

To illustrate adaptation measures in model regions that are especially targeted at disaster risk reduction (DRR), respective measures of the implementation concept are described in detail by the example of South Carinthia (Südkärnten – eh KLAR!):

- \* **Geo data for municipalities:** "GIS for you" – detailed real-time information on infrastructure for emergency situations and for natural hazards management
- \* **Operational plans for emergencies and disasters:** Optimal preparation of the communities for emergencies and disasters; Binding operational plans / contingency plans for all stakeholders for a wide range of natural hazards; Establishment of compulsory emergency management plans (in cooperation with municipalities, state administration of Carinthia, Department Torrent and Avalanche Control and Protection Forest Policy [Wildbach- und Lawinenverbauung und Schutzwaldpolitik, WLV], civil defense and emergency services).
- \* **Natural hazard consulting:** Assistance for the self-protection of properties in natural hazard zones; Increasing human safety and limiting potential damage from natural hazards of residential and commercial buildings in hazardous areas; Expert consultations, e.g. as an additional tool in consultation processes for thermal retro-fitting of buildings.

## SOURCES AND FIGURES

Lexner, W.; Buschmann, D. & Strahlhofer, L. (2018): Climate Adaptation Governance in Austria: Country Report Austria (WP1) of the GoApply project. [https://www.alpine-space.eu/projects/goapply/results/results\\_revised/goapply\\_d.t1.1.1\\_wp1\\_country-report-austria\\_uba-at\\_final.pdf](https://www.alpine-space.eu/projects/goapply/results/results_revised/goapply_d.t1.1.1_wp1_country-report-austria_uba-at_final.pdf)

Lexner, W. & Buschmann, D. (2018): Case study reports on the mainstreaming of climate adaptation: Country Report Austria (WP2) of the GoApply project. [https://www.alpine-space.eu/projects/goapply/results/results\\_revised/goapply\\_d.t2.1.1\\_wp2\\_case-study-reports\\_austria\\_uba-at\\_dec-2018.pdf](https://www.alpine-space.eu/projects/goapply/results/results_revised/goapply_d.t2.1.1_wp2_case-study-reports_austria_uba-at_dec-2018.pdf)

### Figures:

Figure 1: Klar! Logo (© Klima- und Energiefonds, 2019)

Figure 2: 20 KLAR! regions in Austria (© Klima- und Energiefonds, 2017)

Figure 3: Online visualization of the KLAR! program governance network (© GoApply project: Mapping Governance of Climate Adaptation in the Alpine Space; <https://www.wsl.ch/gov-vis-cca/>)

## LINKS AND CONTACTS

Climate Adaptation Consulting in the Federal States: <http://klimawandelanpassung.at/index.php?id=35138>

Climate Change Adaptation Model Regions (KLAR!): <https://klar-anpassungsregionen.at/>

Climate and energy fund (KLIEN): <https://www.klimafonds.gv.at/>

National climate adaptation information portal: <http://www.klimawandelanpassung.at/>

South Carinthia (Südkärnten – eh KLAR!): <https://www.xn--kem-sdkrnten-mcb74a.at/de/klar/klar>

# SWITZERLAND

## CLIMATE ADAPTATION STRATEGY GRIMSEL AREA

- \* **Strategy** focusing on the **impacts of climate change, especially natural hazards** on various sectors such as tourism, infrastructure, housing and communication in **two municipalities**
- \* Integration of the objectives and measures concerning climate change adaptation in the overall **socio-economic context of the region**.
- \* One of 31 projects of the **Swiss pilot program “Adaptation to Climate Change”** implemented from 2013 to 2017 in collaboration with regional and local authorities.



Figure 1: Natural hazard processes in the Grimsel region (© Oberingenieurkreis I & Regionalkonferenz Oberland-Ost, 2016)

## DESCRIPTION

In Switzerland, the Federal Office for Environment (Bundesamt für Umwelt, Schweiz, BAFU) has launched the **pilot program “Adaptation to Climate Change”** to support the cantons, the regions and the municipalities in dealing with the challenges of climate change such as natural hazards. The aim of this program is to initiate and financially support projects that help reduce climate risks and increase adaptability at the local level. The first stage of the program, from 2013 to 2017, enabled the implementation of 31 projects, focusing on water shortage, climate-adapted settlement development, management of ecosystem changes and land use, knowledge transfer and governance as well as natural hazards. One of these projects is the **“Climate Adaptation Strategy Grimsel”**, aiming to sensitize the people in the Grimsel region to the impacts of climate change and to develop options for action. In recent years, various parts of the area have been severely affected by natural hazards such as **mudflows and rock falls**, caused by thawing permafrost and melting glaciers. The outcome of the project is a **comprehensive, long-term strategy for dealing with natural hazards**, which contributes to the **identification and mitigation of risks**, the **sensitization of the population** and which presents possible opportunities.

The strategy is aimed primarily at the **actors of the Grimsel region** including the **municipalities** Guttannen and Innertkirchen and the **canton Bern** (mainly road and hydraulic engineering). It complies with official guidelines and visions of the municipalities and local institutions. During the process of developing the strategy, it became apparent, that a **broader content framework**, including not only climatic changes, but also other factors (demographic development, tourism, quality of living, traffic infrastructure provision), is beneficial. The following fields of action are directly linked to natural hazard management:

- \* **M1: Setting up a control group:** to ensure the implementation of the strategy on a long-term basis. The tasks of this control group is the continuous review of the process and the management of exchange and coordination between the different action fields of the strategy.

- \* **M3: Improvement of data and information exchange on natural hazards:** to inform the population and institutions about relevant changing impacts and processes caused by natural hazards. The preparation of complex data is important to ensure the availability of the information not only for professionals, but also for a wider audience, in particular the population.
- \* **M4: Preparations for a possible Grimsel railway:** Natural hazard processes can cause the disconnection and isolation of the municipalities to other localities, by destroying cantonal roads in the valleys. The Grimsel railway could be a “climate-proof” alternative that ensures the accessibility of the municipalities in case of a natural hazard event.
- \* **M5: Improvement of risk communication in the tourism sector:** to better inform tourists about natural hazards and possible impacts (e.g. roadblocks), to facilitate communication processes by identifying the relevant channels and the type of information and target group.
- \* **M6: Marketing of natural landscapes and dynamic processes:** to draw interest to the environmental aspects of the region and to sensitize tourists for the dynamic processes of nature, increasing the awareness for natural hazards and the understanding for roadblocks.

INFRAS, an external contractor, performed the operational project management, consisting of the process management, the moderation, the technical support and the administration. The **steering group**, responsible for the project management, coordination and external communication of the strategy, consisted of representatives of the Regional Conference Oberland-Ost<sup>3</sup>, the municipality Guttannen and the Oberingenieurkreis I<sup>4</sup> canton Bern. Furthermore, the responsibilities for the development and implementation of the strategy were divided into **working groups** composed of the municipalities and local public corporations (e.g. public corporation for flood protection), representatives of cantonal offices as well as representatives from the energy industry, tourism and agriculture. For all fields of action covered by the strategy, corresponding experts and institutions were members of the working groups.

**Status:** The strategy, finalized in January 2016, defines **long-term and continuous implementation periods for the measures**. For example, the steering group, introduced in 2016, regularly informs the partners about the progress of the implementation and ensures the continuity of the strategy by organizing conferences in regular intervals. This is possible, because the members of the steering group bear the costs for administration and conferences.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	Natural hazards have always been part of the Grimsel region. Due to thawing permafrost and melting glaciers, these <b>processes are expected to occur more frequently in the future</b> especially in the summer season (OIK I, 2013). The strategy aims to find solutions and take action to cope with these impacts of climate change.
<b>Added value for both CCA and DRR:</b>	The working groups, which emerged from the pilot project in the Grimsel region, aim to <b>develop a strategy to reduce the risks</b> posed by climate change and to <b>increase the resilience</b> of society, economy and nature, focusing on natural hazards. At the same time, the strategy makes use of the <b>opportunities</b> arising from climate change.
<b>CCA: Uncertainty and long-term perspective considered</b>	For the development of the strategy, the project team identified the challenges for the region that directly emerge from climatic changes e.g. natural hazards as for example rock fall, landslides, debris flow and avalanches. It analyzed the current situation as well as the <b>expected development under advancing climate change and/or lack of active effort</b> . The strategy considers also other issues and trends indirectly connected with climatic change (e.g. demographic development, settlement development, touristic development).

<sup>3</sup> Regional Conference (Regionalkonferenz): Public-law associations within the canton Bern, for the interregional collaboration of municipalities. Tasks: regional cultural, transport and spatial planning policy.

<sup>4</sup> Oberingenieurkreis: Chief Engineer District, civil engineering office of an administration district in Switzerland

<b>DRR: Risk management cycle considered</b>	The measures of the strategy effectively concern <b>risk communication, risk prevention and emergency provision</b> . For example, the measures M3 and M5 should help to ensure that institutions and other user groups are informed about relevant changes in the natural hazard situation in a timely and appropriate manner. The objectives are to raise the awareness for natural hazards and to improve the information channels and warning systems.
<b>Linkage between several governance levels and/or elements</b>	The project encompasses the <b>cantonal level</b> (canton Bern), the <b>regional level</b> (Regional Conference Oberland-Ost, Oberingenieurkreis I, tourism association Haslital, electricity utility Oberhasli) and the <b>local level</b> (municipalities Guttannen and Innertkirchen, public corporation for flood protection as well as other local institutions of the municipalities e.g. road/infrastructure and settlement). The steering group ensured the <b>exchange of information between the working groups and the involved actors</b> via workshops and bilateral discussions. The FOEN on the <b>national level</b> was responsible for the program coordination on behalf of the federal government, for the technical support of the pilot project, but also for the exchange with other project executing organizations through project interim discussions and exchange events.

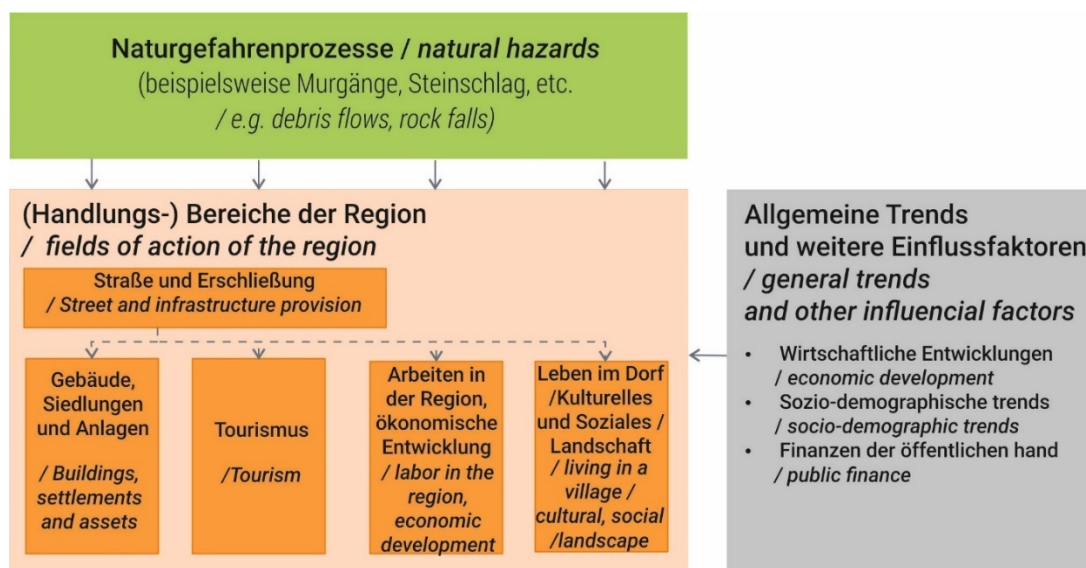


Figure 2: Influencing factors on the Grimsel region: The graphic visualizes how the natural hazards processes (green) and general trends and influencing factors (gray) affect the region and, together with internal feedback, influence and shape the region  
(© Oberingenieurkreis I & Regionalkonferenz Oberland-Ost, 2016), own translation in italic

## CHALLENGES

- \* **Improvement of data and information exchange on natural hazards:** There sometimes are divergent and high expectations on a regional data and information platform. For experts in the field of hazard monitoring, the platform should provide different information than for the population. Furthermore, there are different types of data, which cannot be transmitted to a broad circle in a timely manner (e.g. "alarm data") or whose sovereignty lies outside of any of the institutions involved (e.g. Federal Office of Meteorology and Climatology, WSL Institute for Snow and Avalanche Research SLF). In addition, it is important to avoid parallel structures and to provide appropriate add-ons to existing information portals.
- \* **Improving event communication for tourism:** In the case of a natural hazard event, the availability of information for different tourist groups is important (e.g. roadblock, block of hiking trails). This requires the precise communication and the transformation of information into a comprehensible language. If the communication channels are not functioning optimally, there is a risk of misinformation, which may result in tourists avoiding the region.

- \* **Difficulties with the use of climate scenarios:** At the beginning of the project, the use of climate scenarios was intended. However, during the process, a different procedure developed. The initial idea of differentiating the issues and the fields of action according to different scenarios (low, medium, high) was too complex for the chosen approach. Furthermore, the involved actors did not understand and agree with the predicted strong changes in the natural hazard situation. Instead of working with scenarios, the project members agreed on a common assessment of the expected development in terms of climatic changes.

## SUCCESS FACTORS

- \* **Steering group for the effective organization of the project:** The steering group managed the exchange and communication of the involved partners and regularly informed the institutions about the progress of the implementation of the climate adaptation strategy. This made it possible for all partners to participate, if necessary and to develop a common strategy. The steering group has taken into account existing competencies and responsibilities of the institutions, thereby avoiding unnecessary effort and ensuring the advancement of the Climate Adaptation Strategy. Furthermore, it guarantees the maintenance of the strategy even in case of a large time lag between two natural hazard events.
- \* **A cross-sectoral approach and the active involvement of all relevant stakeholders** are essential for the development of regional adaptation strategies. Without broad support and political commitment, there is a risk that declarations of intent will remain non-binding. Formal anchoring in the municipalities or regional organizations, as has been done in the pilot projects, lays the foundation for the implementation of strategies and adaptation measures.
- \* **Adaptation approach enables the examination of a comprehensive cross-sectoral view:** In the course of the participatory process, the stakeholders involved were informed about the consequences of climate change in the region. Based on this information, the focus shifted from dealing with natural hazards to a climate-adapted regional development. This enabled the integration of objectives and measures in an overall socio-economic context of the region. For example, the measure M2 deals with the conversion of vacant buildings for residential purposes within the village of Guttannen to support the densification and to provide additional living space.
- \* **Application of appropriate communication strategies:** Personal bilateral exploratory talks, which took place before the first workshop, were an effective way to understand the specific situation and to focus the discussion on the important needs and solutions. It served as a complement to workshops, in which not all participants can express themselves in detail. Several workshops provided the possibility to discuss needs, conflicts and options of action, to set priorities and to develop common goals. The workshop method "world café" was well received and proved to be a good tool to discuss in small groups. The method was used in particular for the in-depth discussion of the fields of action.

## LESSONS LEARNT

- \* **Current natural hazard events have a strong impact on problem perception:** Extreme natural hazard events such as large debris flows occurred between 2009 and 2011 in the Grimsel region. Therefore, risk awareness of the project team at the beginning of the project in early 2014 was high. However, during the project, hardly any natural hazard events occurred in the municipalities. As a result, the risk perception of the participants lowered significantly in a short time. The decrease of urgency enabled more relaxed discussions and more thematically varied results, whereas, in an urgent natural hazard situation, the focus is very much on risk mitigation and structural measures. It is important to consider that in the case of another natural hazard event, the perception of risk can change again, which offers conflict potential.
- \* **Considering other factors influencing the natural hazard situation:** The actors of the Grimsel region are aware of the risks caused by natural hazards and know how to deal with them, because of the long natural hazard history. However, challenges arise when natural hazard processes interfere with other issues, such as demographic development. For example, trends such as ageing and emigration in Guttannen could increase, if the population is not willing to accept frequently occurring roadblocks. Another important factor is political decisions influencing, for example, the implementation of a Grimsel railway. The experience of the project team was that it is not possible to distinguish between the adaptation to climate change on a local level and overarching aspects of sustainable regional development. Therefore, the climate adaptation strategy is thematically broad and goes beyond CCA.

- \* **A common problem perception is as important as the scientific basis:** There are already many scientific studies and extensive monitoring of natural hazard processes in the Grimsel region. The permanent collection of data serves as a basis for various studies on the current and future natural hazard situation. In particular, the corridor Study "Grimselpassstraße" as well as the natural hazard map "periGlazial" provided important information for the development of the strategy. Nevertheless, the scientific studies alone are insufficient as a basis for the successful implementation of the project. The local risk awareness and the consideration of local security needs play an important role. Therefore, the involvement of all relevant regional stakeholders has a huge impact on the success of the local strategy development. Especially during workshops, there is a need for discussion and the integration of different positions in order to attain a common problem perception and definition. The project represents an important supplement to scientific findings in the region.
- \* **Focus on opportunities as well as risks:** In line with the federal adaptation strategy, the strategy should not only minimize risks but also highlight opportunities arising from climate change. Especially, in a broad-based process that focusses on the participation of stakeholders, it is important to discuss chances, to identify possibilities and to show perspectives. Especially one of the measures (measure M6 on marketing natural landscape and dynamic processes) focuses on these opportunities.
- \* **Communication as an interdisciplinary topic:** In the project, communication proved to be an important cross-cutting issue. It plays a crucial role in the strategy process and throughout the implementation. Moreover, it is the solution to various challenges identified in the region. The goal of understandable, targeted, regular and timely communication is important in all fields of action of the strategy. Therefore, two priority measures target communication and information exchange.

## SOURCES AND FIGURES

- Climate ADAPT (2018): Climate adaptation strategy for the Grimsel area in the Swiss Alps (2018). Online: <https://climate-adapt.eea.europa.eu/metadata/case-studies/climate-adaptation-strategy-for-the-grimsel-area-in-the-swiss-alps> (4.4.2019)
- OIK I (2013): Korridorstudie Grimsel, Gefahrenabklärung periglaziales Gefahrenpotential Grimselstrasse, Oberingenieurkreis I (OIK).
- Tiefbauamt des Kantons Bern (2016): Klimaadaptionsstrategie Grimselgebiet, Strategie zur Anpassung an die Auswirkungen des Klimawandels im Grimselgebiet. Regionalkonferenz Oberland-Ost. Online: <https://www.bafu.admin.ch/dam/bafu/fr/dokumente/klima/externe-studien-berichte/klimaadaptionsstrategiegrimselgebiet.1.pdf.download.pdf/klimaadaptionsstrategiegrimselgebiet.pdf> (4.4.2019)
- Tiefbauamt des Kantons Bern (2016): Methoden- und Erfahrungsbericht zur Klimaadaptionsstrategie Grimselgebiet, Strategie zur Anpassung an die Auswirkungen des Klimawandels im Grimselgebiet. Regionalkonferenz Oberland-Ost. Online: <https://www.bafu.admin.ch/dam/bafu/fr/dokumente/klima/externe-studien-berichte/klimaadaptionsstrategiegrimselgebiet.pdf.download.pdf/klimaadaptionsstrategiegrimselgebiet-methoden-erfahrungsbericht.pdf> (4.4.2019)

### Figures:

Figure 1: Natural hazard processes in the Grimsel region (© Oberingenieurkreis I & Regionalkonferenz Oberland-Ost, 2016)

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## LINKS AND CONTACT

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**Link:** [www.oberland-ost.ch/images/pdf/regionalentwicklung/klimaadaptionsstrategie\\_grimselgebiet\\_2016.pdf](http://www.oberland-ost.ch/images/pdf/regionalentwicklung/klimaadaptionsstrategie_grimselgebiet_2016.pdf)

# SWITZERLAND

## SOLUTIONS TO SECURE AREAS AS FLOOD CORRIDORS

- \* Development of a guideline to secure areas as flood corridors for public authorities on cantonal and municipal level including a decision-making scheme and recommendations for its implementation
- \* Facilitating excess load management by controlled discharge of water flow through flood corridors
- \* Finding solutions within the framework of spatial planning procedures and hydraulic engineering projects

### DESCRIPTION

The project “Solutions for Securing Areas as Flood Corridors” is one of the 31 pilot projects initiated within the frame of the Climate Adaptation Strategy Switzerland, conducted between 2014 and 2015 and funded by the Federal Office for Environment (Bundesamt für Umwelt, Schweiz, BAFU). The aim of the project was to develop recommendations to proactively secure land as flood corridors on a long-term basis, while including landowners and different user groups in the decision-making process. Flood corridors significantly contribute to **reducing the risk of overload situations** by controlling land use and the management of agricultural land. If an increase in frequency and magnitude due to climate change is expected to happen within the near future, the surging water needs to be discharged in a controllable manner producing the least damages possible. Therefore, the **guideline** proposes a **procedure for securing areas as flood corridors**, including fundamental circumstances and steps for its realization. The legal framework, the practice of spatial planning and the realization of hydraulic engineering projects were important for the development of this scheme. It primarily addresses those in charge of the cantonal civil engineering, spatial planning, environmental and agricultural offices. A civil engineering office (EBP Schweiz AG) conducted the pilot project on behalf of and in close cooperation with the cantons Nidwalden and Thurgau as well as the Swiss Federal Office for the Environment. The supporting team consisted of associates of the federal offices and the state offices of the two cantons. The following actions were part of the project:

- \* Collecting and processing existing basics and practice examples on securing areas for flood corridors
- \* Identifying solutions and developing a comprehensive decision-making scheme
- \* Describing challenges for the implementation of recommendations
- \* Communicating the results via leaflets and technical conferences

The guideline outlines a **decision-making scheme**, which includes solutions for spatial planning procedures and for hydraulic engineering projects. Spatial planning offers for example the possibility to prevent the designation of building land, or the possibility to impose conditions on the current use and/or management (e.g. Figure 1). Within the framework of hydraulic engineering projects, private law offers solutions for solving restrictions of the use or management or, if necessary, for changing ownership conditions.

**Status:** The project “Solutions to secure flood corridors” was finished in 2015. Currently, the project organization office did not yet identify any projects or case study that make use of the guideline. However, several projects already implemented or are planning to implement kinds of flood corridors such as the flood corridor

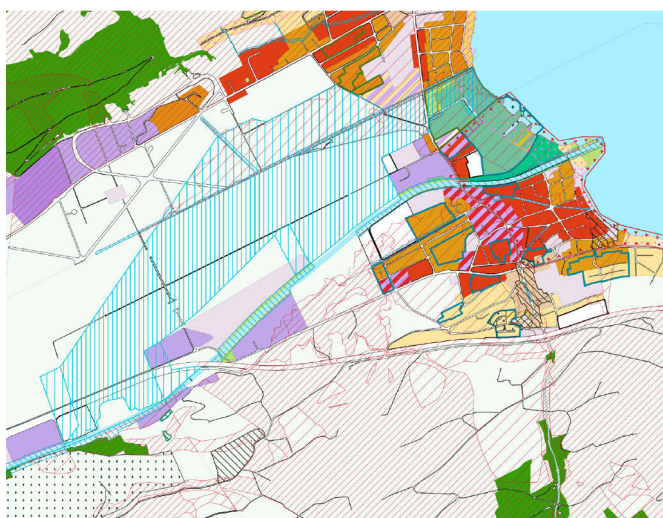


Figure 1: Visualization of the flood corridor Aawasser in the land use plan Buochs (© GIS Daten AG).

Aawasser (Engelberger Aa, Canton Nidwalden), 2<sup>nd</sup> Thurkorrektio (Canton Thurgau), 3<sup>rd</sup> Rhonekorrektio (Canton Wallis), Wasserbauplan Lutschine (Schwellenkorporation Böldli-Süd), Linthwerk (Canton Glarus) and Urner Talboden (Canton Uri).

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The project is part of the Swiss program "Adaptation to climate change" in the cluster "Dealing with Natural Hazards" and deliberately connects CCA and DRR by presenting a solution for the increasing flood risk, also due to climate change.
<b>Added value for both CCA and DRR:</b>	The guideline facilitates the process of implementing flood corridors on a municipal or cantonal level. By describing solutions for securing areas, developing a decision-making scheme and collecting experiences from case studies this project publishes recommendations for responsible policy- and decision-makers. A participative implementation process of flood corridors also contributes to mainstreaming and awareness raising of climate change adaptation and disaster risk reduction.
<b>CCA: Uncertainty and long-term perspective considered</b>	The guideline considers current climate scenarios that predict more frequent and intense flood events, exceeding the design event of protective measures. There remains a residual risk, for which this project seeks to find solutions. Flood corridors provide a possibility to cope with the overload case with high drainage peaks and contribute to minimizing the risk. This adaptation measure is largely independent of how the magnitude of flood events in individual watercourses will actually shift with regard to climate change. Depending on the level of the peak discharge, there is a higher or less high flooding of the corridor. Therefore, the resulting damage changes rather linearly and not abruptly, as opposed to the destructive collapse of dams which are measured according to a design event.
<b>DRR: Risk management cycle considered</b>	The Swiss strategy "Protection against Natural Hazards" requires an integrated risk management. The idea is to combine possible protective measures and actions in the risk cycle of prevention, intervention and regeneration in the best way – depending on the restrictive hazard situation. The guideline suggests a planning of flood corridors at the cantonal level in the frame of an integrated action plan. The best way is to integrate the designation of flood corridors into the (municipal or cantonal) action planning (Maßnahmenplanung). Suitable instruments are the water construction plan (Wasserbauplan, Wasserbauprogramm) and the cantonal structure Plan (Richtplan).
<b>Linkage between several governance levels and/or elements</b>	The guideline promotes collaboration between several sectors, such as water management, environmental protection, agriculture, civil engineering and spatial development. It further aims at including not only public authorities (cantonal and municipal offices), but also affected landowners and users to generate long-term, consensual solutions.

## CHALLENGES

- \* **Dealing with increasing risk for buildings in flood corridors:** The establishment of a flood corridor can increase the risk in the flood corridor beyond the desired level of protection. In this case, the implementation of further measures is necessary until the achievement of the desired level of protection or the protection goals. If no proportional measures are possible, solutions within the scheme of private law, such as the compensation for landowners plays an important role. In this context, the following questions arise: Is risk compensation necessary through local measures (site or property protection)? Who finances these local measures? In the absence of proportionate measures, is it possible to compensate the damage instead of protecting the site or property? By answering these questions, the clarification of the legal situation is needed.

- \* **Identifying appropriate solutions for a specific situation:** The natural, legal, property- and usage-related characteristics of the areas relevant to flood corridors vary from case to case. It is important to consider this circumstance adequately in finding a solution and to obtain an overview of the affected areas in order to achieve sustainable, widely accepted solutions in the long term.

## SUCCESS FACTORS

- \* **Assessment of practice examples:** Five practice examples in the cantons Nidwalden and Thurgau, as well as workshops with experts served as a basis for the preparation of the guideline. The structured description of the selected examples allowed the screening of important aspects in implementing flood corridors. The content of the description is structured as follows:
- \* **Initial situation and project description:** previous land-use and affected inhabitants, description of the project, objectives and measures, type of corridor etc.
- \* **Specific solution procedure of the project:** type of procedure (spatial planning or hydraulic engineering project), steps, involved stakeholders, timeframe, alternative solutions/possible combination of solutions, procedure of possible compensation measures etc.
- \* **Description of the solution:** land-use afterwards, use- and management restrictions, construction ban, easements, visualization of the flood corridor in the land use planning, amount of compensation etc.
- \* **Experiences:** acceptance of the project, political feasibility, practical and technical feasibility, challenges, success factors, quantity and annuality of events at which the flood corridor has already been used etc.
- \* **Determining suitable areas as flood corridors with integrated planning:** The planning of flood corridors at the cantonal level should be carried out within the framework of an integral planning of measures on a municipal and cantonal level, otherwise, the acceptance in the population is low. The correct instrument is usually the water plan (also referred to as hydraulic engineering program or river catchment management). A recommendation for the cantons is to provide an overview of the possible locations of flood corridors. The setup of a flood corridor in a specific area is recommended especially, if there is a risk of major damage in the case of overload and there is an overriding public interest. It is important to ensure the securing of solutions for flood corridors in the long term, for example by including areas as flood corridors in the cantonal structural plan, in the land use plan or, if necessary, via land register entries.
- \* **Involvement of authorities and affected citizens throughout the planning process:** For securing areas as flood corridors, several authorities at cantonal and municipal level are concerned. Therefore, it is necessary to involve the authorities responsible for the planning at an early stage and to co-ordinate the procedure. For example, the attendance of municipal representatives during the planning process ensures a permanent and transparent communication between the administration and the citizens. Acceptance depends essentially on whether a solution with the concerned parties is consensual. Even if the land securing is a public-law injunction, the involved stakeholders and affected citizens should receive information on these decisions beforehand. Attempting to reach a mutual agreement with those heavily affected should be one of the first steps of the planning process.
- \* **Promotion of flood corridors:** In order to promote the instrument of flood corridors at the municipal level, cantons can passively or actively inform communities about the possibility of flood corridors as a protective measure or advise them in specific cases. The cantonal webpage is an example for passive information, while informational events are active.

## LESSONS LEARNT

- \* **Determination of standardized corridor types to facilitate the process in the municipalities:** The designation of flood corridors in land use planning and the definition of restrictions on use and management in the construction and zoning regulations would be easier for municipalities if standardized flood corridor types existed. For the development of these corridor types, it would be necessary to identify the annuality and intensity of events within the corridor and to define proposals for use and management restrictions per type, also concerning agricultural land and transport infrastructure. Furthermore, it is essential to check the suitability of a legal anchoring of the corridor types.

- \* **Encouraging Acceptance:** The acceptance of a project to secure areas as flood corridors among the population and the landowners affected has a major impact on the feasibility and long-term success of flood corridors. Therefore, the inclusion of all stakeholders in the planning plays an important role. It is crucial to take into account the concerns of those affected to increase the acceptance of the project significantly. In order to involve the landowners more closely and to increase their acceptance, it is important that the affected parties get information about project goals and the planning steps at an early stage. Possible forms are information events, media, site visits, individual negotiations on possible accommodation, etc. It is important that all property owners are treated equally.
- \* **Economic Feasibility of Flood Corridors:** As an example, the canton Nidwalden implements not only structural and organizational protection measures, but also checks the economic feasibility of spatial planning measures to secure areas as flood corridors. An estimate of the predicted development of potential damage losses for 2085 showed that the settlement pressure is expected to increase continuously. The analysis of the additional required building area revealed that in the future, flood risk will rise and that it is necessary to include flood corridors into the cantonal legislation. The investment in flood corridors reduces not only the risk, but also the costs by avoiding damages in the future. Thereby, the canton contributes to a cost-effective flood protection, because the planned measures reduce current and prospective risks.

## SOURCES AND FIGURES

- EBP Schweiz AG (2015a): Lösungsansätze zur Sicherung von Flächen für Hochwasserkorridore. Leitfaden. Schlussbericht. Online: <https://www.nccs.admin.ch/dam/nccs/de/dokumente/klima/externe-studien-berichte/loesungsansaetzezursicherungvonflaechenfuerhochwasserkorridore.pdf.download.pdf/>
- EBP Schweiz AG (2015b): Flächen für Hochwasserkorridore sichern – Wie vorgehen? Faltblatt. Online: [https://www.nccs.admin.ch/dam/nccs/de/dokumente/klima/externe-studien-berichte/flaechen\\_fuer\\_hochwasserkorridoresichern.pdf.download.pdf/](https://www.nccs.admin.ch/dam/nccs/de/dokumente/klima/externe-studien-berichte/flaechen_fuer_hochwasserkorridoresichern.pdf.download.pdf/)
- EBP Schweiz AG (2015c): Projekt Flächen für Hochwasserkorridore sichern. Online: <https://www.ebp.ch/de/projekte/flaechen-fuer-hochwasserkorridore-sichern>
- EBP Schweiz (2015d): Lösungsansätze zur Sicherung von Flächen für Hochwasserkorridore. Materialband zum Leitfaden: Praxisbeispiele.
- Schweizerische Eidgenossenschaft, BAFU (2017): Pilotprojekt zur Anpassung an den Klimawandel „Lösungsansätze zur Sicherung von Flächen für Hochwasserkorridore“. Pilotprojekte zur Anpassung an den Klimawandel: Cluster „Umgang mit Naturgefahren“ Online: <https://www.nccs.admin.ch/nccs/de/home/massnahmen/projekte/pak/pilotprogramm-anpassung-an-den-klimawandel2/pilotprogramm-anpassung-an-den-klimawandel/pilotprojekte-zur-anpassung-an-den-klimawandel-cluster-umgang-0/pilotprojekt-zur-anpassung-an-den-klimawandel-loesungsansaetze-.html>

### Figures:

Figure 1: Visualization of the flood corridor Aawasser in the land use plan Buochs, blue hatching: special use zone flood corridor (Webportal Kanton Nidwalden, Zonenplan. [www.gis-daten.ch](http://www.gis-daten.ch) [13.10.2015]; EBP Schweiz AG, 2015b)

## LINKS AND CONTACT

**Link:** <https://www.ebp.ch/de/projekte/flaechen-fuer-hochwasserkorridore-sichern>

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# GERMANY

## KLIWA

### CLIMATE CHANGE AND CONSEQUENCES FOR WATER MANAGEMENT

- \* A **cooperation between** the German federal states Bavaria, Baden-Württemberg, Rhineland-Palatinate and the German Meteorological Service
- \* Dealing with the impacts of climate change on the water management and river basins of Southern Germany
- \* Analysis of present and future changes of climate related parameters for a robust basis to generate recommendations for action

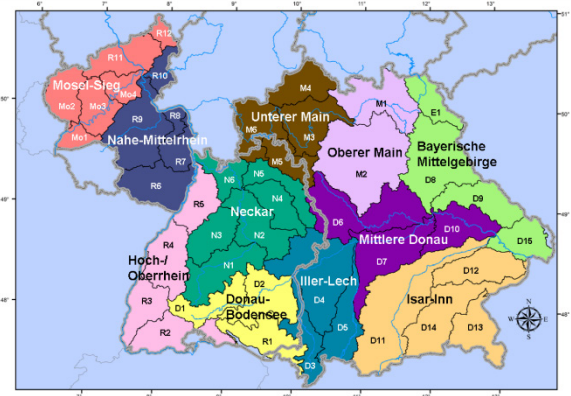


Figure 1: Overview of the 44 KLIWA study areas and 11 KLIWA regions (© KLIWA, 2016)

## DESCRIPTION

KLIWA is a **research cooperation program**, initiated in **1999** by the German federal states Baden-Württemberg and Bavaria and the German Meteorological Service. In 2007, the federal state of Rhineland-Palatinate joined the program. It refers to the IPCC report since 2001, concluding that changes in the climate directly affect the surface water and ground-water, which further influences the water management in various sectors (e.g. flood protection, rainwater management and soil protection). Therefore, the program emphasizes the necessity to develop and complement the knowledge basis about the **impacts of climate change on the water management, considering new findings in climate research**. Collecting basic data enables the **quantification of impacts and the development of recommendations** for sustainable actions. Still, a sustainable planning of the water management requires adequate data and verified information on the development of the water balance. Therefore, a **long-term research program like KLIWA** following a systematic approach along with **interdisciplinary and transnational cooperation** is necessary. KLIWA takes into account **regional climate projections**, which assess the impacts of climatic changes to identify its effects on the run-off regime on a regional level. The concept of KLIWA entails a framework of **five sectors**. Every sector includes several projects with a duration of one to four years:

- \* **Sector A: Determination of previous changes in the climate and the water balance** (long-term behaviour as a reference/initial situation)
- \* **Sector B: Estimation of the effects of possible climate changes on the water balance of river basins** (climate projections and water balance models)
- \* **Sector C:** Measurement and evaluation of the continuous changes in selected climate-relevant parameters and the water balance (Climate-Monitoring)
- \* **Sector D:** Development of sustainable prevention concepts for water management action (recommended actions)
- \* **Sector "Ö":** Public relations and dissemination

The actors involved incorporate the Baden-Württemberg ministry of environment, climate and energy (Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg, UM BW), the Bavarian ministry of environment, health and consumer protection (Bayerisches Staatsministerium für Umwelt und Verbraucherschutz, StMUV) and the Rhineland-Palatinate ministry of environment, energy, food and forestry (Ministerium für Umwelt, Energie, Ernährung und Forsten Rheinland Pfalz, MUEEF). The German Meteorological Service, as a scientific partner, supports, consults and is represented with the other partners

in the steering committee and the KLIWA working group. Additional members of the group are experts from the environmental state agencies of the partners, having the duty to implement the respective projects.

**Status:** The present phase of the program focuses on the development of **recommendations for action for various sectors in the water management** considering climate change adaptation. The individual projects are mostly in progress or already finished. The KLIWA reports contain results of various analysis and findings of the cooperation. The KLIWA brochure and the internet homepage summarizes these current findings ([www.kliwa.de](http://www.kliwa.de).)

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The high frequency of flood events in the 1990s in Southern Germany raised the question of the root causes and the impacts of climate change on the water management. The aim of the cooperation is to gain knowledge and facts about the extent and dimension of the impacts of climatic changes in order to adapt and to reduce the risk of natural hazards on a regional level.
<b>Added value for both CCA and DRR:</b>	The use and ongoing support in the development of regional climate projections enables the projection of regional impacts of climate change in Southern Germany on the water management. The processing of the collected data on the climatic parameters generates new findings on the prospective development of the water management. Therefore, recommendations for action of climate change adaptation as well as for disaster risk reduction will be more precise and explicit for this region.
<b>CCA: Uncertainty and long-term perspective considered</b>	The uncertainty and possible changing of regional parameters were reasons for setting up the cooperation. Sector B focuses on developing future climate scenarios (2021 – 2050) by using climate projections and impact models (hydrological & water ecology) for scenario simulations for e.g. flows, groundwater recharge or water quality.
<b>DRR: Risk management cycle considered</b>	The cooperation or the administrations will translate the results of the research into recommendations for action to regulate the water management in different sectors such as flood protection, drought and rainwater management as well as soil protection. The recommendations include topics such as retention basins, land use management, technical flood protection and flood provision, as well as risk communication, which is an important focus and implies informing the public about changes in precipitation, flood risk and heavy rainfall.
<b>Linkage between several governance levels and/or elements</b>	The federal state ministries and environmental agencies work together with representatives of the region, municipalities and local experts to plan and implement the projects. The exchange of knowledge, information and data between the federal states and the different special fields (e.g. water management, climate change research, public administration) are of vital importance in this cooperation.

## (FUTURE) CHALLENGES

- \* **Considering continuously expanding knowledge on climate change:** In the last couple of years, the knowledge on global and regional climate change expanded and the corresponding climate projections and associated data have multiplied. The task of KLIWA is to consider this development and to be open to the use of new global and regional climate projections. As far as possible, KLIWA is continuing to improve climate models by providing feedback to the climate modellers about the multiple experiences gained from their use in impact models. Therefore, a future challenge for KLIWA will be, on the one hand, to handle existing model ranges, on the other hand, to elaborate precise projections while taking the differences from various climate projections into account. Furthermore, the comprehensible representation **and communication** of these results to the public play an important role.

- \* **The uncertainty of climate models:** The quantification of expected changes due to climate change will continue to be highly complex. The challenge is to elaborate explicit adaptation measures based on the results of climate models. However, science and research are continuously progressing in understanding the independencies and impacts of global climate and the modelling of natural hazards at different scales. In the course of further investigations, the review of the methods used so far by KLIWA and the consideration of new findings are important processes.
- \* **Strengthening cooperation and exchange:** The investigations carried out by KLIWA require intensive cooperation between research and administration. For the future, this cooperation needs strengthening. The research results of national and international institutions need to be included in the work of KLIWA. Essential prospective tasks are the monitoring of pending work on adaptation measures at EU and national level and the cooperation and exchange of experience with other federal states. Ultimately, the issue of climate change and water management will become a permanent task for the water management authorities involved in KLIWA.

## SUCCESS FACTORS

- \* **Public Relations for the dissemination of project results:** From the beginning, the aim of KLIWA was to inform the interested public, the professional world and the political authorities about the objectives and results on a regular basis. Due to the increasing awareness of climate change and its impacts, there is a great need for scientifically sound information for the public. With the sector public relations, the program attempts to present comprehensible results and raise awareness for the problems that humankind will face in the future. Therefore, KLIWA uses the internet, scientific journals, administrative reports, colloquia and workshops to share information on the program and its results. Especially the scientific symposia, which take place every two to three years, the KLIWA brochures as well as regular booklet publications serve as effective information channels.
- \* **Regional climate projection for the prevention and mitigation of natural risks:** Simulations on water balance models help to estimate future changes in the water management. The global climate models serve as a basis for these simulations. In KLIWA, quality and plausibility checked regional climate projections are used based on statistic and dynamic modelling techniques. The consideration of only a single climate projection is not effective. Therefore, KLIWA aims to create a foundation based on a group of several climate projections. The use of regional based projections and research of KLIWA is exemplary and bridges the gap between regional and global based studies. The detection of climatic changes on the regional level is important for early prevention and mitigation measures and provides a transparent basis of information for the population. For this the climate change research additionally relies on long-term observations of meteorological and hydrological data collected by the German Meteorological Service and the federal states. For long-term observation data from 1991 onwards is used for climate and hydrological variables.
- \* **Synergies with other projects for effective research:** Since the program started in 1999, KLIWA has already delivered important findings, which are essential for Southern Germany and other regions. Projects, such as the Bavarian Flood action program 2020plus (Bayerisches Hochwasserschutz – Aktionsprogramm 2020plus (AP2020plus)), refer to the results from the KLIWA cooperation project (climate change factor). Institutions like the BMBF and the European Union deal with further questions on this topic in other research projects. The Federal Institute of Hydrology as a federal agency has an associate status (*außerordentliche Mitgliedschaft*) of KLIWA. This is to ensure an intensive and timely exchange of recent results, which has a positive effect on the objectives of all research projects involved. It is the task of KLIWA, regardless of the producing projects, to bring together all relevant results for the

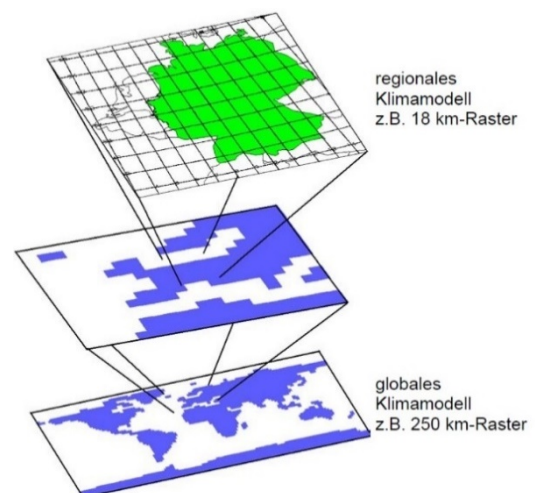


Figure 2: Downscaling from Global Climate Model to Regional Climate Model (© Ulbrich, 2004 in: KLIWA, 2006)

best basis for recommendations of action. The collective approach of the federal states involved in KLIWA promotes consistency and economic efficiency. Furthermore, the statements derived from the results of KLIWA are more decisive when introduced into the discussion of CCA and DRR by more than one federal state. Collaboration beyond the borders of a single federal state or country provides more possibilities in the research sector and connects stakeholders, which accelerates the exchange and certain processes connected with data and information.

## LESSONS LEART

- \* **From options to recommendations using discussions on the local level:** It is difficult to formulate recommendations for action because there are a lot of different users and aspects to consider, which vary from region to region. Therefore, KLIWA has decided to continue working with options rather than recommendations in order to show, which options exist and which conflicts, problems and opportunities are associated with them in a “neutral” manner. Within a next step, the discussion on the feasibility and effectiveness of these options on the local level leads to specific solutions and measures. For this reason, KLIWA does not already provide final recommendations, but presents options that need to be examined, and processed and decided at the local level. KLIWA provides an impulse to act, it raises questions, provides information and raises awareness.
- \* **Long time frame enables learning processes:** A challenge for KLIWA is to deliver authoritative projections and long-lasting tenable results considering the uncertainty of climate change. Therefore, it is important to have enough time to develop reliable methods. Referring to a 20-years of experience, KLIWA benefits from learning processes which were only possible due to the long project period. For example, it took a long time to develop options for actions, based on the acquired knowledge and subsequently to create concrete recommendations.
- \* **Project scale defines the implementation approach on the local level:** There is a difference between projects focusing on one single case study (e.g. municipality or river basin) and projects dealing with a larger area with multiple case studies such as Southern Germany. The scale of the project defines the extent and approach of the project and the quality of the derived adaptation measures. KLIWA focuses on the creation of a knowledge base about the impacts of climate change on a larger level. It is therefore difficult to transfer this basic knowledge to a local level. For this step, the local conditions need to be taken into account in order to be able to select necessary and possible adaptation measures. Furthermore, the consideration of financial and political constraints on the implementation level limits the possibilities for action. KLIWA works together with local authorities to advise and inform about possible adaptation options. For example, in Bavaria, mainly the water management offices are responsible for the implementation of this task. Within a next step, they need to decide to what extent it is possible to implement adaptation measures in the various municipalities.
- \* **Collaboration and exchange in various research projects:** Reasonable and targeted adaptation to the consequences of climate change requires extensive knowledge of processes as well as past and future developments. Therefore, climate research is very important. One institution alone can hardly bear the associated responsibilities and workload. In various projects, the involved federal administrations have been working together to develop, evaluate and summarize the required knowledge and to make it available for the public in collaboration with universities, the DWD and international partners e.g. projects like AdaptAlp, KlimEx, ClimChAlp, ESPACE, GLOWA-Danube, WETRAX. KLIWA is the framework for various research projects and collects all relevant results. This enables a stable basis of knowledge, which is necessary to recommend concrete and long-term options and measures for Southern Germany.
- \* **Including communication experts for early and clear communication:** It is important to integrate the target group that uses the information gathered by KLIWA, e.g. ministries, water management offices, early in the process of the project, in order to know the specific values required. For scientists, it is a challenge to communicate the results in a way that is understandable for a specific group. This process of transforming the information into clear statements and predictions is time-consuming and needs to be considered from the beginning. The integration of communication experts, who actively accompany the project with a communication strategy, is beneficial. The communicability and the informative value of the results is an important aspect in terms of adaptation to climate change. For Bavaria, the climate change factor was introduced for technical flood protection measures, based on the results of KLIWA. This factor is a clearly defined value that applies for the federal State of Bavaria, although climatic changes in some areas will be above or below this value. However, it is easy to communicate and consistent.



- \* **Project team consisting of administrative offices - both advantage and disadvantage:** Beneficial for KLIWA is that the involved partners are all administrative offices that aim to collect information, knowledge and options for the administrative level. In contrast to other projects, where connecting between research and administration requires additional effort, the administrative offices of KLIWA already had a selective and targeted approach towards the development of options from the beginning. However, the administrative bodies are no scientific experts and have to compile this scientific expertise and methodological basics through other research projects and studies or time. This approach also requires time and effort to ensure a consistent procedure and authoritative results.

## SOURCES

- BLfU – Bayrisches Landesamt für Umwelt (2017): Niedrigwasser in Bayern. Grundlagen, Veränderung und Auswirkungen. KLIWA (2006): Regionale Klimaszenarien für Süddeutschland. Abschätzung der Auswirkungen auf den Wasserhaushalt. Heft 9.
- KLIWA (2015): Vorgehenskonzept. Fachlicher Rahmen für die Zusammenarbeit der Länder Baden-Württemberg, Bayern und Rheinland-Pfalz sowie dem Deutschen Wetterdienst zum Thema Klimaveränderung und Konsequenzen für die Wasserwirtschaft.
- Ulbrich U. (2004): Mögliche diagnostische Arbeiten zu Extremereignissen. – Planungstreffen für den deutschen Beitrag zum IPCC AR4, unveröffentlicht.

### Figures:

Figure 1: Overview of the 44 KLIWA study areas and 11 KLIWA regions (© KLIWA, 2016)

Figure 2: Downscaling from Global Climate Model to Regional Climate Model (© Ulbrich, 2004 in: KLIWA, 2006)

## LINKS AND CONTACT

**Contact:** [www.kliwa.de/kontakt.htm](http://www.kliwa.de/kontakt.htm)

**Homepage:** [www.kliwa.de](http://www.kliwa.de)

## GERMANY

### BAVARIAN FLOOD PROTECTION ACTION PROGRAM AP2020PLUS & CLIMATE CHANGE FACTOR

- \* Bavarian program for a 20-year timeframe that combines measures of technical flood protection, natural retention and the risk management
- \* **Active contribution of citizens** in planning flood protection measures within the “Hochwasserdiallog Bayern”
- \* **Climate change factor** (“Klimaänderungs-zuschlag”) additionally introduced as a factor for the calculation of technical flood protection systems

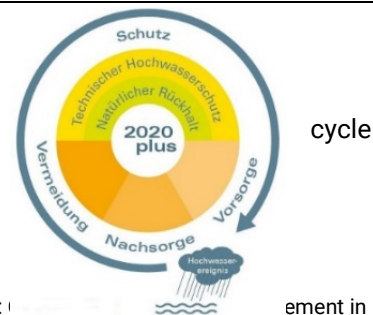


Figure. 1: Integrated risk management in Bavaria, Action Program 2020plus  
(© STMUV BAYERN, 2014)

## DESCRIPTION

After extensive floods in 1999, the Bavarian State Ministry of Environment and Consumer Protection (Bayerisches Staatsministerium für Umwelt und Verbraucherschutz, StMUV) adopted the “Flood Protection Action Program 2020 – for sustainable flood protection in Bavaria” (AP2020plus), which includes a professional strategic approach to flood protection and a schedule for its implementation. It is based on the flood risk management, including flood risk maps and management plans. After the flood event in June 2013, the StMUV introduced the program 2020plus. It combines the already existing Action Program 2020 with its fields of action “Technical Flood Protection”, “Natural Retention” and “Flood Prevention” within the integrated risk management cycle. It focuses on the resilience of flood defense systems, the recovery after flood events and the prevention of flood damages. The herein applied integral approach enables a rapid and flexible reaction, in particular to the effects of climate change. The new program AP2020plus additionally considers **residual risk, the creation of more resistant protection systems and an extended concept for retention**. The program connects the Bavarian water management, the cities and municipalities, the provincial offices, the ministries responsible for agriculture, forestry and nature conservation as well as the citizens.

The risk management approach of the AP2020plus is based on a **strategic flood risk dialogue** (according to the European Directive 2007/60/EC on flood risk management) between all involved actors, such as state administrations, cities and municipalities, infrastructure agencies, industrial and commercial enterprises and the individual citizens. Basis for a constructive risk dialogue are maps that visualize the hazards and risks in a way that is understandable to the public. This dialogue is organized on a **local level** between the municipalities and cities, the water management offices and the civil protection authorities. The Free State of Bavaria offers municipalities the opportunity to deal with the dangers and risks in their area with expert support. This should enable them to continue this dialogue with those affected in the municipality if necessary. In addition, the “Flood risk dialogue Bavaria”, initiated by water authorities in 2015, offers **citizens** the opportunity to actively contribute to the development and planning of flood protection measures, especially flood polders. An **interregional dialogue with experts** takes place in form of lectures and discussion rounds involving various stakeholders, e.g. representatives of citizens’ initiatives, nature conservation, agriculture and administration and focuses on the general flood risk situation and possible measures.

In 2004, the Bavarian government introduced the **“climate change factor” for the dimensioning of flood protection systems** (see Figure 2), based on the first results of the KLIWA program (see case study on KLIWA). In all Bavaria, the increase in the flood discharge for a 100-year flood is estimated at 15 percent. Although, the climate change factor is not directly part of the action program 2020plus, it became **legally binding** for the development and construction of Bavaria flood protection systems **at major watercourses**, in 2004. For smaller watercourses, the municipalities are responsible but **receive subsidies from** the Free State of Bavaria for the implementation of flood control measures, if they include the climate change factor. Therefore, the factor is the basis for technical flood protection and plays an important role in the Action Program 2020plus.

**Status:** In Bavaria, there are currently around **250 measures under construction** for the protection of the population against flooding, ranging from small retention basins to major flood protection projects along the Danube. Additional protection measures of the program are **flood polders** (Flutpolder), which serve as retention areas **in case of overload**. Currently, several flood polders are under construction or already finished (e.g. Seifener Becken, Riedensheim, Katzau, Öberauer Schleife).

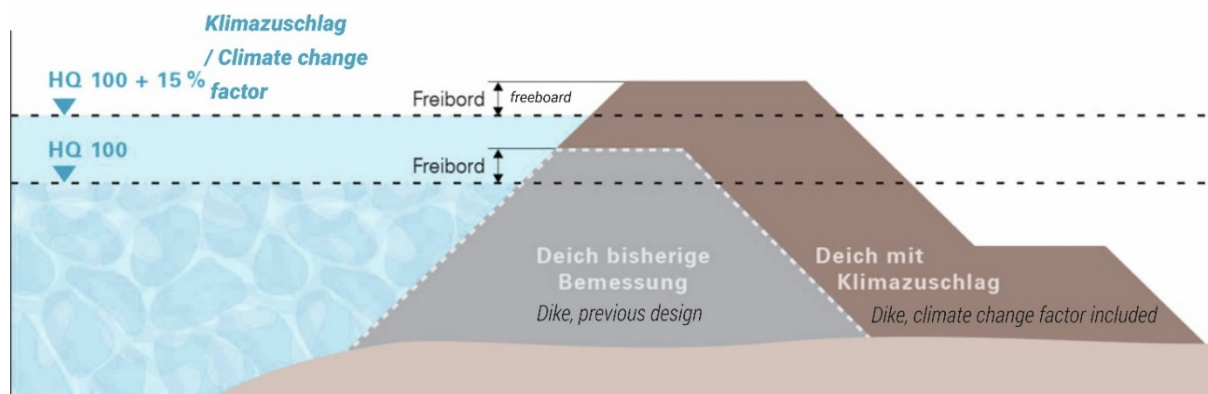


Figure 2: The surcharge on the current flood discharge, which is the basis for the dimensioning of protective structures, takes into account the possible impact of climate change (© KLIWA, 2019), own translation in italic.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The program analyses residual risk and aims to revise the flood retention concept. It takes into account the potentially higher flood discharge in the future (climate change factor) and tries to find solutions for a flood protection concept adapted to climate change.
<b>Added value for both CCA and DRR:</b>	The integrated flood risk management, pursued by the program focuses on sustainable flood protection by implementing large-scale measures such as flood polders. The flood dialogue facilitates the horizontal and vertical communication, increases the acceptance of the population for measures and structural protection structures and ensures a broad discussion about possible solutions. In addition, the program serves as a guideline for how to deal with governmental tasks, such as flood protection, within the administration on the national, regional and local level (municipalities).
<b>CCA: Uncertainty and long-term perspective considered</b>	The program 2020plus considers climate change in the phase of planning flood protection systems. The climate change factor is based on the current results of KLIWA, a research program dealing with the impacts of climate change on the water management and river basins of South Germany. The future flood discharge is expected to exceed the current HQ <sub>100</sub> by the defined climate change factor. Nevertheless, it is only an estimated factor, due to the unpredictability and complexity of climate change-related effects on precipitation levels.
<b>DRR: Risk management cycle considered</b>	The Action Program 2020plus aims to improve the flood protection and to reduce the potential damage of flood events by implementing measures in the phases “recovery” and “preparedness”, which are part of the integrated risk management cycle.
<b>Linkage between several governance levels and/or elements</b>	The risk management is a continuous process based on a systematic flood dialogue between all actors involved. The actors include state administrations (water management, agriculture, forestry, and nature conservation), provincial offices, cities and municipalities, infrastructure supervisors, industrial and commercial enterprises, and every single citizen.

## CHALLENGES

- \* **Little awareness of residual risk:** The awareness of residual risk in the population is low, since extreme natural hazard events rarely occur and people tend to forget about hazardous events after several years (WAGNER, 2004; zit. in. WOLTER-KRAUTBLATTER et.al. 2016; Schneiderbauer et al. 2018). However, every flood-protection system has its limitations and a certain residual risk will remain. Therefore, it is important to sensitize the population for self-provision and the necessity of flood protection measures. Due to low insurance rates against floods and heavy rainfall events, the Bavarian State Government, associations and business representatives, have launched a campaign to raise awareness of natural hazards insurance ([www.elementar-versichern.de](http://www.elementar-versichern.de)), in 2018. The aim is to inform citizens about the importance of self-provision and comprehensive insurance cover against natural disasters.
- \* **Continuous revision of flood risk maps and management plans:** Within the duration of the action program 2020plus the technical progress in climate change research will continue, calling for an adjustment of the planning basis of the program, such as the revision and adaptation of flood risk maps and management plans within a 6-year cycle (according to the European Directive 2007/60/EC on flood risk management). Considering the amount of already existing flood-, torrent protection structures and retention basins, flood risk protection is an ongoing task. Only reliable monitoring and maintenance ensures long-term functionality.
- \* **Stunning responsibility for municipalities:** In Bavaria, the municipalities are responsible for the maintenance and development of protective structures on third order watercourses (smaller rivers and torrents) and its catchment areas. However, professional and economic maintenance is often a burden for a single municipality or water association. In many cases, the municipalities are unable to provide necessary financial resources for a permanent recruitment of specialized personnel, ongoing education and training of those involved and the provision of material and equipment. Therefore, the Bavarian state supports municipal flood protection concepts and measures of the municipalities if budget funds are sufficient. This helps to avoid unreasonably high burdens of cost for the municipalities and its citizens. Still, an additional challenge for municipalities is the lack of knowledge of different funding opportunities and the choice of the appropriate approach.

## SUCCESS FACTORS

- \* **European Flood Directive as a basis:** The European Directive 2007/60/EC on flood risk management was transposed into national law in 2010. Since then, it creates the basis for risk assessment and provides a framework for flood risk measures. Against this background, the AP 2020plus focuses on the aspect of protection, defines the financial framework, prioritizes the individual projects and provides the technical and strategic basis.
- \* **Foreseen availability of financial resources for decades:** The action program of Bavaria goes back to the year 1999, ensuring a regular and projectable budget each year. Instead of 115 million €, around 150 million € per year are now available for the implementation of the AP 2020plus. In addition, the program "Flood Protection Danube" with a total amount of 600 million € is part of the program since 2013. Thus, the flood defence financing volume increased from 2.3 € to 3.4 billion €. This led to a faster implementation of numerous measures. The new Bavarian Water Action Program 2030 (Bayerisches Gewässer-Aktionsprogramm 2030, *Bavarian AP2030*), seamlessly following after the AP 2020plus (refer to case study on AP2020plus), enables a continuation and adaptation of an integrated flood risk management in Bavaria. In addition, the Bavarian AP 2030 also integrates measures for water body development (according to the Water Framework Directive 2000/60/EC) and for improving the social function. A budget of 200€ per year is designated for all three areas.

## LESSONS LEARNT

- \* **Flood protection boosts synergies:** For further improvements in flood protection, the Bavarian Council of Ministers is currently setting up a new Water Action Program 2030, with the main objective to protect the population from damages caused by floods and to strengthen existing protection structures, ensuring protection, production and preservation. In addition, the program takes into consideration the social function of the watercourses. As for example, the accessibility of the watercourses for the population

should be provided since rivers and streams are regarded as being important natural areas for recreation, leisure activities and encounters. Furthermore, the program includes ecological measures such as the renaturation of shorelines and the creation of retention areas with a focus on smaller water bodies. Due to the improvement of the funding conditions in 2013, natural retention can be increasingly pursued in the future, even in small bodies of water (Biodiversitätsprogramm Bayern 2030).

- \* **Generalized climate change factor vs. uncertainty of climate change:** The calculation of a precise climate change factor is depending on the progress of climate change research, which calculates scenarios for the future through model simulations of meteorological processes. The climate change factor is only an approximation for the necessary adaptation to possible extreme events and requires a re-evaluation of the flood risk in the future. New climate projections are more detailed and will be corrected in a new project specifically for Bavaria (bias correction). This enables the use of the projections in regional water balance models and the evaluation of several flood parameters. New research will consolidate the scientific basis for the adaptation of flood risk management
- \* **Development of an effective event analysis:** The analysis of past events is as important and necessary as the reconstruction and restoration of infrastructure, supply and communication. Above all, for the review of existing flood protection measures and the identification of weaknesses, the process analysis, the assessment of damages and their specific root causes is indispensable. An objective of the action program 2020plus was, therefore, to develop the basis for a systematic and detailed documentation of flood events and its consequences, based on the findings of the flood event in 2013. For the following action program 2030, it is still necessary to develop a future approach to assess and collect performance numbers concerning flood events.

## SOURCES AND FIGURES

- Bayrisches Staatsministerium für Umwelt und Verbraucherschutz (2014): Hochwasserschutz Aktionsprogramm 2020plus. Bayerns Schutzstrategie – Ausweiten. Intensivieren. Beschleunigen. Online: [https://www.regierung.unterfranken.bayern.de/assets/6/3/hochwasserschutz\\_aktionsprogramm\\_2020\\_plus.pdf](https://www.regierung.unterfranken.bayern.de/assets/6/3/hochwasserschutz_aktionsprogramm_2020_plus.pdf)
- Bayrisches Staatsministerium für Umwelt und Verbraucherschutz (n.y.): Hochwasserdiallog Bayern. Online: <https://www.hochwasserdiallog.bayern.de/>
- Bayrischer Gemeindetag (2003): Hochwasserschutz für Kommunen. Praxisratgeber. Arbeitskreis „Hochwasserschutz“ beim Bayrischen Gemeindetag. München. Online: [https://www.lfu.bayern.de/wasser/hw\\_aktionsprogramm\\_2020\\_plus/hw\\_vorsorge/doc/hws\\_kommunen.pdf](https://www.lfu.bayern.de/wasser/hw_aktionsprogramm_2020_plus/hw_vorsorge/doc/hws_kommunen.pdf)
- Bayerische Staatskanzlei (2018): Bericht aus der Kabinettsitzung vom 31. Juli 2018. Online: <https://www.bayern.de/bericht-aus-der-kabinettsitzung-vom-31-juli-2018/>
- KLIWA (2019): Hochwasser. Anpassung. Online: <https://www.kliwa.de/hydrologie-hochwasser-anpassung.htm>
- Rimböck, A. (2015): Bayrisches Hochwasserschutz-Aktionsprogramm 2020plus (AP 2020plus) – Ein „Plus“ auf der Basis von 14 Jahren Forschung und Erfahrung. KW - Korrespondenz Wasserwirtschaft 2015 (8), Nr.1. S.42-48. Online: [https://www.researchgate.net/publication/278667800\\_Bayerisches\\_Hochwasserschutz\\_-\\_Aktionsprogramm\\_2020plus\\_AP\\_2020plus\\_-\\_Ein\\_Plus\\_auf\\_der\\_Basis\\_von\\_14\\_Jahren\\_Forschung\\_und\\_Erfahrung](https://www.researchgate.net/publication/278667800_Bayerisches_Hochwasserschutz_-_Aktionsprogramm_2020plus_AP_2020plus_-_Ein_Plus_auf_der_Basis_von_14_Jahren_Forschung_und_Erfahrung)
- Schneiderbauer, S., Hartmann, S., Dalla Torre, C., Dinkelaker, N., Sankowsky, A., Hoffmann, C., Pedoth, L., Streifeneder, T. (2018). Beyond the Expected: Dealing with the Case of Overload and Residual Risk of Natural Hazards in the Alpine Region. Final Report. Bolzano, Italy.
- Wolter-Krautblatter, R.; Rimböck, A.; Hafner, T.; Wanger, C.; Oberacker, C. (2016). Chancen und Herausforderungen im Bereich des Hochwasser-Restrisikos und der Risikokommunikation: Ideen aus Bayern. Interprevent 2016 – Conference Proceedings. Risk Governance and Policies (Objectives, Strategies, Communication). Online: [https://www.researchgate.net/publication/303961879\\_Chances\\_and\\_Challenges\\_in\\_the\\_Field\\_of\\_Residual\\_Flood\\_Risk\\_and\\_Risk\\_Communication\\_Ideas\\_from\\_Bavaria\\_Chancen\\_und\\_Herausforderungen\\_im\\_Bereich\\_des\\_Hochwasser-Restrisikos\\_und\\_der\\_Risikokommunikation\\_](https://www.researchgate.net/publication/303961879_Chances_and_Challenges_in_the_Field_of_Residual_Flood_Risk_and_Risk_Communication_Ideas_from_Bavaria_Chancen_und_Herausforderungen_im_Bereich_des_Hochwasser-Restrisikos_und_der_Risikokommunikation_)

### Figures:

Figure 1: Cycle of the flood risk management in Bavaria, Action Program 2020plus (© STMUV BAYERN, 2014)

Figure 2: The surcharge on the current flood discharge, which is the basis for the dimensioning of protective structures, takes into account the possible impact of climate change (© KLIWA, 2019)

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## FRANCE

### GIRN-ALPES – Interregional cooperation program: Integrated risk management in the French Alps

- \* Interregional alpine **funding program** for projects of integrated natural risk management in the French Alps
- \* Supporting regional mobilization and organization for natural hazard prevention and climate change adaptation by involving local stakeholders
- \* Currently, **eight alpine territories** of GIRN (TAGIRN) in the progress of implementation



Figure 1: Logo GIRN-Alpes (© PARN, 2014)

## DESCRIPTION

The **Alpine Center for Natural Hazards and Risks Prevention (PARN)** coordinates the **Interregional Program for Integrated Natural Risks Management in the Alpine Massif (GIRN-Alpes)** since 2009 within the framework of the joint planning of the **Interregional Alpine Massif Convention (CIMA)** and the **Interregional Operational Program for the Massif of the Alps (POIA or ERDF-Alps)**. The program GIRN-Alpes is co-financed by the Regions Provence-Alpes-Côte d'Azur and Auvergne-Rhône-Alpes-Regions, the State (Commissariat général à l'Égalité des territoires, CGET) and the European Regional Development Fund (ERDF). The program on integrated risk management approaches for natural hazards (gestion intégrée des risques naturels dans les Alpes, GIRN) aims to complement **traditional practices of natural risk management on a technical, organizational and territorial level by engaging local stakeholders in the management of natural risks**. The first period of this program (2009 to 2014) was targeted to develop integrated risk management approaches for natural hazards on an interregional scale in the French Alps. The current period of the CIMA-POIA program started in 2015 and ends in 2020. It integrates the objectives of the two programs:

- \* POIA: "Extend and improve the integrated management of natural hazards on the French Alps by the decision support of local actors"
- \* CIMA: "Support adaptation to climate change" (Axis 3) by "Developing integrated natural risk management" (Measure 3.2).

Currently **eight alpine territories** are being implemented (see Figure 2). The actions implemented enable **an integrated approach in natural hazards management**, encompassing the collaboration with all actors within the territory and the consideration of specific territorial needs, capacities and resources (financial, human, material, etc.). These territories with specific forms of vulnerability (urbanization in valley bottoms and slopes, strong need for accessibility, tourism etc.) must consider and provide appropriate natural risk management and preventive responses:

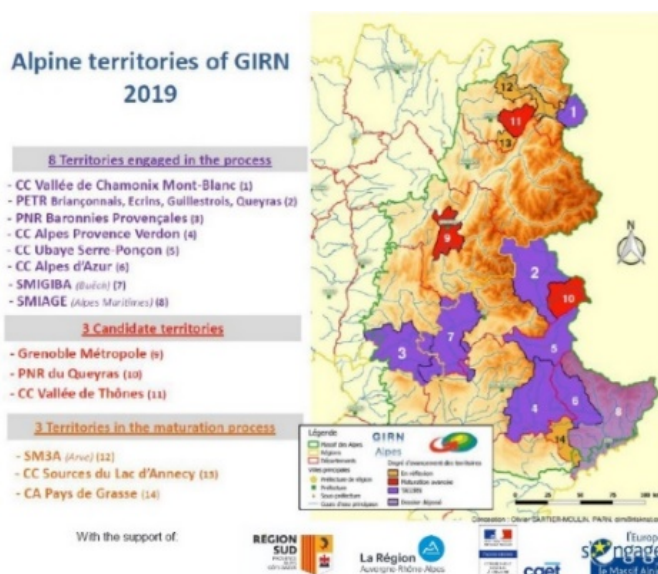


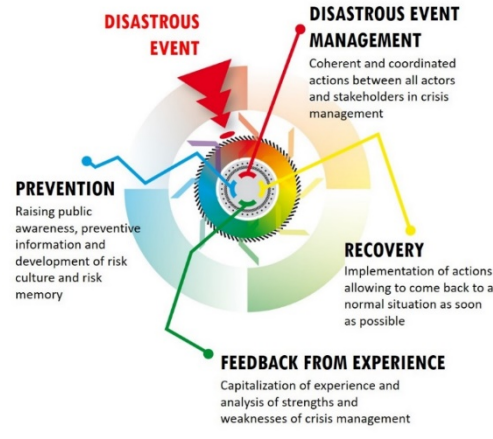
Figure 2: The French network of Alpine Integrated Natural Risk Management Territories – TAGIRN (© PARN, 2019)

- \* The **Chamonix Mont-Blanc Valley (CCVCMB)** is exposed to avalanches, flooding, landslides and rock fall. In context of the GIRN-program, the CCVCMB follows a multi-risk approach and supports the enhancement of local projects by promoting local activities. Furthermore, it facilitates transferability by willingly exchanging and networking. The actors involved are institutional partners of the operation, the PARN, representatives of the CCVCMB and additional actors e.g. MétéoFrance, MétéoRisk, University of Grenoble Alpes.
- \* The actions carried out by the **Regional Nature Park of Baronniers Provençales** (Parc Naturel Régional des Baronnies Provençales (PNRBP) focus on the risk of landslides, forest fires and rock fall and include awareness rising campaigns. Information measures are e.g. cartographic inventories of forest fires, booklets, safety trainings, consultation meetings, open public meetings and site visits. Steering committees for each natural hazard – composed of state services, public institutions, municipalities and their inhabitants, local associations and research laboratories – are responsible to plan and implement of the actions. Additionally, a research team (Irstea RECOVER) aims to create a forecasting model of forest fires that takes into account climate change and the evolution of forest tree species in the territory.
- \* The GIRN-Mission of the **Briançonnais, Ecrins, Guillestrois and Queyras (PETR)** has implemented preventive information actions in an innovative way, by informing citizens through games that raise awareness of natural mountain hazards. These games will serve as communication support and help to raise awareness of the population at events initiated by the mission GIRN PETR or requested by the municipalities.

**Status:** In total, eight TAGIRN projects, supported by the PARN, have been submitted to the POIA and CIMA calls for proposals in 2016 and 2017. These following eight territories are engaged in the GIRN process until 2020 (see figure 2).

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The purpose of the program GIRN-Alpes is to increase the competences of alpine territories in terms of risk management and adaptation to climate change since 2015. The program aims to achieve this goal by mobilizing not only a wide range of interdisciplinary scientific and technical skills, but also to provide specific resources dedicated to the co-development, capitalization and transfer of knowledge and practices for managers and decision-makers.
<b>Added value for both CCA and DRR:</b>	The joint program of CIMA and POIA co-finances territorial and scientific projects. There are three types of project eligible: <ul style="list-style-type: none"> <li>* Local projects in the Alpine territories of Integrated Natural Risk Management (TAGIRN)</li> <li>* Interregional activities of motivation, sensitization and networking for better management of natural risks</li> <li>* Action research projects aiming to improve knowledge, skills and management within local policies for Natural (Mountain) Risk Management and to develop decision-making tools adapted to the specific needs of Alpine territories.</li> </ul>
<b>CCA: Uncertainty and long-term perspective considered</b>	The dynamic character of natural events – unpredictability, cumulative and domino effects – and diverse vulnerabilities and impact scenarios lead to particular difficulties in detecting, monitoring, forecasting, evaluating and prioritizing risk situations, which are always associated with high uncertainties. The prioritization, selection and dimension of interventions are therefore difficult to decide. Moreover, socio-economic issues and limited resources of mountain communities are important factors to consider for planning risk prevention measures in these territories. Therefore, GIRN-Alpes develops and mainstreams specific management methods and multi-risk approaches adapted to the local and harmonized context that respond to these geographical peculiarities.

<b>DRR: Risk management cycle considered</b>	<p>The GIRN enables a management approach that integrates all essential management phases (prevention, intervention, recondition and feedback loops, Figure 3) and at the same time supports the interaction and cross-cutting between these phases, promoting multi-risk management and the analysis of natural risks as a whole (process analysis, effects, consequences, vulnerabilities, etc.).</p>	 <p>Figure 3: Integrated Risk Management Cycle of GIRN-Alpes (© PARN, 2017, after PETR BEGQ)</p>
<b>Linkage between several governance levels and/or elements</b>	<p>In every territory, actors of several governance levels and sectors collaborate and take on responsibility for certain activities. The GIRN-program combines and connects different types of governance elements such as policies e.g. funding programs CIMA, POIA, measures e.g. forecasting model, safety training and actors on national, regional and local levels.</p>	

## CHALLENGES

- \* **Territorial approach requires consideration of specific territorial needs:** The territorial approach of GIRN pursues to develop synergies over the various risk management phases and on a larger spatio-temporal scale than usual. The integrated risk management is based on the needs of the territories in order to propose customized solutions, which go in line with the financial, human and material resources of the territories. The challenge for GIRN is to meet the needs of everyone while respecting the different responsibilities in the territories. The project management of GIRN needs to have a thorough vision of the challenges of the territory in its own development and operating characteristics. This new type of management, which is based on consultation, leads to a global and dynamic vision of the “risk and development” problem of a territory and its main functions concerning human, economic, cultural, land, mobility-access and environmental issues.
- \* **Low risk perception of the population:** An objective of the GIRN is to raise awareness for natural risks and climate change. In this context, a challenge for the TAGIRN Regional Nature Park of Baronnies Provençales (PNRBP) is to promote a sensitive approach to avoid certain practices that are at risk of triggering natural hazards such as forest fires, rock fall and landslides. The measures of the Regional Natural Park include consultation meetings with the municipalities, trainings for the safety of private houses, open public meetings and site visits. The problem in this case study is that the people do not expect the occurrence of natural hazards in the park, because past extreme events happened several decades ago. The lack of risk awareness impedes an adapted behavior. However, the threat of forest fires is still present and minor fires occur regularly.
- \* **Acceptance of GIRN on local level:** A challenge is the influence of local communities on the decision to either engage or withdraw from the dynamics of GIRN. The local authorities do not perceive GIRN matters as priority concerns in relation to other local issues e.g. economic development, maintenance of public services, or other obligations and sovereign concerns. Risk prevention in France follows a hazard-centered approach e.g. hazard zoning, protection structure strategy, and traditionally appears to be rather sectoral and fragmented. This does not promote a global and dynamic vision of preventive action at the scale of a river basin and is responsible for the lack of a collective approach to management issues. Therefore, the integrated approach, which proposes to complete the risk cycle by highlighting the reduction of vulnerabilities and the enhancement of resilient societies, sometimes appears counter-intuitive for certain actors.

- \* **Self-financing capacity:** The territorial and scientific actions of GIRN benefit from European funds (ERDF), national funds (Fonds National d'Aménagement et de Développement du Territoire) and regional (Auvergne-Rhône-Alpes and Provence-Alpes-Côte d'Azur) co-funding. However, even if the program benefits from regional and European support, the (minimal) self-financing assets that municipalities and regions must provide is a constraint and plays an important role in the structure and design of GIRN projects.

## SUCCESS FACTORS

- \* **Dissemination of knowledge and expertise through Science-Decision-Action:** The objective of the interface network Science-Decision-Action (SDA) for natural hazard and risk prevention in the Alps is to foster scientific projects co-developed with local actors to support local approaches. It aims to connect communities and actors and to develop innovative tools for Integrated Risk Management which are adapted to alpine and local specificities and are able to contribute to enhanced resilience and climate change adaptation in the Alpine Space. It is a platform to disseminate the knowledge and expertise of project leaders and enables the development of effective projects within a broader scientific, operational, territorial and institutional community. The PARN organizes exchange days with members of the SDA to present the progress of the projects, to share experiences and to collectively reflect together with the representatives of the partner territories about the results. These regular meetings help to improve mutual understanding and strengthen the links between these different user groups.
- \* **Learning from the previous program period:** The PARN, as the coordinating body of the GIRN-program, has been helping alpine mountain communities to improve their risk management and its adaptability to climate change for a period of 10 years by co-developing local strategies for Integrated Risk Management in the form of multi-year action programs within a territory. After the first period between 2009 and 2015, the actions of five pilot sites and their impacts on the territory were evaluated to identify good practices and promote their transferability to other sites. This evaluation of the first program enabled the collection of lessons learnt on several levels: governance, integration and innovation.

## LESSONS LEARNT

- \* **Finding appropriate methods for raising awareness:** In PNRBP, several different methods are used for risk awareness raising and sensitization of inhabitants and tourists. On balance, the public meetings did not lead to the expected results, while the smaller group meetings e.g. work meetings or field trips were much more successful. Working in small groups requires less organization, less time and effort, more flexibility and delivers better results.
- \* **Sharing the experience between the various GIRN territories** made it possible to disseminate knowledge and expertise, thus accelerating the implementation of actions through mutual assistance between sites coordinated by PARN. GIRN paves the way to solve problems, which are specific to mountain valleys and supports the continuous sharing of experience throughout the Alps and beyond the French borders. For example, the project RockTheAlps pursues the GIRN experiment for the entire Alpine Space until the end of 2019, in the framework of the EU-Strategy for Alpine Regions (EUSALP). The objective is to develop a harmonized approach for the mapping of rock fall and protection forests in the Alpine Space. Furthermore, the project GreenRisk4Alps helps to better integrate the ecosystem service of protection forests against gravitational risks (rock fall, avalanches, torrents, debris flows) and implements territorially specific risk management systems in six pilot action regions.
- \* **Establishing a broad network of stakeholders:** It is beneficial to develop a broad network of partners by involving not only stakeholders of natural risk management but also key stakeholders in the territory. The collective process ensures acceptance for the project in the short-, medium- and long-term. This can be achieved by fostering the regular communication with the stakeholders and by planning appropriate actions that respond to the local needs. The networking of integrated management actors is a guarantee for durability, whether at the level of pilot sites or the whole program. Furthermore, it is important to ensure that local authorities in the territory are voluntarily involved in the project and that stakeholders of risk management are open to the idea of developing new approaches.
- \* **Continuous project team:** The development of GIRN requires relatively little financial resources, but a strong investment of staff is required, led by a team that consists of a project leader and elected officials. The personnel turnover of local drivers could slow down the progress of some actions and thus limit their efficiency.

## SOURCES AND FIGURES

- Einhorn B. (2018a): Integrated Risk Management of Natural Hazards and Climate Change Adaptation in Alpine Regions: Governance Framework and concrete examples in the French Alps. [Project Observer Introduction], GreenRisk4Alps Kickoff Meeting, Innsbruck, 25-27 July 2018.  
Online: <http://risknat.org/reunion-de-lancement-du-projet-greenrisk4alps/>
- Einhorn B. (2018b) – L'adaptation de la gestion des risques naturels aux impacts du changement climatique. Chapitre 2.4 du Cahier Montagne du GREC-SUD : « Impacts du changement climatique et transition(s) dans les Alpes du Sud », octobre 2018, pp. 19-20.  
Online: <http://risknat.org/cahier-montagne-du-grec-sud/>
- Einhorn B. (2018c): Mission de coordination GIRN & SDA. [Présentation], Journée annuelle de la Gestion Intégrée des Risques Naturels (GIRN) et des projets Science-Décision-Action (SDA), Gap, 27 novembre 2018.  
Online: <http://risknat.org/journee-annuelle-girn-sda-2018/>
- Einhorn B., Berger F., Jarjaye J., Crévolin A., Cartier-Moulin O., Peisser C. (2019) – Les Territoires Alpains de Gestion Intégrée des Risques Naturels (TAGIRN) : Boîte à outils pour la résilience et l'adaptation au changement climatique. [Poster et résumé] Assises Nationales des Risques Naturels (ANRN), Montpellier, 25-26 mars 2019.  
Online: <http://risknat.org/assises-nationales-des-risques-naturels-anrn-2019-montpellier/>
- L'OPÉRATION « GESTION INTÉGRÉE DES RISQUES NATURELS DANS LES ALPES » 2015-2020. La Gestion Intégrée des Risques Naturels (GIRN)
- PARN (2019): Actes de Journée annuelle 2018 de la Gestion Intégrée des Risques Naturels (GIRN) et des projets Science-Décision-Action (SDA, Gap, 27 novembre 2018). [Cartier-Moulin O., Einhorn B., Gérard S., Giroud N., Peisser C., Vengeon JM.], 28 pp.  
Online: <http://risknat.org/journee-annuelle-girn-sda-2018/>
- Portal: [www.risknat.org/girn-alpes-2/operation\\_girn/index.html](http://www.risknat.org/girn-alpes-2/operation_girn/index.html)
- TAGIRN: [www.risknat.org/girn-alpes-2/actions-des-TAGIRN/](http://www.risknat.org/girn-alpes-2/actions-des-TAGIRN/)

### Figures:

Figure 1: Logo GIRN-Alpes (© PARN, 2014)

Figure 2: The French network of Alpine Integrated Natural Risk Management Territories – TAGIRN (© PARN, 2019)

Figure 3: Integrated Risk Management Cycle of GIRN-Alpes (© PARN, 2017, after PETR BEGQ)

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## FRANCE

### MRN – INSURANCE AND CLIMATE RISKS PREVENTION

- \* **Insurance association** that acts as a technical **interface** between the insurance profession and various public stake-holders in natural risk management
- \* Aims at building networks and **private-public-partnerships** with associations and public actors on national, regional and local level
- \* Observation and monitoring of hazards, risks and exposure, awareness raising and information sharing on a **territorial level**.

### DESCRIPTION

French insurance companies created the association “Mission Risques Naturels” (Insurance and climate risks prevention, MRN) in 2000, just after experiencing huge losses caused by storms Lothar and Martin, as well as large floods and ground subsidence. The MRN is an initiative aiming to improve knowledge and prevention of climate change impacts. It acts as a **technical interface between insurers and other public stakeholders** engaged in natural risk management. With MRN, the insurance societies Fédération Française des Sociétés d'Assurances and Groupement des entreprises mutuelles d'assurance contribute to the natural risk prevention by participating in various national and territorial committees established by the state of France. **Multi-stakeholder dialogue** and public-private partnership initiatives on national, regional and local levels help to improve information sharing, public awareness raising and the analysis of socio-economic and financial costs of risk scenarios. The association aims to strengthen the collaborative exchange and dissemination of data and information on assessment, monitoring, prediction, forecasting and early warning purposes and fosters collaboration between the public and private sectors.

The activities of MRN include the development of a **GIS tool (MRN GIS)** for the **analysis of the exposure of sites insured against natural hazards** as well as the compilation of a database (BD SILEHC) of damages caused by floods with the goal to **improve the knowledge of flood loss experience**. Research studies undertaken by MRN are using the insurance loss adjustment data to analyze damages on buildings caused by climate events (“événements dommageables d'origine climatique”). The study CAT CLIM DATA, conducted in partnership with the French Construction Quality Agency and insurance experts, focuses on the assessment of data on damages caused by natural hazards. Further activities are the **active participation of the team in different governance bodies** that deal with natural risk management and the distribution of prevention correspondents (voluntary representatives of insurance companies) throughout the French territory. These correspondents participate in information meetings on the natural disaster insurance system as well as in the Departmental Committees for major natural Risk Prevention and the Risk-Basin Committees that identify territories with potential significant flood risks. Communication activities of MRN include the conference B<sup>3</sup> **“Build Back Better”** focusing on the contributions of insurance actors on reconstructing buildings after a flood and the “Tour de France” en Chambre de Commerce et d'Industrie to raise the awareness of companies for the flood risk.

**Status:** The MRN started in 2000 and serves as a **platform** between insurance companies and public authorities. Risk awareness raising, information sharing and monitoring are long-term activities of the association. MRN publishes a semi-annual newsletter to stakeholders of natural risk management as well as lessons learned monographs on major natural events and various reports.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The association MRN <b>refers to international frameworks</b> that deal with climate change adaptation and disaster risk reduction such as the Sendai framework for DRR (SFDRR, 2015-2030), COP21 UNFCCC (COP21, 2015) and the Post-2015 Development Agenda (Post-2015). MRN was created because of the recognition of the necessity to face climate change and to sustainably maintain the high level of insurance for natural hazards in the country.
<b>Added value for both CCA and DRR:</b>	MRN enables and supports the <b>cooperation between insurance associations and public authorities</b> . The involvement of insurance companies into the natural risk management improves a participative governance of prevention. It enables better risk communication, the collection of data about damages on buildings due to natural hazards and the development of a cartographic tool for the analysis of natural hazard exposure.
<b>CCA: Uncertainty and long-term perspective considered</b>	MRN aims to find strategies to cope with natural hazards on a <b>long-term basis</b> and works with risk scenarios. The geographic information tool "MRN GIS" shows available information on the status of risks and collective prevention procedures. This extranet platform is regularly updated with new data and helps to <b>analyze the current and future exposure of specific sites</b> . Furthermore, MRN takes part in research studies e.g. on the economic impacts of climate change, especially the impact of storm surge on property damages.
<b>DRR: Risk management cycle considered</b>	The insurance associations are <b>participating in key stages of the natural risk management</b> to undertake concrete actions to improve risk prevention. MRN supports information sharing and public awareness raising. The insurance trade associations are represented in the design of management and resources allocation strategies, in the risk assessment at the territorial level and the assessment of public policy tools as well as the event analysis, the compilation of lessons learnt and the public risk prevention policy financing (see figure 3).
<b>Linkage between several governance levels and/or elements</b>	MRN has established <b>partnerships and platforms</b> for exchange between public authorities and private sectoral stakeholders. This facilitates the collaboration between insurers and various national, regional and local public actors and other associations. In addition, a <b>network of representatives of insurance companies</b> is contributing to awareness raising by participating in information meetings on the natural disasters insurance system as well as local participative governance activities in the territories.

## CHALLENGES

- \* **Willingness to collaborate on sharing data:** Members of MRN are private insurance companies competing on the world market. Therefore, the willingness to collaborate in data exchange is a relevant topic in the association. The challenge is to overcome the usual competitive approach of insurance companies in order to achieve the objective of general interest.
- \* **Data management and data secrecy:** The measurement of negative impacts and the monitoring of their development is necessary to reduce vulnerability and to gradually contain and reduce natural hazard impacts. However, this is a complex task with a number of management issues, such as the questions of how to analyze and discuss the available exposure and loss data and which methods to use. The collection, analysis and processing of data requires significant coordination effort within the association. In addition, the treatment of individual data is a sensitive issue, because there are different user groups: the insurance companies within MRN, but also the public authorities outside of the association.

- \* **French insurance system does not support self-provision:** In France, as soon as a person has insurance for a house or a car, the natural risk is taken into account automatically. In general, French citizens have to pay more for their insurances compared to other countries, because of this additional insurance service. However, this means that insurance policy-holders, who do not live in flood-prone areas, pay the same amount for insurances, as those who live in flood-prone areas. It also means that, without the existence of hazard maps for the prevention of natural risks (Plans de prévention des risques naturels, PPRN), policy-holders or municipalities are not refrained from living or building in flood areas. Therefore, this policy is inadequate to promote prevention measures.
- \* **Gap between strategic and operational level:** Currently, the aim for MRN is to put the strategy into practice and to achieve a collective awareness for the need to improve knowledge of indemnification (compensation for damages) in order to achieve the necessary changes to improve insured risks. The challenge is to translate the results of the data collection into local risk reduction policies and to find links between insurance conditions and risk reduction requirements (e.g., limits of insurability).

## SUCCESS FACTORS

- \* **Observatoire national des risques naturels, ONRN:** The national observatory for natural risks was founded in 2012 and renewed for the 3<sup>rd</sup> time. It is a partnership agreement between the State (Ministry of Ecological and Solidary Transition – General Directorate for Risk Prevention), the central reinsurance fund and MRN. The implementation of this national observatory strengthens the link between insurance and prevention and provides a framework for bringing together actors dealing with preventive issues, data on natural hazards and indicators to reduce vulnerability. The observatory is a tool for sharing and disseminating data and indicators on natural hazards. It concretizes an approach initiated by the Council of Orientation for the Prevention of Major Natural Risks, a committee composed of elected representatives, experts and professionals of civil society and state services, whose primary mission is the reduction of vulnerability to natural disasters. The purpose of the website of ONRN is to allow everyone, professionals and individuals, to access data on natural hazards and to better understand these phenomena and their impacts.
- \* **Aarhus Convention:** The “Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters” took place in Aarhus in 2001 and was ratified by 47 nations. It had a big influence on the development of participative governance mechanisms in France. The Aarhus Convention focused on public participation in environmental decision-making and the right of everyone to receive environmental information from public authorities. MRN includes the objective of giving the population access to environmental information into its program.
- \* **Lessons Learned from the occurrence of major natural hazards:** The strategy of MRN includes the application of lessons learnt from natural hazard events to the ongoing projects. Due to its long-term runtime, MRN is able to learn from experiences and publishes documentations of major hazard events e.g. monographies on lessons learnt, feedback reports, report of the declarations of natural disaster, insured damages. This helps to anticipate and improve information on natural risks and to better equip and monitor the hydrographic network.
- \* **Facilitating risk communication:** The association MRN facilitates risk communication between the private and the public sectors. By collaborating with representatives of the insurance trade associations on a local level, the public authorities get a better understanding for the insurance profession and the possible potentials that arise from this collaboration. The role of MRN representatives is to present, explain and warn about certain topics.
- \* **Economic strategy:** MRN aims to support national and local risk assessments, socio-economic cost-benefit analysis and capacity building, and to demonstrate opportunities where resilience building and disaster risk reduction is a sound economic strategy, with attractive returns and competitive advantages.

## LESSONS LEARNT

- \* **Loss data important for local level:** Loss data is important to initiate the dialogue with local stakeholders responsible for the local DRR policy, particularly politicians, as these stakeholders have a keen interest in information on damage on the local level. In particular, the costs of insured damages by event and municipality are useful for the local flood risk management, but also to make the consequences of floods

tangible for the nonspecialized public. This loss data facilitates the targeted implementation of structural measures to reduce vulnerabilities and it opens up new perspectives regarding risk communication, awareness raising and risk culture.

- \* **Mutual benefit for insurance companies and natural hazard experts:** With MRN, insurance companies can conjointly collect and capitalize their data in order to measure the stakes (insurance underwriter) and to contribute to debates on the possible development of “mandatory” construction insurances against natural hazards. It is the insurer’s vocation to make its knowledge available to as many people as possible, especially for prevention purposes. In return, the insurers expect a high return on investment. The analyzed data facilitates the adaptation of regulations in the construction sector as well as the improvement of resilience of territories and buildings. The experts of natural hazard management have the same objective as the insurance companies: the improvement of resilience and the reduction of climatic and natural damages. By collaborating, these two stakeholder groups combine their technical expertise and are able to contribute to the improvement of prevention.
- \* **French national DRR Platform system:** The French DRR platform aims to integrate many components into the system, supporting both top down and bottom up dialogue capacities. Besides the Ministry of Ecology and Sustainable Development and Energy, the General Directorate for Risk Prevention and the official national DRR-platform, by the Council of Orientation for the Prevention of Major Natural Risks, the system also includes the National Forum for Natural Risks Reduction, the French Association for Natural Disaster Risk Reduction and its scientific council as well as the ONRN.
- \* **DRR participative governance fora:** DRR participative governance fora have been put in place by the French authorities, in compliance with the Aarhus convention on public access to information, public participation in decision making and access to justice, on environmental issues. Civil society and insurance representatives are now committed to contribute to the whole risk management cycle in the frame of participative governance committees, e.g. design of strategies and assessment of public policy tools. Local insurance representatives are also participating in committees at territorial level within administration units, e.g. prefecture level (*département*). In addition, local authorities have the possibility to act at river basin level with their own participative governance.

## SOURCES

- COP21, 2015: Conference of the Parties on its 21st session, held in Paris from 30.11. to 13.12.2015. United Nations Framework Convention on Climate Change (UNFCCC).
- MRN (2015): Brochure - Insurance and Climate Risks Prevention. Mission Risques Naturels (MRN) – an initiative of French insurers to improve the knowledge and prevention of climate risks. Online: <https://www.mrn.asso.fr/wp-content/uploads/2018/04/2015-brochure-presentation-mrn-assurance-et-prevention-ven-mrn.pdf>
- MRN (2017): Lettre d’information #26 de la mission risques naturels – Décembre 2017. Numéro special – Conférence B<sup>3</sup> du 8 septembre 2017. Online: <https://www.mrn.asso.fr/wp-content/uploads/2017/12/2017-lettre-mrn-n26.pdf>
- MRN (2018a): Présentation de l’association. Online: [https://www.mrn.asso.fr/wp-content/uploads/2018/05/fiche-presentation\\_mrn-2018.pdf](https://www.mrn.asso.fr/wp-content/uploads/2018/05/fiche-presentation_mrn-2018.pdf)
- MRN (2018b): Lettre d’information #27 de la mission risques naturels – Juillet 2018. Numéro special “Construire en zone inondable et réhabiliter après inondation”
- MRN (2018c): Lettre d’information #28 de la mission risques naturels – Décembre 2018. Numéro special “Sécheresse”. Online: [https://www.mrn.asso.fr/wp-content/uploads/2019/01/20-12-2018\\_lettre-mrn-n28.pdf](https://www.mrn.asso.fr/wp-content/uploads/2019/01/20-12-2018_lettre-mrn-n28.pdf)
- MRN (2018d): Présentation des activités de l’association MRN. 22.8.2018. Online: [https://www.mrn.asso.fr/wp-content/uploads/2018/09/presentation-mrn\\_v21092018-1.pdf](https://www.mrn.asso.fr/wp-content/uploads/2018/09/presentation-mrn_v21092018-1.pdf)
- MRN (2018e): Rapport d’activités 2017, perspectives 2018. Online: [https://www.mrn.asso.fr/wp-content/uploads/2018/08/ra\\_2017\\_perspectives\\_2018\\_mrn\\_vlongue.pdf](https://www.mrn.asso.fr/wp-content/uploads/2018/08/ra_2017_perspectives_2018_mrn_vlongue.pdf)
- MRN (2019): Lettre d’information #29 de la mission risques naturels – Février 2019. Numéro special “Aléas naturels et (in)adaptation du bâti”. Online: [https://www.mrn.asso.fr/wp-content/uploads/2019/02/lettre-mrn-29\\_construction\\_vfinale-1.pdf](https://www.mrn.asso.fr/wp-content/uploads/2019/02/lettre-mrn-29_construction_vfinale-1.pdf)
- Nussbaum R. & Rothschild, E. (2017a): Multi-stakeholder National Platforms. National implementation of Sendai indicators: Methods and tools for recording and sharing loss data. 9<sup>th</sup> EU Loss Data Workshop – Brussels 20/03/2017. Towards the implementation of Sendai Indicators: Benefits from an effective loss data recording. Online: [http://www.onrn.fr/site/binaries/content/assets/documents/onrn/publications-2016-2017/9th\\_eu\\_loss\\_data\\_workshop\\_r\\_nussbaum\\_final.pdf](http://www.onrn.fr/site/binaries/content/assets/documents/onrn/publications-2016-2017/9th_eu_loss_data_workshop_r_nussbaum_final.pdf)



Nussbaum R. & Rothschild, E. (2017b): Disaster risk management participative governance fora, at national, regional and local level. The French experience and practices, from DRM practitioners' perspective. Following IASS-IDRiM Workshop: Potsdam 29 August 2017 - Risk Governance for Natural Disasters. Extending Integrated Disaster Risk Management to Sustainable Communities.

POST-2015 Development Agenda: Sustainable Development Goals. Process led by United Nations from 2012 till 2015.

SFDRR, 2015-2030: Sendai Framework for Disaster Risk Reduction, United Nations Office for Disaster Risk Reduction (UNISDR). Adopted during the 2<sup>nd</sup> World Conference on Disaster Risk Reduction; Sendai Japan.

## LINKS AND CONTACT

**Homepage:** [mrn.asso.fr](http://mrn.asso.fr)

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## ITALY

### MUNICIPAL WATER MANAGEMENT PLAN ISOLA VICENTINA MAINSTREAMING ADAPTATION IN WATER MANAGEMENT FOR FLOOD PROTECTION

- \* Conversion of the Municipal Water Management Plan into a **local flood adaptation plan**
- \* Local Plan that addresses **current and future hydraulic problems**, which affect the vulnerability of buildings, infrastructure and people
- \* **Developing strategies and measures** for prevention, protection and preparation against river flood and heavy rainfall and promoting sustainable land use practices

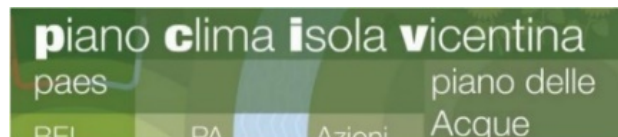


Figure 1: Logo of the Municipal Water Management Plan of Isola Vicentina /Piano Clima Isola Vicentina – Piano delle Acque (© Municipality of Isola Vicentina, 2017)

## DESCRIPTION

High discharge levels of rivers nearby, heavy rainfall events and the local drainage system of relatively small dimension, are causing the potential flood risk in Isola Vicentina. Regional models for the Veneto region show that the magnitude and frequency of extreme precipitation events and the occurrence of flood events will increase in the future due to climate change. Therefore, the municipality Isola Vicentina is elaborating its Municipal Water Management Plan (MWMP) as a solution to integrate climate change into water management. The process started in 2014 with the EU's **"Mayors Adapt" initiative**, one of the projects of the **European movement "Covenant of Mayors for Climate and Energy"**. Isola Vicentina is part of this initiative, which aims to strengthen the resilience of cities and local authorities to the impacts of climate change. The objective is to convert the MWMP of Isola Vicentina into a local flood adaptation plan. Together with the Sustainable Energy Action Plan, the MWMP represents a comprehensive climate strategy for the city.

MWMPs are used throughout the Veneto region. They serve as a coordination tool to **analyze the local drainage system**, by depicting responsibilities for administration and maintenance to identify problems and develop appropriate flood protection measures. In Isola Vicentina, the MWMP was extended to a **local flood adaptation plan** by including strategies for prevention, protection and preparedness. For this purpose, a series of scenarios were analyzed in order to understand how land use affects the water retention capacity and flood risk potential of a certain area. Within the framework of the adaptation plan, the impact of extreme weather events on urban and rural areas was analyzed and suggestions were made for the modification of the physical structure of built-up areas were made, also considering citizens' behavior and social organization. The prevention measures aim to **reduce soil-sealing, surface run-off and prevent new building developments in flood-prone areas**. A Sustainable Urban Drainage System and the re-forestation of un-built areas are two measures to improve the resilience of the municipality towards hydrological hazards. Additional protection measures include the **restoration of flood plains and wetlands**, the **construction of structural flood defenses** and the enhancement of the **drainage capacities** of municipal networks. Preparedness measures also aim to inform and educate the citizens about the risks by organizing public workshops for citizens and providing booklets about instructions what to do before, during and after a flood. In addition, the city is currently developing a **WebGis application**, enabling citizens to learn about the environmental and economic benefits of the measures presented in the plan (see Figure 2). The mayor of Isola Vicentina carries out the MWMP, in collaboration with the research group at the Università IUAV di Venezia and a local consultancy company. Other actors involved in this project are local authorities, e.g. land reclamation authority, civil protection organizations, and municipal authorities, and the citizens of Isola Vicentina.

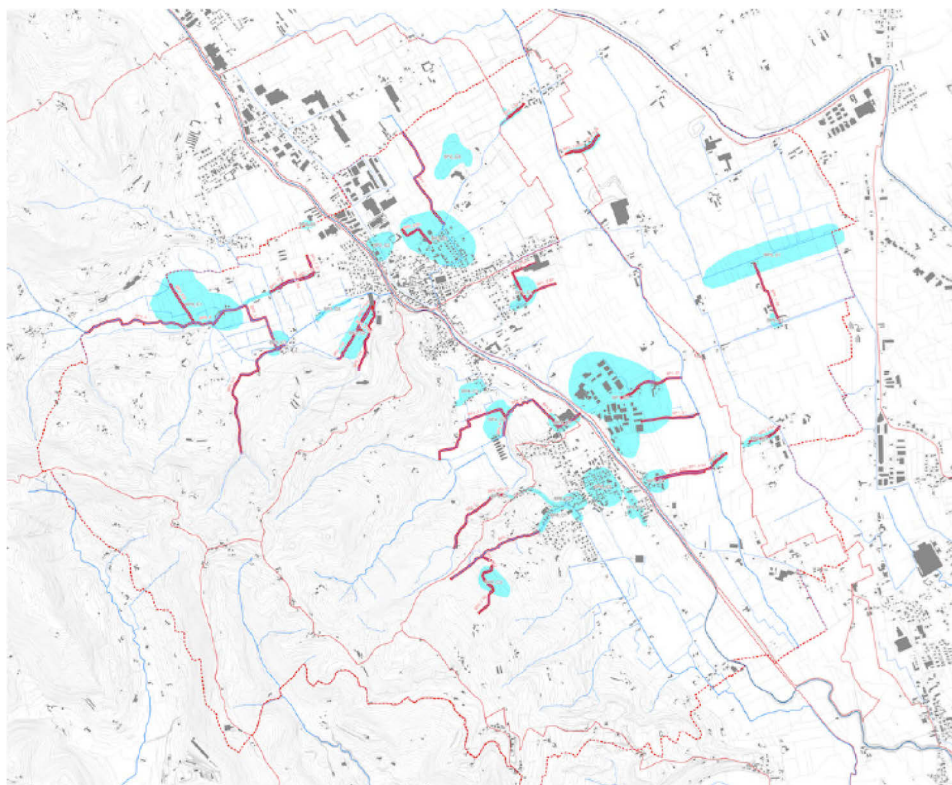



Figure 2: Flood-prone areas (historically flooded) as recognized by the citizens during the public meetings; waterways causing the flooding issues are highlighted in red (© Municipality of Isola Vicentina, 2017)

**Status:** The MWMP was approved in 2016 and **prospective measures are being implemented between 2017 and 2022**. A few measures are currently being implemented, such as the adoption of the management and maintenance regulation framework in small private ditches, the construction of one of the three water retention areas and the designation of a pilot area for woodland and forestry as a prevention measure.

### WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	Isola Vicentina signed the EU's Mayors Adapt initiative in order to integrate climate change adaptation into its water management and sustainably reduce potential flood risk in its municipality.
<b>Added value for both CCA and DRR:</b>	There is added value for both CCA and DRR, as the MWMP includes climate change effects to project different future scenarios, which build the basis for concrete measures of flood protection on a local level. These kind of adaptation plans are transferrable and adaptable to other cities and municipalities.
<b>CCA: Uncertainty and long-term perspective considered</b>	The plan tries to reduce long-term potential flood damage triggered by expected increases of magnitudes and frequencies of precipitation. Furthermore, it analyses each drainage basin, river and stream flowing through the municipality, evaluating its maximum flow rate and flood-extent with regard to different return periods (5, 10, 20, 30, 100, 300-years). The adaptation measures promoted by the plan, took into account the statistically evaluated dimension of extreme flood events according to these different return periods, considering climate change effects.

<p><b>DRR: Risk management cycle considered</b></p>	<p>The MWMP of Isola Vicentina considers the risk cycle by identifying different strategies for prevention, protection and prepared-ness. The measures comprise a comprehensive risk analysis, adjusted land use planning, implementation of flood protection structures and communication measures to inform and sensitize the population.</p>	 <p>Figure 3: Risk Cycle of the Municipal Water Management Plan of Isola Vicentina: Response and Recondition, Prevention, Preparation and Protection (© Municipality of Isola Vicentina, 2017)</p>
<p><b>Linkage between several governance levels and/or elements</b></p>	<p>The flood-risk-management approach suggested by the European Directive 2007/60/EC on flood risk management on the European level served as a basis for the whole MWMP elaboration process. A specific chapter of the MWMP comprehensively lists regional and national laws related to the realization of the plan. The project, implemented on a local level, incorporates public authorities and citizens. Additionally, the university, located in Venice, and a local consultancy company contribute to the project.</p>	

## CHALLENGES

- \* **Lack of cooperation with surrounding municipalities:** A single municipality was in charge of the MWMP, without any official coordination with surrounding municipalities. Consequently, down-stream municipalities will benefit from the implementation of some risk reduction measures, whereas some critical issues generated up-stream of Isola Vicentina could not be solved by the plan alone.
- \* **Difficulties in the definition of individual responsibilities:** It was not easy to identify and determine the responsibilities explicitly for all components of the drainage system in the municipality, especially for non-public spaces. Nonetheless, private sites affect the drainage system as well and need to be taken into account. This concerns for example farmers and local agricultural practices (rural drainage) as well as private home-owners, who are responsible for cleaning private urban ditches and reducing soil sealing on private properties.

## SUCCESS FACTORS

- \* **Workshops for citizen participation:** The elaboration process included four public workshops that enabled the involvement and consultation of the citizens and local stakeholders. This encompassed the assessment and comparison of selected flood risk reduction measures with the priorities and feedback of the public. Above all, 200 people participated in these workshops, including key stakeholder groups, selected deliberately such as farmers, business persons and land-owners of flood-prone areas. In general, the motivation to participate was high, since the flood in 2010 raised the awareness for flood issues within the public. These workshops helped to raise flood risk awareness and to train and educate citizens on how to cope with extreme weather events. The workshops helped to share good practices on the daily management and maintenance of small watercourses.
- \* **Engagement of multiple actors:** The elaboration of the MWMP was possible due to the decisiveness of the municipal government of Isola Vicentina, the scientific support of the IUAV University and the fieldwork carried out by municipal and technical consultants. The community played an important role in the planning process, because the citizens were directly involved in site surveys and in the identification of the most critical areas, thanks to their experience with flooding.

## LESSONS LEARNT

- \* **City twinning program on climate change adaptation:** The twinning program connects cities which are starting with climate change adaptation plans with “mentor-municipalities” which have already successfully developed strategies to make territories more resilient. The program aims to accelerate local capacity building and exchange of good practices. Isola Vicentina is the mentor-municipality for Andrano (Italy) and Agueda (Portugal). The three municipalities all share a Mediterranean climate and are currently facing several common challenges caused by climate change, including issues of water and flood management. A meeting of the representatives of the twinning cities enabled an exchange of knowledge, experiences and information with other local authorities that share a number of similar climate adaptation concerns. Isola Vicentina had the opportunity to present its Municipal Water Management Plan and its main strategies. The learning cities assessed the transferability of the presented strategies and measures for their own municipal territory. The experiences of Isola Vicentina played an important role in future planning and implementation processes of the learning municipalities. The three cities will continue their trilateral cooperation on the topics of mitigation and adaptation.

## SOURCES AND FIGURES

Covenant of Mayors for Climate & Energy (2017): Twinning visit report: Isola Vicentina (VI). Online:

[http://www.konventderbuergermeister.eu/IMG/pdf/Isola\\_Vicentina\\_Twinning\\_report\\_2016\\_FINAL.pdf](http://www.konventderbuergermeister.eu/IMG/pdf/Isola_Vicentina_Twinning_report_2016_FINAL.pdf)

European Environment Agency (2018): Mainstreaming adaptation in water management for flood protection in Isola

Vicentina. Online: <https://climate-adapt.eea.europa.eu/metadata/case-studies/mainstreaming-adaptation-in-water-management-for-flood-protection-in-isola-vicentina>

IUAV (2017): Piano Comunale delle Acque di Isola Vicentina. Rapporto ambientale preliminare, 2017. Università IUAV di Venezia, Dipartimento di Progettazione e Pianificazione in Ambienti Complessi . Online: [http://www.comune.isola-vicentina.vi.it/alfstreaming-servlet/streamer/resourceId/fb709549-5bc2-4c3e-83a3-b2dd361d3cfd/PCdA\\_Relazione\\_Idrologica\\_Idraulica.pdf](http://www.comune.isola-vicentina.vi.it/alfstreaming-servlet/streamer/resourceId/fb709549-5bc2-4c3e-83a3-b2dd361d3cfd/PCdA_Relazione_Idrologica_Idraulica.pdf)

### Figures:

Figure 1: Climate Plan of Isola Vicentina, Water Plan (© Municipality of Isola Vicentina, 2017)

Figure 2: Flood-prone areas (historically flooded) as recognized by the citizens during the public meetings; waterways causing the flooding issues are highlighted in red (© Municipality of Isola Vicentina, 2017)

Figure 3: Risk Cycle of the Municipal Water Management Plan of Isola Vicentina: Response and Recondition, Prevention, Preparation and Protection (© Municipality of Isola Vicentina, 2017; adapted by ILAP, 2019)

## LINKS AND CONTACT

**Homepage:** [www.comune.isola-vicentina.vi.it/](http://www.comune.isola-vicentina.vi.it/)

**Link:** [www.climate-adapt.eea.europa.eu/metadata/case-studies/mainstreaming-adaptation-in-water-management-for-flood-protection-in-isola-vicentina](http://www.climate-adapt.eea.europa.eu/metadata/case-studies/mainstreaming-adaptation-in-water-management-for-flood-protection-in-isola-vicentina)

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## ITALY

### LIFE FRANCA – FLOOD RISK ANTICIPATION AND COMMUNICATION IN THE ALPS

- \* **LIFE project** for flood risk anticipation and communication in the Italian Alps, Province Trentino, **in three pilot municipalities**
- \* Promoting the **exchange of knowledge** among various stakeholders via an **online flood risk portal**
- \* Supporting **participatory processes**, including citizens, students and teachers, administrators, experts and journalists



Figure 1: Logo LIFE FRANCA  
(© LIFE FRANCA, 2016)

## DESCRIPTION

LIFE FRANCA is a **European project** that promotes flood risk anticipation and communication in the Alps. Flood hazards currently affect many municipalities in Trentino, at the same time the risk awareness among the population is limited. The aim is to develop medium-term and long-term strategies and adaptation measures for mountain areas in order to increase climate change resilience. The European Directive 2007/60/EC on flood risk management was an initial point for the foundation of the project. It calls on member states to develop flood risk maps for all watercourses and coastlines and to implement suitable measures to reduce flood risk potential. The **Italian National Adaptation Strategy**, adopted in 2015, identifies Alpine regions as highly vulnerable. The main focus is on the management of water resources in these areas. The LIFE program, the European Union's financial instrument for environmental issues, nature conservation and climate action projects, funds FRANCA. The involved project partners are the **Universities** of Trento and Padova, the **Autonomous Province of Trento** (Service for Torrent Control), the **Eastern Alps Hydrographic District**, the **Science Museum** (MUSE) and a **company** specialized in geospatial software solutions (Trilogis Srl). These partners are responsible for different measures within the project. The three cities in Trentino, identified for the experimental study, are the city of Trento, the town of Borgo Valsugana and the Rendena Valley. The main objective of LIFE FRANCA is to promote a **culture of regional hazard anticipation and prevention** in Trentino and the Alps, considering the fact that there is no guarantee for complete flood safety. The project aims to prepare the population for flood events through a participatory process involving citizens, experts and administrators. The methods applied in this project include the **analysis and adjustment of collective socio-cultural attitudes**, decision-making practices and a collection of common perceptions of the environmental risks affecting the territory. The actions of LIFE FRANCA are:

- \* The collection, analysis and reorganization of available **flood risk data** in Trentino.
- \* The development of **strategic scenarios** to evaluate the impact of potential flood events.
- \* The creation of an innovative **online flood risk portal** with information on hydrological conditions in the Trentino region e.g. **customized flood risk maps for different user groups**, policies, history of flood protection in Trentino.
- \* The preparation of an **anticipatory governance** model for flood risk in the Alps, including a support program for involving stakeholders in preparative exercises.
- \* The development of a **handbook for flood risk communication** for public authorities and expert groups in the Alpine region.
- \* The organization of seminars for experts, administrators and journalists to improve skills related to handle and communicate regional hazards to the public.
- \* The organization of workshops, activities and educational excursions for students and training courses for teachers, as well as the coordination of travelling exhibitions, guided tours, conferences and meetings for the public in the informal setting of **Science Café events**.

**Status:** The project started in July 2016 and ends in December 2019. The activities of the first year included the collection and re-elaboration of available data on **hydrological hazards**, later used for the development of strategic scenarios on impacts of natural hazards. In 2017, FRANCA published the first version of the **online flood risk portal**. Since the beginning, several “**Science Cafés**” have already taken place, dealing with topics such as forecasts and weather alerts, mapping the flood hazard and protective structures. Further events in the Trentino region include conferences, educational activities in the study areas, **participatory planning of strategic scenarios**, **focus groups** and **training courses**. On the **website of LIFE FRANCA** a number of informational videos and leaflets are available.

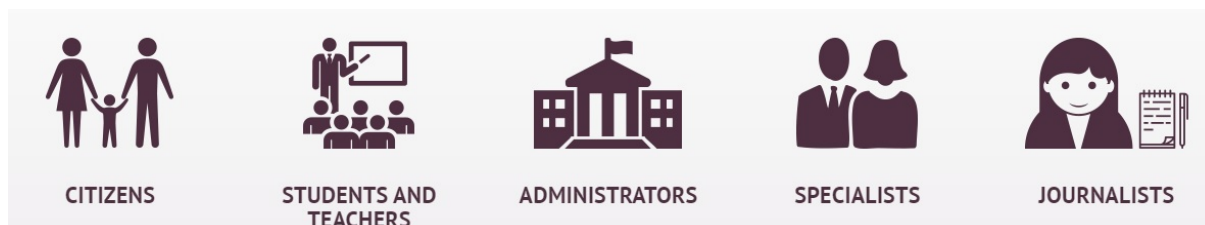


Figure 2: LIFE FRANCA involves various stakeholder groups (© LIFE FRANCA, 2016)

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The project LIFE FRANCA was initiated due to the need for long-term strategies and adaptation measures for mountain areas to increase climate change resilience. It is based on the Italian National Adaptation Strategy to Climate Change and particularly focuses on the management of emergencies and the behavior of different social groups in the context of flood risk.
<b>Added value for both CCA and DRR:</b>	The added value is the application of communication and participation strategies that raise public risk awareness and involve multiple stakeholders to develop an attitude of co-responsibility between public and private actors when it comes to realizing actions. These strategies have a long-term effect by changing the risk-culture on a local level and by increasing the resilience of the society towards climate change. The aim is to perform a pilot project, to transfer the results to other regions and to other natural risks related to climate change.
<b>CCA: Uncertainty and long-term perspective considered</b>	The objective is to strengthen the communication and management strategies in the municipalities to prepare the citizens and public authorities for the uncertainty of climate change effects in the future. In focus groups, the possible scenarios for the municipalities will be defined, analyzed and evaluated, taking into account possible changing conditions and their implicit uncertainties. Long-term measures include the creation and maintenance of a digital platform to disseminate information about flood risk maps and scenarios and the development of a collaboration network for preparing wide-ranging projects expanding to other regions and entities.
<b>DRR: Risk management cycle considered</b>	The project aims to improve the awareness and preparedness for climate change related risks. Therefore, the planned measures are mainly effective in reducing vulnerabilities rather than building structural protection measures. The measures of awareness raising and developing a communication strategy are essential parts of the phases prevention and preparation regarding the risk management cycle.
<b>Linkage between several governance levels and/or elements</b>	Several project partners, such as the Universities of Trento and Padova, the Service for Torrent Control, the Eastern Alps Hydrographic District and the Science Museum, collectively contribute to the project. On a local level, the municipalities and their citizens are directly involved in the LIFE FRANCA project and its measures. The aim of the portal on flood hazards is to promote the exchange of knowledge among various stakeholders. There will be a continuous update of the portal to ensure up-to-datedness.

Furthermore, LIFE FRANCA shares the results and knowledge gained in the project with other stakeholders, such as neighboring regions, different drainage basin authorities, the Ministry of the Environment, environmental associations and companies. The exchange with other LIFE projects promoting awareness of climate change-related hazards is intended.

## CHALLENGES

- \* **Selective disclosure of information on possible hazards:** The launch of the project LIFE FRANCA raised the question of how to screen and filter the extensive amount of information on climate change. This led to inherent tensions between LIFE FRANCA and the administrative authorities. The objective of LIFE FRANCA is to encourage an open dialogue among experts, administrators and citizens. This mission is in conflict with the administrative approach to organize responsibilities through centralized management and controlling access to information. Taking the uncertainty of climate change into account, foreseeing natural hazards and warning the public becomes a difficult task. The project raised questions on how information and data on climate change and extreme events should be published and disseminated, and who should decide about the selective disclosure based on which criteria. On another level, unconfined exchange of information with the general public means that qualified technicians need to spend valuable time to filter serious information from irrelevant arguments. To meet these challenges, LIFE FRANCA decided to divide the users of the portal into 3 categories: citizens, technicians and administrators. Each group will have access to a different set of data and the interaction with citizens will be coordinated with a drop-down menu to limit exchanges to identifiable hydrological risks.
- \* **Creating enough server space and bandwidth for the online portal:** The online interactive service of LIFE FRANCA was developed on the existing web service of the Provincia Autonoma di Trento. However, this infrastructure was not designed for data-rich two-way exchanges. This led to three problems: The shared web service did not meet the requirements of the LIFE FRANCA interactive application due to a lack of server space and the bandwidth. Templates for submitting reports on hazards and damages by citizens are obsolete because the interactive operation of a standard text-only interface is difficult when using a mobile phone. Furthermore, the layers overlapped upon a bare geological map, without organized layer integration or optimization. The project team solved these problems by allowing citizens to directly interact through a web-GIS tool (Trilogis Srl) and by allotting more space and bandwidth on the web service of the Provincia Autonoma di Trento.

## SUCCESS FACTORS

- \* **Citizens involved in the detection of natural risks via an online portal:** The Autonomous Province of Trento has adopted a specific monitoring program for hydraulic-forestry works and waterways. The portal is being updated regularly. However, it is important that citizens too are involved in the activities of protecting the territory. On the online portal, every citizen can actively contribute to detect natural hazards by informing the responsible service about any damage caused by flooding.
- \* **Proximity of project partners:** All partners in LIFE FRANCA are located in the same city, Trento, with the exception of the University of Padova as an external partner. Physical and cultural proximity ensures a shared view and facilitates a common approach, which allows all partners to proceed more efficiently, particularly in a project dealing with site-specific issues. Apart from that, the participants all act in a similar way with little attempt to find alternative solutions. To sum up, a set of homogeneous partners might accelerate the process, but a diversity of stakeholders can be beneficial for solving complex problems and finding appropriate and unconventional methods.
- \* **External partnerships and networks:** A network of informal cooperation through the exchange of tools and experiences is growing quickly, particularly among other LIFE-projects: Derris, Master-adapt, Franca and others. The Sardinia Regional Government will make use of the scenario-based approach to strategic planning used by LIFE FRANCA to develop its own regional strategy for the adaptation to climate change.
- \* **Focus groups for the development of robust strategies:** In LIFE FRANCA, four focus groups were used to involve the public in preparedness exercises that simulate future flood scenarios. Shared risk awareness and a widespread pro-active attitude, supported by robust strategies are the basis for a culture of anticipation and prevention of natural risks. The best strategy includes different viewpoints of every member of the community. By collectively imagining future risk situations and the possible responses of

a territory and its citizens, with its social and environmental components, robust strategies can be defined and prepared. The participants of the focus groups – small group of significant actors of the territory – defined the issues, the time horizon and the use and purpose of the scenarios. The group identified problems and opportunities within each scenario, in order to define effective strategies to take countermeasures.

## LESSONS LEARNT

- \* **Reminding the partners of the common output:** During the first stage of the project, the partners of LIFE FRANCA focused on building the analytical and communication tools, which were assigned to them. The difficulty of the second project stage now is to use these tools to work towards common goals. LIFE FRANCA adopted a strategy of generating synergies between the different fields of action by constantly reminding the partners of the need to converge and coordinate their activities towards a small common output. This process is particularly important for the last part of the project, which mandates well-defined measures for 3 to 5 years after the end of funding. Therefore, the output should be simple and highly consistent, since the assignment of responsibilities after the project is difficult if the partners had no significant incentives.
- \* **High demands on online communication:** Big Data, GPS – global positioning systems and Internet of things are rapidly integrated within small personal devices, such as smartphones. Users expect to access any kind of service in real-time from with their phones. In order to engage citizens in a two-way communication process, LIFE FRANCA aims to provide user-friendly services and considers different user groups. Citizens, technicians and administrators speak different languages, use different tools and look for different information. The dialogue with citizens needs to be designed for social networks and handheld applications, as opposed to personal computer devices accessing conventional websites. Resources such as server space, bandwidth, software and app-coordination should be compatible with the stated objectives and intended audiences.
- \* **Technical versus political issues:** Early in the project, the project team needed to identify technical bottlenecks and political constraints in order to overcome potential problems effectively. It is important to clearly define and address technical requirements and to identify and allocate further resources if needed. At the same time, political objectives should not interfere with technical performances. Technicians may know what needs to be done to achieve the defined measures of the project, but they depend on politicians and the political situation to carry out the tasks.

## SOURCES AND FIGURES

LIFE FRANCA - Homepage. Online: [www.lifefranca.eu/en](http://www.lifefranca.eu/en)

LIFE FRANCA - Flood Risk Anticipation and Communication in the Alps – Project Description. Online:

[http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n\\_proj\\_id=5677&docType=pdf](http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5677&docType=pdf)

LIFE FRANCA - Project brochure. Online: [https://www.lifefranca.eu/wp-content/uploads/2018/10/0504\\_Flyer-LifeFranca\\_eng.pdf](https://www.lifefranca.eu/wp-content/uploads/2018/10/0504_Flyer-LifeFranca_eng.pdf)

LIFE FRANCE - Online Portal - Provincia autonoma di Trento (2018): La difesa dalle alluvioni in Trentino. Il portale "Life Franca". Online: <https://portal.lifefranca.eu/>

### Figures:

Figure 1: Life Franca logo (LIFE FRANCA, 2016)

Figure 2: LIFE FRANCA involves various stakeholder groups (LIFE FRANCA, 2016)

## LINKS AND CONTACT

**Homepage:** [www.lifefranca.eu/en](http://www.lifefranca.eu/en), [www.portal.lifefranca.eu](http://www.portal.lifefranca.eu)

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# LIECHTENSTEIN

## CLIMATE CHANGE ADAPTATION STRATEGY LIECHTENSTEIN

- \* **Cross-sectoral strategy** on **national level** for the adaptation to climate change evoked risks
- \* Identification of challenges for Liechtenstein and **development of corresponding measures for each sector** (e.g. water management, natural hazards, spatial planning) in form of an action plan
- \* Regular **re-evaluation** of the strategy and its action plan

### DESCRIPTION

As a party to the **Paris Agreement**, Liechtenstein is committed to fulfill its obligations, such as the development of a climate adaptation plan on a national level, including all responsible offices and institutions. The Climate Change Adaptation Strategy of Liechtenstein, finalized in 2018, aims to **minimize climate change evoked risks** and **increase the adaptability** of society, economy and the environment. The government of Liechtenstein developed the strategy in the framework of the **Interreg Alpine Space Project C3-ALPS** (capitalizing climate change knowledge for adaptation in the alpine space), which aimed to close the gap between theoretical knowledge on climate change and practical applications by supporting a cross-sectoral approach. For the development of the strategy, several actors have been consulted and the information from interviews and discussions served as a basis for the ongoing work. It shows several interfaces to other policies and strategies and its implementation requires good collaboration among the concerned national offices, municipalities and other institutions.

The strategy lists the possible climate shifts affecting the country and outlines necessary action measures to be taken by Liechtenstein in **various sectors**: water management, agriculture, forestry, energy, tourism, biodiversity management, health, spatial planning as well as natural hazards. In Liechtenstein, **hydro-meteorological extreme events** due to **climate change** (e.g. increasing intensity and probability of heavy rainfall, rising temperatures) have an impact on natural hazard processes, mainly floods, landslides and debris flows. Especially the **river Rhein** constitutes a certain flood risk that needs to be taken into account. The strategy describes ongoing, planned or yet to be developed activities in the sector natural hazards, such as:

- \* Revision of the natural hazard maps (see Case Study Liechtenstein, **Revision of hazard and risk map**)
- \* Statistical evaluation of extreme precipitation events
- \* Continuous inspection and adjustment of the safety level of existing protection systems
- \* Emergency plans for heavy rainfall and forest fires
- \* Verification of the dimensions of protective structures

Involved actors of the strategy and its implementation are **the national authorities**, municipalities as well as private companies (e.g. electricity utility, marketing office, local forestry operations). The Office of Environment is responsible for the implementation of the adaptation strategy and directs the working group, which has been set-up to exchange information and to coordinate activities among the different sectors. Meetings are held once per year. After five years, the government and the responsible offices re-evaluate and update the strategy if necessary. The Office of Civil Protection is responsible for the management and coordination of the measures in the sector natural hazards. Furthermore, measures of the other sectors also have positive effects on the natural hazard situation, such as the **renaturation of watercourses** (biodiversity management) or the **adaptation of the spatial structures** to extreme natural events e.g. determination of retention areas and flood corridors (spatial planning). The **action plan** attached to the strategy consists of a description of each measure, the responsible authority, the priority level, the status of its implementation, a cross-reference to other sectors and the year of initiation.

**Status:** The government of Liechtenstein already implemented several measures, such as the national revision of the hazard maps, the statistical evaluation of extreme precipitation events and the development of a runoff-forecasting model. All of the measures are **intended to be regularly revised**, especially the continuous

inspection and adjustment of the safety level of existing protection systems. The evaluation of the precipitation extreme, completed in 2014, shows that currently no adaptation of the dimensions of protective structures is necessary. If a significant change is apparent in future evaluations, the dimensioning factors have to be adjusted accordingly.



Figure 1: Debris flow Süttigerwis 1995 (left), landslide Sücka 2005 (right) (© ABS 1995/2005 in: RFL, 2018)

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The goal of the climate change adaptation strategy is to minimize climate change evoked risks for inhabitants, goods and natural resources. The sector 'natural hazards' has been chosen deliberately as one of 9 sectors that are the focus of the climate change adaptation in Liechtenstein.
<b>Added value for both CCA and DRR:</b>	The cross-sectoral approach of the strategy enables good cooperation between the different offices and sectors by seeking overarching solutions. Natural hazard measures are continuously implemented, ensuring a long-term effective adaptation to climate change.
<b>CCA: Uncertainty and long-term perspective considered</b>	The national CCA strategy is a long-term instrument, due to the open time frame of the action plan. It takes into account possible changes in the future that cannot currently be predicted, by stipulating a continuous monitoring of parameters and the regular review of protective structure and hazard maps. In addition, the responsible offices will regularly improve the strategy to provide an up-to-date framework.
<b>DRR: Risk management cycle considered</b>	The measures of the section natural hazard in the action plan of the strategy are instruments used in different phases of the risk management cycle. For example, the statistical evaluation of precipitation events is part of the event analysis, whereas the inspection of structural measures is a prevention measure. This includes the revision of natural hazard maps, which enable the adaptation of the local planning and the prevention of damages. The development of emergency plans serves as a basis for preparation and organization measures.
<b>Linkages between several governance levels and/or elements</b>	The strategy was conducted and published by the government on a national level. For the professional contributions, several experts were involved. The strategy is linked to the action plan and therefore to concrete measures. The national authorities are responsible for the implementation of these measures.

## CHALLENGES

- \* **Depending on neighboring countries:** Liechtenstein is dependent on neighboring countries and cantons, when dealing with natural hazards and climate change adaptation, as for example river basins are located beyond the borders of Liechtenstein. For a successful adaptation to climate change, good cooperation with neighboring countries is important to exchange information and experiences and to coordinate activities.
- \* **Residual Risk:** Total security against natural hazards is not possible for technical, financial and resource-related reasons. The goal is to better prepare for future natural hazard events by learning from experiences, and to limit the negative effects to a generally accepted level.
- \* **Conflicts between measures of different sectors:** The Climate Change Adaptation Strategy identifies synergies and conflicts between the sectors water management, natural hazards, agriculture, forestry, energy, tourism, biodiversity, health and spatial development in the context of climate change. It emphasizes the need for cross-sectoral collaboration and coordination of the planned activities and considers a few conflicts that could occur between different adaptation measures, such as flood risk protection and agriculture: During flood events, deliberate flooding of agricultural land may be necessary in order to avoid major damages in residential areas. The use of planning instruments to determine suitable locations is essential to optimize flood protection while minimizing the negative impact on agricultural land and settlement area.

## SUCCESS FACTORS

- \* **Orientation towards Switzerland:** Liechtenstein's strategy is based on the structure and content of the first part of the Swiss Climate Change Adaptation Strategy, which also consists of the nine sectors water management, forestry, agriculture, health, energy, tourism, spatial planning, natural hazards and biodiversity management. The strategy of Switzerland identifies challenges, opportunities and corresponding options for action for each sector, which are similar to Liechtenstein. Furthermore, Liechtenstein does not create its own climate models, but rather follows the models of neighboring countries, especially Switzerland.
- \* **Prioritizing of measures:** The strategy identifies main challenges (e.g. increasing summer drought, increasing flood risk) and prioritizes the corresponding measures. Each sector and its responsible authorities determine which measures are included in the action plan by the following criteria: urgency (without the implementation of the measure, major negative consequences for infrastructure, people or nature must be expected), effectiveness (the measure has high effects in terms of adaptation to climate change) and feasibility (the measure can be implemented to a large extent in the next few years).

## LESSONS LEARNT

- \* **Continuous recording of meteorological and climatological data** forms an important basis for future risk analysis on climate change (MeteoSwiss and other private or public bodies). In addition, regular monitoring of climate-related changes is necessary for the individual sectors, such as agriculture, biodiversity, natural hazards and the development of forest communities. Adaptation to climate change relies on scientific evidence and is a dynamic process that takes into account existing uncertainties and future developments.
- \* **Continuous revision of measures:** The climatic increase of flood events requires an ongoing examination of the risk situation. By periodically updating the hazard maps, new risks can be identified and, if necessary, remedied by appropriate measures. It is important to continuously check and adjust the safety level of existing protective structures. The flood risk in the settlement area can be reduced with existing measures to improve the retention of rainwater.
- \* **Information and awareness:** In addition to the development of a knowledge basis, information activities are an important element of adapting to climate change. It is therefore important to promote the exchange of information with stakeholders in all sectors. For this purpose, data and information relevant for practical issues need to be collected, as this serves as a decision-making basis for the actors concerned. Furthermore, it is important to raise the awareness of the population for the expected climate-related changes and about planned measures.

## SOURCES AND FIGURES

C3-ALPS (2012-2014): Interreg Alpine Space Project C3-ALPS – Climate Change Capitalisation, CIPRA – International.  
Online: <https://www.cipra.org/de/cipra/international/projekte/abgeschlossen/c3> [8.4.2019]

LFL – Landesverwaltung Fürstentum Liechtenstein (2017): Regierungskanzlei. Berichte und Anträge Nummer 2017/29.  
Auswirkungen des Übereinkommens von Paris auf Liechtenstein. Online:

<https://bua.regierung.li/BuA/default.aspx?year=2017&nr=29&content=2079586681> [8.4.2019]

Regierung Fürstentum Liechtenstein (2018): Anpassungsstrategie an den Klimawandel in Liechtenstein. Amt für Umwelt, Fürstentum Liechtenstein. Online: <https://www.llv.li/files/au/konsultation-strategie-fl-ra-lnr-2016-1911.pdf> [8.4.2019]

### Figures:

Figure 1: Debris flow Süttigerwis 1995 (left), landslide Sücka 2005 (right) (© ABS 1995/2005 in: RFL, 2018)

## LINKS AND CONTACT

**Link:** <https://www.llv.li/inhalt/117675/amtstellen/klimawandelanpassung>

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# LIECHTENSTEIN

## REVISION OF HAZARD AND RISK MAP

- \* **Country-wide revision of hazard and risk maps** and periodic reassessment due to climate change initiated by the government
- \* Part of the Climate Change Adaptation Strategy of Liechtenstein
- \* Two-stage process for developing a **proper methodology** including experts and authorities on the local and national level.

## DESCRIPTION

The government mandated the **Office of Civil Protection** with a **revision of the nationwide hazard map**, which was first developed in 2001. Due to changes in the natural and technical system, hazard maps have the character of adaptive planning. Progress in science and technology is constantly generating new findings, models and scenarios, which requires a periodic reassessment of the natural hazard situation, as suggested by the European Directive 2007/60/EC on flood risk management, considering improved and regional climate change models and estimated related potential impacts. The government of Liechtenstein announced a **revision of the national hazard map 15 years after** the creation of the first period. The natural hazard map uses hazard zones to indicate the **location, frequency and intensity of potential hazard processes** such as **landslides, floods, avalanches and rock fall**. The map is a legally binding instrument for the national and municipal offices and serves as an important basis for the development of protection measures and for spatial planning. It is accessible for the population via an **online Geodata Portal, since 2017**. In areas where the revised maps show an **aggravation of the hazard situation**, the municipal **authorities contact the landowners involved**. The revision of natural hazard maps is **part of the Climate Change Adaptation Strategy of Liechtenstein** (see Case Study **Climate Change Adaptation Strategy Liechtenstein**), finalized in 2018. As part of the revision and implementation of the national natural hazard map, the Office of Civil Protection is responsible for dealing with all issues related to gravitational hazards. According to the Forest Act, hazard areas are to be identified in the zoning plans of the municipalities. Furthermore, the government recommends that municipalities adequately consider the findings of the hazard map in the land use planning or other strategic space-related projects. In this context, the government of Liechtenstein accompanied local revisions of building regulations, the implementation of the hazard map into the local planning and other local adaptation measures. Thanks to extensive investments in protection against natural hazards, several of the deficits identified in the original map have been removed over the last few years, especially with flood control measures.

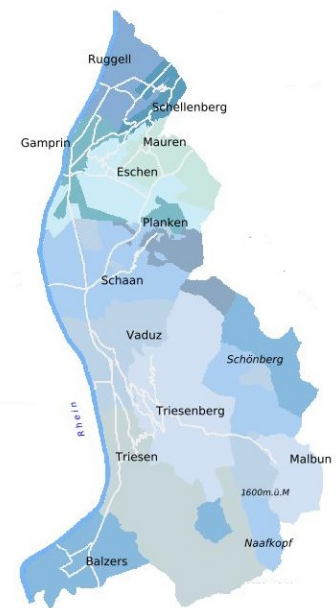


Figure1: Geodata Portal: overview Liechtenstein (© LLV, 2019)

**Status:** After the revision of the **maps of Triesen und Triesenberg in 2015**, other municipalities followed. In 2018, the government has approved the revised natural hazard maps of the remaining municipalities Balzers, Vaduz and Schaan. The municipalities are now in the process of transferring and implementing the maps to the local planning.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	The government recognized the need to adapt the natural hazard map of Liechtenstein to the current and future hazard situation and instructed the revision of the maps, due to possible natural and technical changes in the future, such as the increase of hydro-meteorological extreme events. The hazard map serves as an important basis for flood risk protection and is a legally binding instrument for the local and national planning.
<b>Added value for both CCA and DRR:</b>	The revision of the hazard map is important for an adapted spatial planning (definition of hazard zones in the local planning, building control requirements) and facilitates the localization and dimensioning of protection measures according to the current risk situation. It serves as an instrument for the emergency planning and supports the sensitization of the population.
<b>CCA: Uncertainty and long-term perspective considered</b>	It is intended that the revision of the map will be repeated every 15 to 20 years, taking into account new findings and projection models.
<b>DRR: Risk management cycle considered</b>	The application of hazard maps is effective in different stages of the risk cycle: prevention (spatial planning, technical measures, protection forests), provision (emergency planning), intervention (damage mitigation). The hazard maps form the basis for risk maps, which have been compiled for all settlement areas and enable the implementation and prioritization of measures.
<b>Linkages between several governance levels and/or elements</b>	The natural hazard maps are legally binding for the state and municipal authorities with the approval of the government and must be considered in all spatial development activities. The municipalities are responsible to implement revised hazard maps in local planning instruments. For the public, the revised hazard maps are available on the Geodata-Portal of the Liechtenstein National Administration.

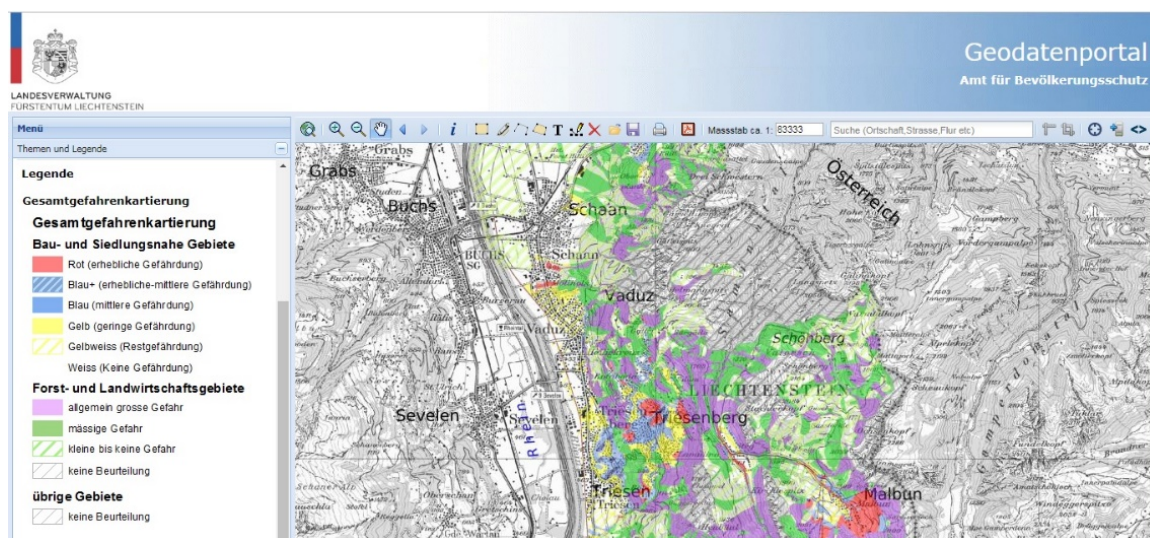


Figure 2: Geodata Portal: map section of the hazard map Liechtenstein (© LLV, 2019)

## CHALLENGES

- \* **Regional climate projections:** It is difficult to transfer the consequences of global warming to Liechtenstein. The currently available climate models are not yet sufficient to predict regional effects of detail. In view of its small size, Liechtenstein has no such regional climate projections. The CCA Strategy and the revision of the hazard maps are oriented towards the models of neighboring countries, especially Switzerland.

## SUCCESS FACTORS

- \* **Two-stage process:** The development of the hazard maps took place in a two-stage process. First, the methodology was tested in the municipalities Triesen and Triesenberg with the focus on landslides. Passing through several feedback stages, combining expert panels, administrative offices, municipalities and ministry, the government approved the procedure and the elaborated methodology was applied to the remaining municipalities including all natural hazard processes. After approval by government enactment, the implementation of the hazard maps in the local and the regional planning started.
- \* **Embedded in the CCA Strategy:** The revision of the hazard maps is part of the Climate Change Adaptation Strategy of Liechtenstein and therefore other relevant topics such as existing protection measures and the statistical evaluation of extreme precipitation events are taken into account. The revision process benefits from a joint coordination of measures directed by the Office of Civil Protection for the sector natural hazards.

## LESSONS LEARNT

- \* **New scientific findings** are an important prerequisite for estimating the expected consequences of climate change, especially on a small scale. In addition, an improved understanding of climate-related changes enables the targeted development of concrete measures, such as the improvement of early warning systems for flood events. Therefore, it is important to follow the findings and experiences of the scientific work as well as pilot projects in other countries.

## SOURCES

- Amt für Bevölkerungsschutz (2018): Geodatenportal – Gesamtgefahrenkartierung. Online: <https://geodaten.llv.li/geoportal/naturgefahren.html> [8.4.2019]
- MIJW – Ministerium für Inneres, Justiz und Wirtschaft (2015): Rechenschaftsbericht. Online: <https://www.regierung.li/media/attachments/Rechenschaftsbericht-2015-ab-S-254-.pdf?t=636708997034924591> [8.4.2019]
- Presseportal (2015): Revision der Naturgefahrenkarten in Triesenberg und Triesen genehmigt. Online unter: <https://www.presseportal.ch/de/pm/100000148/100780473>
- Regierung Fürstentum Liechtenstein (2018): Anpassungsstrategie an den Klimawandel in Liechtenstein. Amt für Umwelt, Fürstentum Liechtenstein. Online: <https://www.llv.li/files/au/konsultation-strategie-fl-ra-lnr-2016-1911.pdf> [8.4.2019]
- Regierung Fürstentum Liechtenstein (2018): Revision der Naturgefahrenkarten Balzers, Vaduz und Schaan genehmigt. Online: <https://www.regierung.li/de/mitteilungen/206575> [8.4.2019]

### Figures:

Figure 1: Geodata Portal: overview Liechtenstein (© LLV, 2019)

Figure 2: Geodata Portal: map section of the hazard map Liechtenstein (© LLV, 2019)

## LINKS AND CONTACT

**Link:** <https://geodaten.llv.li/geoportal/naturgefahren.html>

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## SLOVENIA

### MASPREM – LANDSLIDE PREDICTION SYSTEM FOR RAINFALL-INDUCED LANDSLIDES IN SLOVENIA

- \* **Landslide prediction system** on **national and local level**, introduced in 2013 by Slovenian Ministry of Defense
- \* MASPREM-system alerts responsible regional and local authorities and landslide experts
- \* **Web mapping application** delivers information on landslide probability accessible for the public



Figure 1: Logo Geo-ZS of Slovenia  
(© GeoZS, n.d.)

## DESCRIPTION

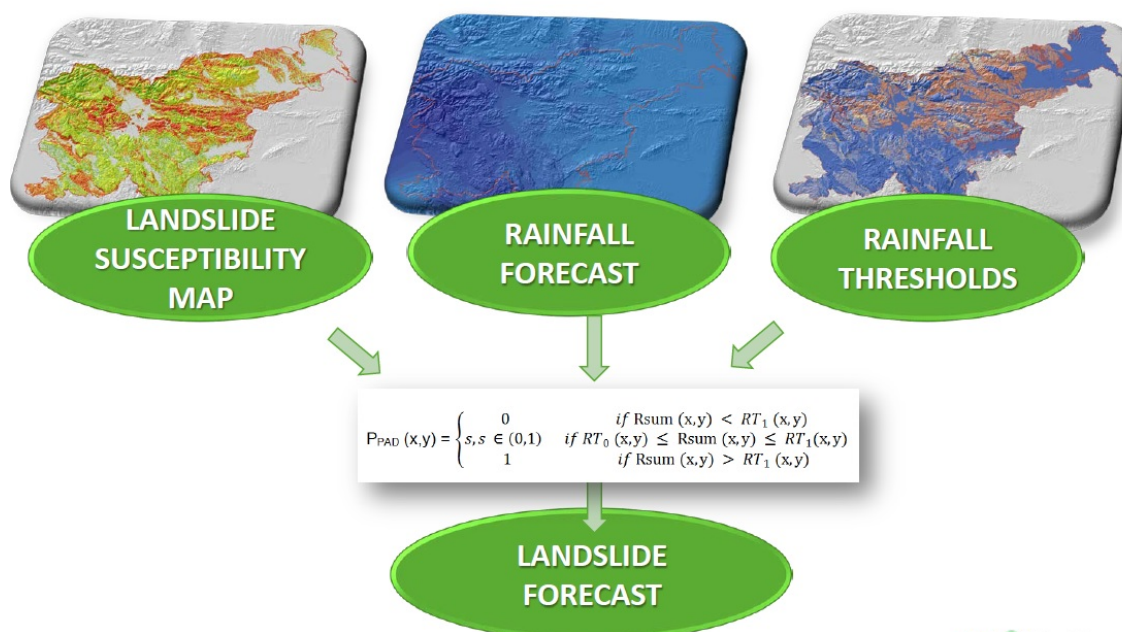
In 2013, the Slovenian Administration for Civil Protection and Disaster Relief (ACPDR, a constituent of the Ministry of Defence) and the Geological Survey (Geo-ZS) of Slovenia commissioned the **system for landslide prediction in time (MASPREM)** for the whole country of Slovenia. The legislation of Slovenia determines the duty of the state and the municipalities to **inform the citizens about natural hazards**. The purpose of the modelling system is to **forecast landslide probability** and to inform civil agencies and responsible authorities of an increased probability of landslide occurrence caused by heavy precipitation that exceeds the rainfall threshold. Currently, MASPREM predicts the landslide probability **twice a day at a national scale** (1:250 000), integrating three major components: a land susceptibility map, landslide triggering rainfall threshold values and precipitation forecasting models. The system also predicts **landslides on a local level**, including exposure maps of inhabitants, buildings and different types of infrastructure to potential landslide occurrence at a scale of 1:25000 for 14 selected municipalities. The aim is to **identify landslide-prone areas** in space and time based on the **knowledge of past landslide events and terrain parameters, geological attributes and precipitation thresholds**.

Almost a quarter of the population of Slovenia lives in landslide-prone areas. In 2014, heavy rainfalls in Slovenia initiated 800 slope failures, causing considerable damage and economic loss. Landslide prediction and the identification of causes that lead to slope failure are possible strategies to reduce the damage. The important factors in determining the precipitation limit at which landslides occurs, is the **intensity of precipitation** and the **amount of precipitation** over a given period of time. Furthermore, persistent rainfall has a strong impact on the groundwater level and on soil moisture, which also have a decisive influence on the occurrence of landslides. For the prediction of landslides, MASPREM considers two different rainfall scenarios and therefore, it uses **two prediction models**. The comparison of the results of the models with a **landslide inventory** is necessary to **validate the output**. The system predicts landslide occurrence for the next **24-hours**. If the probability of landslide occurrence increases, the **system automatically notifies responsible authorities for disaster management** at the Civil Protection Agency and landslide experts at the Geo-ZS. A **web mapping application** shows the results of the prediction models **in classes ranging from one to five** displaying areas with negligible to high landslide probability. The **web application e-Plaz** is also part of the project MASPREM and informs about natural hazards in Slovenia about rock fall, landslides, debris flow, and erosion. It provides access to **enter, view and edit data** on landslides and erosion for municipal representatives and selected national institutions.

**Status:** The landslide prediction system is currently in a **validation phase** and the results need to be treated within their reliability. An important task is to show, that the model reasonably represents actual conditions in nature. Therefore, the **reliability** of the prediction models is assessed each time a landslide is reported. In the period of 2013 to 2016, MASPREM has managed to inform about 84 alerts concerning the probability of landslides. The web applications are already accessible online and deliver landslide probability maps and

forecasts on a national and on a local scale. In addition, the application shows the exposure of infrastructure e.g. roads, sewage, plumbing, and electricity, towards landslides for fourteen municipalities.

## A landslide forecast system



Calculation of landslide forecast predicts an increased probability of certain date.



Figure 2: Calculation of the landslide forecast system (© GeoZS, 2016)

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	MASPREM contributes to the Slovenian strategy of protection against natural hazards and climate change adaptation, by regularly warning about the current risk and probability of landslides, the most significant natural hazard of Slovenia.
<b>Added value for both CCA and DRR:</b>	The forecast system is especially notable because it predicts the occurrence of landslides not only on a national, but also on a local level and uses real-time computers to calculate the current probability. The local scale forecast enables a local disaster risk management with precise measures for the specific municipality.
<b>CCA: Uncertainty and long-term perspective considered</b>	The forecasting model considers continuous precipitation threshold values for each engineering geological unit. The system takes account of the current hydrologic conditions and therefore combines static data with dynamic data.
<b>DRR: Risk management cycle considered</b>	The reliable and timely forecast of natural hazards is an important part of the risk management (preparedness) and enables the preparation of immediate measures. In Slovenia, the forecast system predicts the occurrence of landslides for the next 24-hours ahead. Responsible authorities and citizens are able to react faster to the increasing hazard probability.
<b>Linkage between several governance levels and/or elements</b>	On a national level, the ACPDR and the Ministry for Defense conducted and financed the project. The Geo-ZS works on the elaboration of the system. The authorities of the selected municipalities represent the actors on the local level. They contribute for example to the collection of landslide event data. Citizens can access the information of the landslide probability on national or local level through web application services.

## CHALLENGES

- \* **Uncertainties of models:** After the validation phase, MASPREM has the potential to become a useful operating system. However, several limitation factors related to the input data need to be considered. Each of the three pillars, the land susceptibility model, the landslide triggering rainfall threshold values and the precipitation-forecasting model, bear uncertainties, that individually and collectively, pose big challenges to forecasting prediction accuracy. One of the goals of the project is to assess the sources of these uncertainties and to propose future steps to minimize them. The sources of uncertainty are mainly related to the spatial resolution of the precipitation model (ALADIN), the density of the rain gauge network and the effects of antecedent rainfall on landslide occurrence.
- \* **Incomplete database:** The Geo-ZS collects landslide data since 1998. However, the database only contains information on the location and date of occurrence in 898 cases out of 7273 landslide events. The geographic positioning of the landslide occurrence inaccurate in 20% of the data. In the future, the acquisition of new and more detailed data is required to develop a comprehensive landslide warning system. Therefore, a uniform and centralized collection of data is needed, which presents a major challenge as there is no legal basis for this, and authorities are not obligated to provide data to the Geological Survey of Slovenia.
- \* **DRR needs warning system on a local scale:** At the moment, a landslide warning system predicts landslide probability for the area of Slovenia at the scale 1:250,000 while the real-time disaster management requires the prompt detection of damage on settlements and people, as well as a timely and effective re-routing of traffic flows at the local level.
- \* **No strategy for warning the regional authorities:** In Slovenia, the ACPDR is responsible for the task of sending an alert to regional authorities, who are responsible for further coordination and measures (Official Gazette of the Republic Slovenia, number 51/2006-ZVNDN-UPB1). In the case of the landslide warning system, the ACPDR does not have any systematic procedures for the warning of regional offices.

## SUCCESS FACTORS

- \* **Early warning system for risk mitigation and intervention:** After the finalization of the validation phase and ensuring that the reliability of the system is high enough, the system will be able to inform infrastructure owners (roads, railways, gas/oil pipelines, buildings, electrical power systems), planners, civil agencies, local authorities and citizens of an increased probability of landslides and enable them to mitigate risks. An early warning system will improve the resilience of citizens living in hazard areas and will give them enough time to save themselves and their property.
- \* **Uniform collection of event data:** The administration for civil protection and disaster relief and the Ministry of Defense have established a working group to prepare a framework for actions and measures, implemented when landslides occur. For this reason, the working group developed a common inventory form to collect event data and to assure higher quality of assessment. The minimum dataset, which is required to assure a certain quality of the project, consists of the date of occurrence, the location, the type and description of the landslide, the cause of event and the damages occurred.
- \* **Good collaboration with Environmental Agency and ACPDR:** The collaboration between the Geological Survey of Slovenia with the national offices worked well and contributed to the project's success. On the one hand, the Environmental Agency of Slovenia provided the ALADIN/SI weather forecasting model and the INCA models, which are used for the precipitation data and the prediction of landslides. On the other hand, the Geological Survey of Slovenia also organized workshops for local, regional and national authorities that are dealing with landslide risk, which required good collaboration with the ACPDR. The main purpose of the workshops was to distribute a basic knowledge on landslide processes and to give instructions on the web-application e-Plaz.

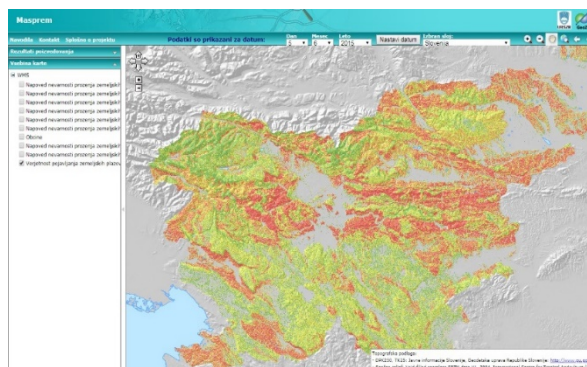


Figure 3: Geodata portal MASPREM, probability of landslide occurrence (© GeoZS, 2013)

## LESSONS LEARNT

- \* **Real-time monitoring on local level necessary:** With advances in the temporal and spatial resolution of the precipitation forecast, it will be possible to predict landslides caused by rainfall in the future, with sufficient reliability to alert the responsible regional and local offices that are able to inform the affected population. However, potential landslide locations are difficult to determine, because of the strong influence of local conditions e.g. soil thickness, lithology, local seepage, and their threshold values. Furthermore, the local hydrologic processes that lead to landslides often occur within minutes. Therefore, it is necessary to develop a real-time monitoring of e.g. precipitation, groundwater level and infiltration on the local level, in order to provide data about triggering mechanisms.
- \* **Consideration of technical, social, economic and political aspect:** MASPREM shows that its effectiveness depends on the technical aspect of the system as well as on the social, economic and political conditions of its operation. From the social point of view, the landslide prediction system is necessary to prepare people for extreme weather events and to develop strategies to maximize the safety of the population during the event. Furthermore, it is important to consider the economic aspect, because the development and management of the prediction system needs to be sustainable in the long-term and the associated costs should be kept at a feasible level. In addition, the Administration of Civil Protection and Disaster Risk and other relevant authorities need to be adequately engaged in management and communication processes.
- \* **Basis for spatial planning and insurance:** The development of susceptibility maps for spatial planning will assist planners in designing resilient and sustainable infrastructure. Insurers and risk managers can use this system to assess the risk in a portfolio of exposures. This might help to guide an insurer's underwriting strategy or to decide how much reinsurance to purchase.

## SOURCES AND FIGURES

- Milica Slokar, Joze Papez (2013): Presentation: Floods on Drava River Basin 2012 in Slovenia – Lessons learned. Contribution of PLANALP members from Slovenia on "Water and Risk Management facing climate change: towards the local adaptation". Brescia, 10.10.2013. Online: <http://www.alpconv.org/en/organization/groups/WGWater/workshopplanalp/Documents/Planalp-Slovenia-Brescia2013-Floods%20on%20Drava%20River%20Basin-Final.pdf>
- Šinigoj, J.; Jemec-Auflič, M., Krivic, M. (2017): Landslide prediction system in Slovenia (Masprem). Online: <https://www.researchgate.net/publication/316663891>
- Šinigoj, J.; Jemec-Auflič, M., Krivic, M., Podboj, M. (2016): Landslide prediction system for rainfall induced landslides in Slovenia (Masprem) - Sistem opozarjanja na nevarnost prozenja zemeljskih plazov v Sloveniji (Masprem). Geologija. December 2016. Online: <https://www.researchgate.net/publication/311912674>
- Špela Kumelj, Mateja Jemec-Auflič, Jernej Jež, Tina Peternel, Blaž Milanič Presentation (2016): Involvement of the Geological Survey of Slovenia in the field of natural hazard risk management. COMLAND workshop, Ljubljana, 23.06.2016. Online: <https://giam.zrc-sazu.si/sites/default/files/kumelj-1.pdf>

### Figures:

Figure 1: Logo Geo-ZS of Slovenia (© GeoZS, n.d.)

Figure 2: Calculation of the landslide forecast system (© GeoZS, 2016)

Figure 3: Geodata portal MASPREM, probability of landslide occurrence (© GeoZS, 2013)

## LINKS AND CONTACT

**Links:** <https://www.e-plaz.si/>; <http://akvamarin.geo-zs.si/masprem/>; <http://biotit.geo-zs.si/masprem/examples/wms-masprem.html>

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## SLOVENIA

### VIPAVA RIVER BASIN – BEWATER PROJECT SOCIETY ADAPTING TO GLOBAL CHANGE

- \* **International project** targeting climate change adaptation in water management by **collecting and disseminating implementation experiences** in four Mediterranean regions
- \* Development of **participative approach**, including scientists, experts, local and national authorities and citizens in **adapting river basin management**
- \* Development of **River Basin Adaptation Plans (RBAP)** consisting of measures for flood risk protection in the Vipava river basin, Slovenia



Figure 1: BeWater logo  
(© BeWater, 2013)

## DESCRIPTION

The Vipava valley in Slovenia is part of the BeWater project, which aims to establish climate adaptation principles into water management in four Mediterranean river basins (Spain, Cyprus, Tunisia, Slovenia). Its objective is to **increase the resilience of the social and economic system to the uncertainty of climate change**. The project fosters **the intensive collaboration between scientists and local stakeholders** to identify various options for water management in each of the basins and to develop River basin Adaptation Plans. Participatory strategies and the active engagement of the local societies play an important role in the project, ensuring a **bottom-up co-design process**. The **European Union** funded the project through the European Commission's 7th Framework Program. It started in 2013 and closed in March 2017. The main output of the BeWater project encompasses a handbook with a step-by-step guide to the BeWater approach, the River Basin Adaptation Plans and Policy Briefs.

**The BeWater approach for adaptive river basin management** includes various steps: the identification of stakeholders, the compilation of available information on climate change, the determination of challenges and objectives, the formulation of water management options as well as the assessment and evaluation of options, their optimal timing and the roles of the involved stakeholders. **The Institute for Water of the Republic of Slovenia** conducted a collaborative process of developing the Adaptation Plan together with local stakeholders. They have identified three main challenges that the Vipava river basin is facing in terms of climate change: (a) water availability during droughts in growing season, (b) flood risk reduction and (c) appropriate water quality. The **Vipava River Basin Adaptation Plan** lists **20 water management options** to face these challenges, including implementation-oriented information for each option such as their feasibility, acceptability, policy synergies and co-benefits. The plan suggests a timeline for implementation and priority levels. Options that show synergies with objectives from relevant sectoral plans (e.g. Inland Fisheries Program, Natura 2000 Management Program) will receive support for their implementation.

The implementation of a few water management options happened before the end of the BeWater project. For instance, a **Council for Vipava River** was established by the end of 2015, as a response to the first water management option (WM01): Establishment of an inter-municipal expert working group. The Council is composed of mayors from municipalities of the Vipava river basin as well as their regional development agencies and has political importance and executive power. Its main objective is the integrated planning of water management and spatial development by regularly organizing meetings and providing necessary resources, guidance and administration. It consists of experts in various fields (e.g. spatial planning, hydrology, nature conservation, economy), which are provided by the Ministry of Environment and Spatial Planning and its agencies. Further objectives of this working group are to propose new ideas, initiatives and projects that encourage the sustainable development, to improve communication between municipalities and experts as well as local and state authorities.

For the WM01 the RBAP defines a period of 12 years with an estimated total cost of 136.506€ until the year 2030, including group organization and animation of 12 members (2 meetings per year). Possible funding options are the INTERREG MED Program 2014-2020 and the Horizon 2020.

**Status:** A follow-up project of the River Basin Adaptation Plan is the LIFE project called ViVaCCAdapt - Adapting to the impacts of Climate Change in the Vipava Valley, which started in July 2016 and will last for five years. The project aims to reduce the damage caused by strong winds and considers the effects of climate change. Furthermore, the results of the BeWater project initiated two new proposals for projects, whereof one – VISFRIM project – aims to improve flood risk protection in the cross-border river basins in Slovenia (Soča, Vipava) and Italy (Lemene). State institutions and local authorities will implement measures and activities, exchange available knowledge and data and develop models for simulation of flood risk. The project started in early 2019 and will last for 3 years.

## WHY IS IT A GOOD PRACTICE EXAMPLE?

<b>Coherence and cooperation between CCA and DRR stimulated deliberately</b>	Due to the estimated increase in water scarcity, drought episodes and extreme weather events in the Mediterranean region, the BeWater project focused on the design of adaptive water management approaches and the development of river basin adaptation plans to increase the societal resilience to climate variability. In Slovenia, flood risk protection is one of the challenges caused by climate change that the stakeholders identified in the case study. Therefore, the RBAP includes appropriate measures to reduce flood risk in the Vipava valley.
<b>Added value for both CCA and DRR:</b>	The participatory approach formed the basis of the project, which consists of knowledge sharing and mutual learning between scientists, experts, policymakers and local society. This offered the possibility for capacity building, awareness raising and the development of practical recommendations. The process of co-production used in BeWater added value to CCA and DRR, producing results with a high degree of social acceptance, political relevance and technical importance to counter the uncertainties and complexity of global change.
<b>CCA: Uncertainty and long-term perspective considered</b>	A global screening of water management initiatives revealed that there is a need to integrate risks and uncertainties of climate change adequately in the planning process via an adaptive approach. Therefore, the River Basin Adaptation Plans of the BeWater project consider the uncertainties surrounding the potential impacts of climate change and emerging socio-economic conditions. With an adaptive approach, they are able to respond to changes in key socio-ecological factors.
<b>DRR: Risk management cycle considered</b>	Flood risk protection is one of the three challenges that the Adaptation Plan deals with. The relevant recommendations include risk management topics such as awareness raising (of local public and water management experts), technical and natural prevention (construction of water reservoirs), risk-governance (expert groups, bottom-up approach) and prevention (risk communication, forecasting systems).
<b>Linkages between several governance levels and/or elements</b>	The BeWater project links the national level with the regional and local level, by fostering the collaboration between national offices and scientists with municipal authorities and the citizens. The similar approach and common objectives in the four case studies allows an exchange at international level. The participatory process in the RBAP included three professionally facilitated workshops, follow-up interviews, individual and group sessions and additional open consultation.

## CHALLENGES

- \* **Reorganization of the Slovenian water sector:** Due to the restructuring of the Slovenian water sector, national stakeholders switched their position and scope of responsibility during the process. This reduced the knowledge transfer to a certain extent and affected the availability of the national actors as well as the general sentiment towards the project. Key stakeholders were unable to attend some workshops, because of the heavy workload. The reorganization also affected the Vipava project team and delayed the project's progress. In this context, the preparation of detailed reports from workshops and other stakeholder interactions were helpful to gather insights, results and the progress of the ongoing activities while ensuring transparency and traceability.
- \* **Engagement of various stakeholders into the planning process:** In the Vipava case study, the local project team was collaborating with multiple stakeholders from different sectors, rising several challenges. The main challenge was to engage policy and decision makers on a national level and to encourage them to participate in workshops. Slovenia is a small country with a limited number of leading public authorities and policy-makers in each sector. It is demanding to organize a meeting that multiple stakeholders can attend.



Figure 2: Process of the River Basin Adaptation Planning (© BeWater, 2016)

## SUCCESS FACTORS

- \* **Participative approach raises probability for long-term engagement:** Natural hazard management concerns various sectors and actors on multiple levels. It is crucial to involve policy makers, local stakeholders and experts in planning processes from the earliest stages of development. The collective elaboration and development in water management helps to define and emphasize the interests, demands and concerns of the community, while expressing common definitions, goals and solutions. By understanding these aspects, and particularly the needs of society, the support for the proposed measures increases and raises the probability of long-term engagement and effectiveness.
- \* **Lessons learnt by other adaptation plans:** By screening best practice examples in the field of water management plans, the BeWater project team gathered valuable information. The project's approach and the development of the RBAPs is based on a set of methods identified in existing adaptation plans.
- \* **Implementation in other planning activities and synergies with sectoral plans:** With the BeWater Policy Briefs, the project delivered recommendations for strengthening policy and institutional frameworks targeting decision-makers on various governance levels. The policy brief for the Vipava River Basin (BeWater, 2017) aims to inform decision makers about potential measures that they can include in other planning activities, such as the River Basin Management Plan, Flood Risk Management Plan or relevant projects. Because of the participative approach, various stakeholders that are involved with the topic support the recommendations of the Adaptation Plan, facilitating their implementation in other Plans. Some measures show synergies or similarities with measures of existing sectoral plans and can therefore be a useful addition. Measures that are already fully or partially included in other sectoral plans can get additional support from the Vipava River Basin Adaptation Plan.
- \* **EU-support for follow-up projects:** Various European financial mechanisms such as LIFE, cohesion and rural development funds (ERDF) provide an opportunity for follow-up projects with the aim of implementing the measures and contributing to a sustainable and adaptive water management. The Institute for Water of the Republic of Slovenia, as the key expert of the planning process, is interested in supporting future activities and will be available for questions and consultation on river basin adaptation actions. As a follow up to the participatory planning process, the LIFE project ViVaCCAdapt already received funding to continue the work.

- \* **Transferability to other river basins:** The four RBAPs serve as a reference for other basins within the Mediterranean region and beyond, that wish to increase their resilience and organize such a participatory development process. To facilitate the transferability potential, the BeWater project produced a handbook presenting lessons learned and clear guidelines, which specify the different considerations and steps involved in creating an adaptation plan at river basin level. The handbook strongly focuses on the participatory approach and the methods used in the project. Therefore, it provides a useful guide for a successful development of an adaptation plan in other basins and regions.

## LESSONS LEARNT

- \* **Focus on the interaction of stakeholders:** During the preparation of the river basin adaptation plans, good relationships and partnerships between the various stakeholders (e.g. organizations, authorities, policy and decision makers) are essential. The active participation of the stakeholders in the planning process effected in a better management and coordination between these actors. Furthermore, the participants got a better insight and understanding of how to deal with impacts of climate change and how to develop appropriate measures for the emerging challenges. For the involvement of stakeholders in the development and assessment of water management options, dedicated workshops are necessary for stakeholders and researchers to interact.
- \* **Wide range of topics necessary:** Given that the development of the RBAP follows a predefined schedule, the project team spent considerable energy and time in the initial phase to collect relevant information. The involvement of stakeholders with extensive knowledge, experience and expertise in various fields supports and accelerates this process. The discussion of different aspects of water management issues and climate change impacts is possible. In this way, the project team deals with all the relevant topics and does not leave out important measures to solve the issues.
- \* **Rigorous structure:** A rigorous methodological approach with a certain degree of flexibility is essential for the successful operation of the project. The clearly defined structure facilitates the prevention of aberrations in the planning process and creates the prerequisites for achieving the overall planning goal. This applies in particular if the intensive involvement of stakeholders is part of the project.



Figure 3: Participatory Planning Process of the River Basin Adaptation Plan (© BeWater, 2016)

## SOURCES AND FIGURES

- BeWater (2016): Developing participatory adaptation plans for river basins – a handbook. Online: [https://www.bewaterproject.eu/images/results/Handbook/BeWater-handbook-final\\_web.pdf](https://www.bewaterproject.eu/images/results/Handbook/BeWater-handbook-final_web.pdf)
- BeWater (2017a): Vipava Society, Slovenia. Online: <http://www.bewaterproject.eu/bewater-society/vipava-society-slovenia>
- BeWater (2017b): Policy Brief no.5. From planning to implementation. Recommendations for actions supporting adaptation in the Vipava River Basin. Online: [https://www.bewaterproject.eu/results/publications/item/bewater-policy-brief-no-5?category\\_id=94](https://www.bewaterproject.eu/results/publications/item/bewater-policy-brief-no-5?category_id=94)
- LIFE ViVaCCAdapt (2016): ViVaCCAdapt. Adapting to the impacts of climate change in the Vipava Valley. Online: <http://www.life-vivaccadapt.si/en/>
- Manca Magjar, Peter Suhadolnik, Sašo Šantl, Špela Vrhovec, Aleksandra Krivograd Klemenčič, Nataša Smolar-Žvanut – IzVRS (2016): Vipava River Basin Adaptation Plan. Online: [http://www.bewaterproject.eu/images/publications/RBAP\\_Vipava\\_FINAL.pdf](http://www.bewaterproject.eu/images/publications/RBAP_Vipava_FINAL.pdf)
- VISFRIM (2019): Flood risk management in the Vipava river basin and other cross-border river basins. Online: <https://www.ita-slo.eu/sl/visfrim>

### Figures:

Figure 1: BeWater logo (© BeWater, 2013) – BeWater, Vipava River Basin

Figure 2: Process of the River Basin Adaptation Planning (© BeWATER, 2016) - BeWater, Vipava River Basin

Figure 3: Participatory Planning Process of the River Basin Adaptation Plan (© BeWater, 2016) - BeWater, Vipava River Basin



## LINKS AND CONTACT

**Homepage:** <http://www.bewaterproject.eu/case-studies/vipava-river-basin-slovenia>

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## References

- EEA. (2017). *Climate change adaptation and disaster risk reduction in Europe: Enhancing coherence of the knowledge base, policies and practices*. EEA report: No 15/2017. Luxembourg: Publications Office of the European Union.
- EFDRR, European forum for disaster risk reduction. (2013). How does Europe link DRR and CCA: working paper. Retrieved from [https://www.unisdr.org/files/35277\\_ddrccafinal.pdf](https://www.unisdr.org/files/35277_ddrccafinal.pdf)
- FOCP. (2014). *Integrated Risk Management: Its importance in protecting people and their livelihoods*. Bern, Switzerland.
- Birkmann J., Pardoe, J (2014). Climate Change Adaptation and Disaster Risk Reduction: Fundamentals, Synergies and Mismatches. In: Glavovic, B. C, Smith, G. P. (2014): *Adapting to climate change. Lessons from natural hazards planning*. Dordrecht: Springer (Environmental hazards). P. 41-56.
- Huq, I.R.S., Anokhin, Y. A., Carmin, J., Goudou, D., Lansigan, F. P., Osman-Elasha, B., & Villamizar, A. (2014). Adaptation needs and options. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. In IPCC (Ed.), *Climate change 2014: Synthesis report: Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)] (pp. 833–868). Geneva, Switzerland: Intergovernmental Panel on Climate Change.
- IFRC. (2013). *Mainstreaming DRR and CCA: a practitioner's guide*.
- IPCC. (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. UK and New York, NY, USA: Cambridge University Press, Cambridge.
- ISDR, EUR-OPA, & Council of Europe. (2011). *Climate Change Adaptation and Disaster Risk Reduction in Europe: A Review of Risk Governance*. Retrieved from <https://www.unisdr.org/we/inform/publications/20591>
- Leitner, M., Schmidt, A., Capela Lourenço, T., Prutsch, A., Liehr, C., Pulquerio, M., Steenbergen, M., Schipper, L. (2018). Draft guidelines to strengthen CCA and DRR institutional coordination and capacities.
- Mercer, J. (2010). Disaster risk reduction or climate change adaptation: Are we reinventing the wheel? *Journal of International Development*, 22(2), 247–264. <https://doi.org/10.1002/jid.1677>
- Schindelegger, A. (2019). *RSA 7 - Natural hazard risk governance*.
- Schindelegger, A., & Kanonier, A. (2019). *Natural Hazard Risk Governance: Status Quo in the EUSALP Region*.
- Schneiderbauer, S., Hartmann, S., Dalla Torre, C., Dinkelaker, N., Sankowsky, A., Hoffmann, C., Pedoth, L., Streifeneder, T. (2018). *Beyond the Expected: Dealing with the Case of Overload and Residual Risk of Natural Hazards in the Alpine Region. Final Report*. Bolzano, Italy.
- Sendai Framework for Disaster Risk Reduction 2015-2030, UNISDR 2015.
- UNISDR. (2009). *2009 UNISDR terminology on disaster risk reduction*. Retrieved from [https://www.unisdr.org/files/7817\\_UNISDRTerminologyEnglish.pdf](https://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf)
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: Natural hazards, people's vulnerability, and disasters*. Second edition (2nd ed.). London, New York: Routledge.