National Report of Switzerland

1. Introduction

Since the last meeting of the Working Party in Krakow in 2004, Switzerland has tried to improve and develop its watershed management in mountain areas in different respects. Without going into the details of the improvements made in the areas of methodology, organisation and legislation, I will attempt to demonstrate the main strategic directions taken.

2. Focus areas in the development of watershed management from a forestry perspective in Switzerland

The storm events of 2005 and the search for the efficient and effective division of tasks between the Confederation and the cantons had a significant influence on watershed management activities at strategic and planning level. I will explain this on the basis of the following seven focus areas.

2.1 New financial equalisation between the Confederation and the cantons

The new system of financial equalisation and division of tasks between the Confederation and the cantons (NFA) has given rise to systemic change in the policy underpinning environmental subsidies. From now on, the Confederation and Cantons will prepare programme agreements together, in which the environmental targets they intend to attain and the amount of federal subsidies available for these measures are defined. Working in collaboration with the cantons, FOEN has defined the basis for the new subsidy policy, of which the current “New Financial Equalisation” (NFA) manual constitutes an important element. It establishes the framework for the implementation of the NFA in the programme agreements by explaining in detail the principles and strategies underlying each individual programme. (01)

The principles of programme-oriented subsidy policy

In view of the fact that the flows of public finance between the Confederation and the cantons for the funding of solutions to socially relevant problems were very unclear and had, therefore, become inefficient, new solutions had to be found. As part of this process, a distinction was made between tasks which should be the sole responsibility of the Confederation in future and those which should be exclusively cantonal tasks.
Protection against natural hazards and the preservation of the forest are joint tasks to be funded by both the Confederation and the cantons.

Even after the unbundling of tasks, in a small federal state like Switzerland, some tasks can only be undertaken jointly by the federal authorities and the cantons. This requires new forms of cooperation and financial organisation between the Confederation and cantons. Instead of subsidising new individual projects in accordance with cost-based criteria, multiannual programmes with global requirements are gaining in significance. The Confederation is responsible for strategic management, including the corresponding controlling, while the cantons determine how they wish to achieve the agreed objectives at

operative level. As a result of the adoption of these new forms of cooperation and finance, the system of cost-oriented input control is eliminated. Based on the new approach, an agreement is reached on the objective of the measure to be implemented and in this way the focus of the state action is placed on the desired service or effect of the measure to be implemented (i.e. output control).

With output control the results of a process or measure become the yardstick for the assessment of the fulfilment of a task. The objective of the redistribution of resources is also targeted exclusively through a general balancing of resources and no longer mixed in with subsidy policy. The level of the subsidies allocated is no longer dependent on the financial health of the individual cantons.
In terms of the instruments of federal state co-operation, where possible, target-oriented agreements on programmes and service proposals are used, with financial support generally being provided through general subsidies.

The following objectives are pursued through the new subsidy policy:

- the improved allocation of roles between the Confederation and cantons;
- the allocation of greater responsibility to the cantons and extension of their scope for organisation in the implementation of federal legislation;
- the optimization of the utilisation of resources through the bundling of individual measures into programmes;
- the enhancement of planning security through the adoption of a medium-term perspective;
- the development of partnership-based action between the Confederation and the cantons.

The following funding areas are negotiated by the Federal Office for the Environment in the context of programme agreements:

- Protective forest (Article 37, Federal Act on Forests)
- Protective structures (Article 36, Federal Act on Forests, Article 6, Federal Act on Hydraulic Engineering)
- Renaturation of water bodies (Article 7, Federal Act on Hydraulic Engineering)
- Species, biotopes and ecological compensation (Article 18 ff, Federal Act on the Protection of Nature and Cultural Heritage)
- Protection of mire landscapes (Article 23 ff, Federal Act on the Protection of Nature and Cultural Heritage)
- Landscape protection measures (Article 13, Federal Act on the Protection of Nature and Cultural Heritage)
- Biodiversity in the forest (Article 38, Federal Act on Forests)
- Game and aquatic bird reserves (Article 11, paragraph 6, Federal Act on Hunting, Article 13, paragraph 3, Federal Act on Hunting)
- Forestry sector (Article 38a, 38, Federal Act on Forests)
- Parks (Article 23k, Federal Act on the Protection of Nature and Cultural Heritage)
- Nitrogen elimination (Article 61, Federal Act on the Protection of Water)
- Noise protection measures (Article 50, paragraph 1, letter b, Federal Act on Environmental Protection)

Initial experience from the programme agreements established up to now shows that the potential for development in the areas of the division of tasks between the Confederation and the cantons and the coordination between the different sectors should be exploited. Controlling at strategic level also has further scope for improvement in terms of the parameters to be controlled and strategic controlling mechanisms.

2.2 The revision of the forest legislation

The innovative Swiss National Forest Programme (Swiss NFP) was defined in the course of a complex participative process which took place over a period of three years. The conservation of biodiversity in the forest and of the protective forest, which provides protection against natural hazards such as avalanches, rockfall and debris flow, were identified as the Confederation's priority funding tasks. In view of the fact that agriculture has abandoned and continues to abandon unattractive former agricultural areas to the forces of nature, in particular in the mountain regions, the question arises as to the extent to which the extremely strict policy for the protection of forest area should be replaced by a more differentiated policy. The requirements in relation to compensation measures for deforestation should be adapted and based on the proportion of forest area in the different regions.

The organisations that support the viewpoint of forest utilisation fear that the new forest legislation could prove a greater obstacle to the survival an internationally competitive forestry and wood sector than the old provisions. For their part, the proponents of forest protection fear excessive intervention or logging by forest owners.

In addition, the Franz Weber Foundation launched a popular intiative entitled "Rettet den Schweizer Wald" ("Save the Swiss Forest") which demanded that the state and its forestry services assume far greater responsibility than previously for the way in which forest property is managed and that public money be made available for this."

For this reason, the two chambers of the Swiss federal parliament rejected the coming into force of the new law as proposed by the Federal Council.

Increasing wood prices are currently leading to the utilisation of forest areas of one to two hectares in size, in particular those located along access roads; this was a less common occurrence in the past. This has prompted critical reactions in various locations on the part of those who view the forest as a recreational area.

Because the old legislation enabled many of the requirements formulated in the forest programme to be implemented without the revision of the law, the resulting "material damage" is minimal. The situation should be seen on a more differentiated way from a political perspective. (2)

2.3 Lessons learned from the storm events of 2005

The flood of August 2005 claimed six lives and gave rise to material damage totalling three billion Swiss francs. Thus, in terms of the damage caused, this event is without parallel over the past three decades. Continuing precipitation over large areas led to exceptionally high discharge and lake levels. The main processes that caused the damage were flooding, erosion, overbank sedimentation, landslides and debris-flow deposition. Taken as a whole and viewed in the context of an extended period of time, this event was rare, but not exceptional. Thus, flood events of a similar magnitude and scope must be expected in the future.

The following insights are particularly significant from the perspective of watershed management.

With material damage totalling three billion Swiss francs, in financial terms, the flood of August 2005 represents the most serious storm event since the systematic recording of storm damage began in 1972. The comparatively low number of casualties is primarily due to efficient emergency planning (including alarm raising and evacuation).
Around 900 municipalities – i.e. almost one third of all municipalities in Switzerland – were affected by the flooding in August 2005. Ninety-two percent of the total damage was

caused by high water, flooding, overbank sedimentation, rising groundwater levels and slope water. The large rivers and lakes were mainly responsible for the prolonged floods, albeit with low levels of bedload, which caused extensive damage in settlement areas in particular. Debris flows, which were only responsible for 3% of the damage, played a less significant role. Five percent of all damage was due to landslides and slope-type debris flows.

In terms of sediment transport, the overview of results provided by the bedload observation network shows that few streams had exceptional sediment loads, even in the core precipitation area. This can probably be explained by the fact that the area-specific precipitation threshold values for the release of debris flows or mobilization of large volumes of sediment transport were only reached or exceeded in individual areas.

Due to the driftwood blockages at bridges and weirs, channel breaching and flooding arose in various locations. At least 110,000 m3 of driftwood was shifted. Given that many smaller deposits of driftwood were not recorded, the total volume that arose in the course of the event would probably significantly exceed this figure. It was established in the first part of the event analysis that a considerable proportion of the driftwood originated from fresh bank erosion or lateral erosion along the affected water bodies (03).

The second part of the analysis, which is due for publication in September 2008, involves, in particular, the success analysis of the organizational measures and early warning system.

2.4 Hazard prevention

Based on the insights already gained from the event analysis carried out on the storm of 2005 (Ereignisanalyse Unwetter 2005), Switzerland must adapt to the fact that natural events on a comparable or even larger scale may arise in the future. In order to prevent similar or even more extensive damage in such an event, it is essential that the consistent implementation of comprehensive flood-protection policy continues. The basis for this is provided by the hazard maps which show where and on what scale natural events should be expected. Based on this information, the necessary preventive measures can be taken, be they based on spatial planning or construction measures. However, even when such measures have been implemented, events must still be expected that exceed the event on which the dimensioning of the measures is based. Thus, protective measures must be robust and have overload capacity. In order to prevent the uncontrolled increase in damage, areas that are at risk must be avoided, protective measures applied to existing and new buildings and emergency measures prepared.

From a general perspective, what is involved here is the optimisation of integrated natural hazard risk management to maximise the efficiency and effectiveness of the use of resources for protection against the effects of natural hazards. In view of the fact that, on average, most damage in recent decades has been caused by flooding, flood protection measures take top priority.

Because such storm events rarely respect country borders and usually involve, for example, large parts of the Alpine region, the promotion of international cooperation in the area of hazard prevention is a worthwhile objective for all Alpine countries. This has already been demonstrated by the establishment of a working group devoted to natural hazards by the Permanent Committee of the Alpine Convention. The working group in question is the Platform on Natural Hazards of the Alpine Convention (PLANALP). Switzerland currently holds the chair of PLANALP.

Figure 1

Integrated natural hazard risk management must be optimised in such a way that human beings and their material assets are sustainably protected against natural hazards through a “mixture of measures“ based on the principles of sustainability

The following important areas for action were identified in Workpackage 8: Flexible Response Network of the Interreg IIIC project “ClimCh”:

- The continued development of a well structured strategy for integrated natural hazard risk management and promotion of the implementation of appropriate tools, taking into special consideration climate change scenarios and growing uncertainties in integral natural hazard risk management and in risk-based decision making.
- The use and enhancement of existing local, regional, national and cross-border networks of public authorities for natural hazard risk management and improvement of cooperation and communication activities between different administrative levels and bodies at regional, national and international level.
- The facilitation of the sharing of the experience and knowledge available in different Alpine regions through the promotion of expert hearings.
- The organisation of educational initiatives and training courses, in particular for young practitioners involved in integrated risk management.
- The promotion of the individual responsibility of members of the general public in relation to the potential risks associated with natural hazards

The follow-on project AdaptAlp was authorised by the EU at the end of June 2008. It is intended to fulfil the requirements by means of pilot tests to be carried out as part of Workpackage 6 “Risk Prevention – Risk Management” (04).

2.5 Risk management

Because investment in prevention is most successful when nothing happens, the natural hazards sector generally settles for pointing out that its job is to prevent damage. This is always effective when major events occur that cause significant damage.

In view of an increasing need for preventive action, in particular in the area of the rehabilitation of old protective structures and concepts, awareness of this issue needs to be raised in political circles. Awareness-raising campaigns are most successful when documentary evidence of previous successes achieved through preventive work can be provided (see Figure 2).

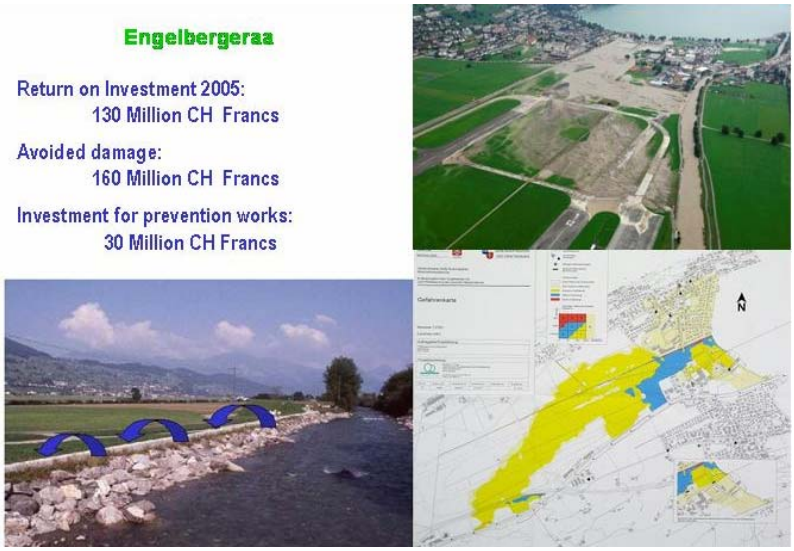

Figure 2
The storm events of 2005 clearly proved to valley inhabitants and the authorities that investment in preventive measures is worthwhile. The return on investment after just two years was 130 million Swiss Francs.

(good example: http://www.climchalp.org/index.php?option=com_wrapper&Itemid=153)

As part of the ClimChAlp project, an attempt was made to compile a database which would enable the localisation of good examples of natural hazard risk management in the Alpine region. The database (PLANALP-DB) is still under construction and very much at the experimental stage. The aim of this database is to make current examples of good practice available for discussion and the promotion of networking (05).
Thus, the strategic report for ClimChAlp specifies the requirement that we – "Continue to widen the PLANALP computer-based information database, which is based on the strategic requirements of the Flexible Response Network, and use it as a platform for the communication of best practice at transnational level" (06).

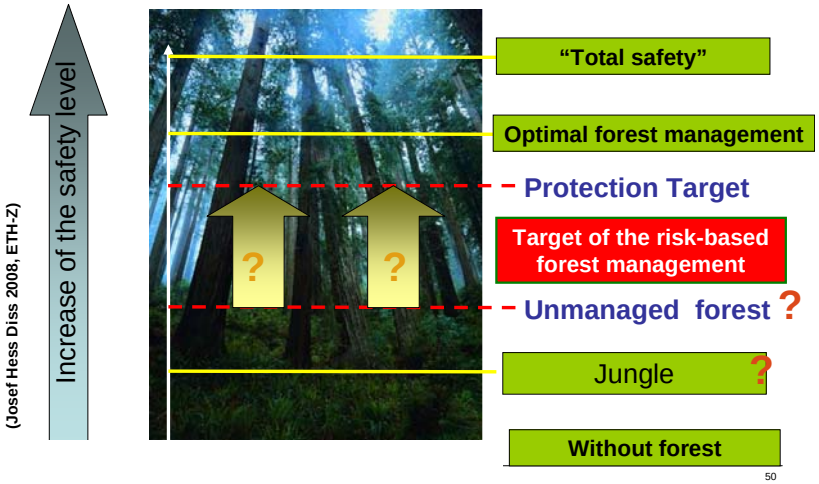

Figure 3

Risk based decision makeing – a new concept for a risk dialogue (14)

The importance of the mountain forest/protective forest in integrated natural hazard risk management

Because the mountain forest and, in particular, the protective forest represent an important component of integrated natural hazard risk management, a corresponding declara-

tion by the responsible politicians was signed in October 2007 as part of the Interreg IIIC project NetworkMountainForests (07), (cf. Annex).

Guidelines for silvicultural intervention in forests with protective functions

The Federal Office for the Environment (FOEN) published guidelines in 2005 for the sustainable guaranteeing of the protective functions of the protective forest which safeguards human beings and their material assets against natural hazards, such as rockfall, avalanches and flooding etc. This provides a basis for the cantonal forestry services at operative level and constitutes, at the same time, a prerequisite for the provision of financial support by the state.
An edited edition of the guidelines was published in English in 2007.

Forests often protect people and material assets from natural hazards by preventing hazards or by reducing their impact. Protection forests are delineated on the basis of an assessment of the hazard potential, the damage potential and the potential effect of the forest.
Protection forest management is based on the assumption that there is a direct link between the level of risk and the state of a forest. The goal of protection forest management is to ensure as effectively as possible the reduction of potential damage due to hazards.

The state of the forest aimed for is defined in so-called target profiles which are based on what is known about natural hazards and the local site conditions. These profiles describe stand conditions which should have a strong protective effect. The target profiles incorporate the attributes tree species composition, stand structure, stability carriers and regeneration (08).

The Riskplan software tool: an attempt at evaluating risks and tracking their development

Risk-appropriate planning and action requires a knowledge of risks that exist in an area along with information about their nature, scope and likelihood of occurrence. Only when an overview of all risks in a valley or region is available, is priority-based risk planning and action possible that also incorporates the cost-benefit factor.

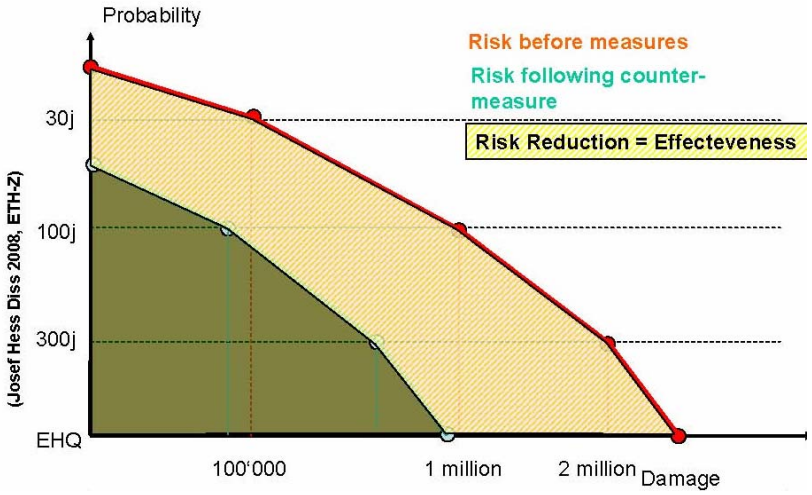

Figure 4

Calculation of risk and riskreduction in a probability (p) – damage diagram (14)

In order to minimise the cost of such analyses, the Swiss Federal Office for Civil Protection (FOCP) and Swiss Federal Office for the Environment (FOEN) together with the

companies GrSoft and Ernst Basler und Partner AG developed the software tool “Riskplan” which is intended to enable the evaluation of risks, their development and the effect of protective measures. The basis for the analysis are freely selectable two-dimensional (x–y) matrices with the input parameters “*Verlauf (Eintretenswahrscheinlichkeit)*”, i.e. course (likelihood of occurrence) and “*Szenario (Schadenausmass)*”, i.e. scenario (damage scope).

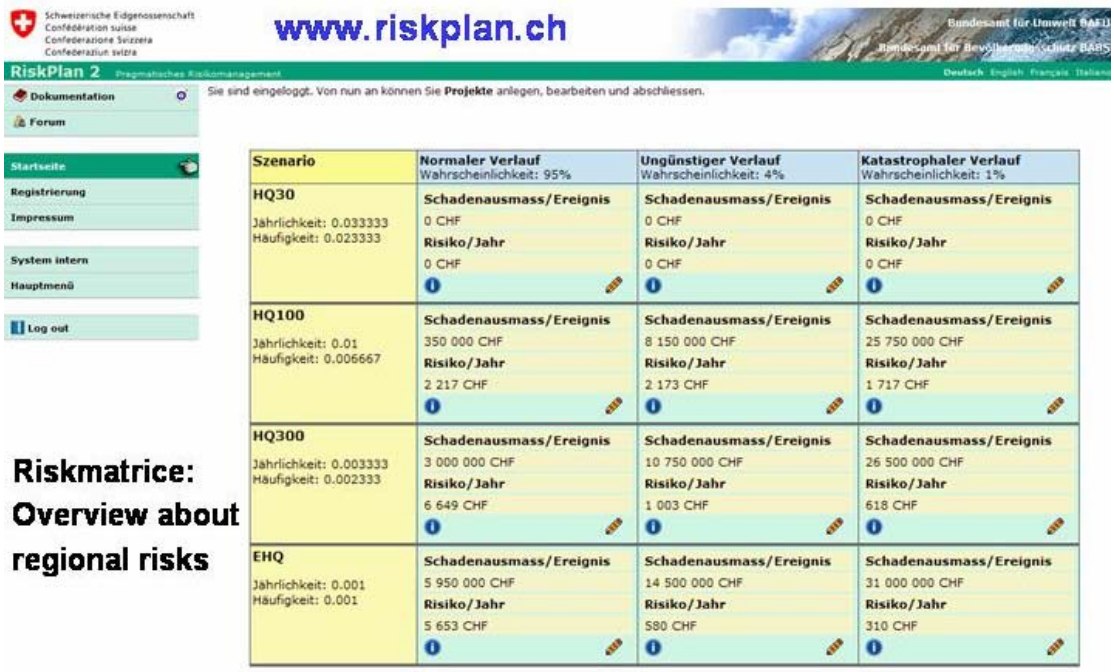

Figure 5

By means of a matrix with freely-selectable x-y dimensions it is possible to evaluate the risks on the basis of adjustable scenarios. In the same way, it is also possible to estimate the contribution made by a protective measure to risk reduction.

The proposed approach is pragmatic, i.e. the knowledge available among experts, victims and experienced specialists and the assessment bases available for the analysis of risk and risk reduction options are used. The results obtained present more or less valid risk assessments.

Based on the example of the Taschinasbach stream, which poses a threat to the municipality of Grüsch in the canton of Graubünden, an attempt was made to carry out a risk analysis as a function of time. In the context of an undergraduate diploma thesis (Willi 2006), the development of the natural-hazard-based risk in the area was evaluated using different scenarios along the stream course while also taking climate change into account. It was also attempted to establish the relevant risk situations for the years 1910 and 2005 based on existing data. The risk situation for 2100 was also analysed under the condition that no settlement development occurs and climate change alone would influence the likelihood of occurrence and the scenarios (9).

Based on the scenarios which were defined by experts, it emerges that, with climate change, it is conceivable that the “risk of fatalities” in the area will once again reach the level that existed in 1910.
As already mentioned, when working on risk planning, estimates are involved and thus a pragmatic approach is required. The results of analyses cannot, therefore, be better than representativity of the assumptions.

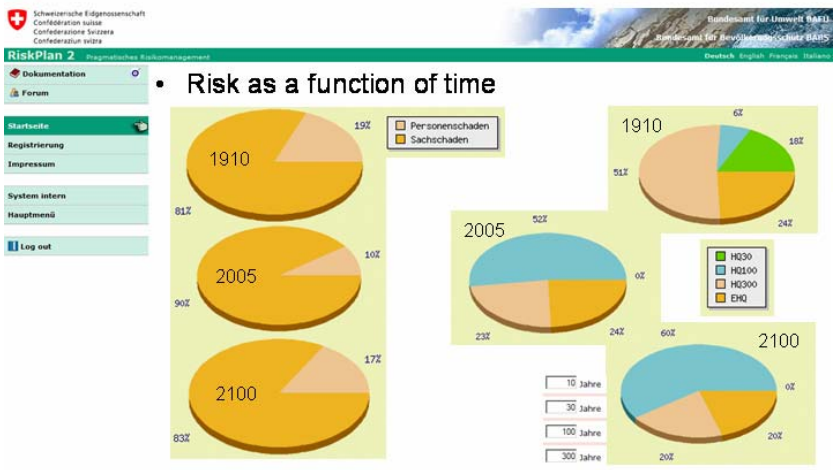

Figure 6

Pragmatic approach to the estimation of risk as a function of time and climate change based on the example of the Taschinasbach strem in Grüsch (canton of Graubünden)

The use of RiskPlan in risk management offers the major advantage of creating plausible bases which enable the staging of a risk dialogue on possible developments with different stakeholder groups such as the authorities and potential victims. Moreover, the flexibility of the tool enables the rapid processing of different scenarios and varying input parameters.

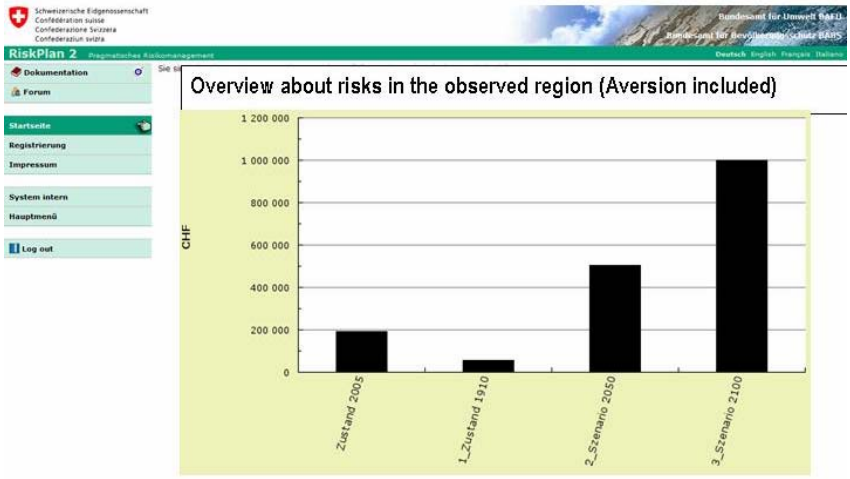

Figure 7

Pragmatic approach to the estimation of risk as a function of time and climate change based on the example of the Taschinasbach stream in Grüsch (canton of Graubünden)

Unsurprisingly, the result shows an increase in risk in the area under assessment (see Figure 13). Based on the prognoses of climatologists and meteorologists, it is likely that more frequent events involving extreme precipitation may be expected in the Alpine region. This is associated with the risks arising from increased flooding in residential areas whose flood protection provisions are not tailored to such developments (10).

The effects of climate change on flood protection in Switzerland

The Kommission für Hochwasserschutz (Commission for Flood Protection) of the Schweizerischen Wasserwirtschaftsverband (Association of Swiss Water Resources Industries) reached the following conclusions at a workshop (11).

- It is only possible to predict the influence of climate change on future flood events in Switzerland in terms of a trend today. Experts expect that there will be more floods in the future and that the extreme values will increase.
- In terms of sediment transport, the retreat of glaciers and thawing of the permafrost at an altitude of between 2300 and 2800 m above sea level will result in an increase in sediment potential. More intensive liquid precipitation also increase the potential for sediment transport.
- The above-mentioned hydrometeorological conditions (precipitation, snow cover, evapotranspiration) would suggest the persistence of saturated soils for long periods in winter and spring in the pre-Alps. This prompts an increasing threat of slope-type debris flows and sediment transport.
- The current principles of flood protection are far-sighted in terms of the expected effects of climate change. As a result they remain valid and must continue to be implemented consistently.
- The protective effect of existing systems must be checked periodically, damage potential assessed and any necessary improvements carried out. During the assessment of existing and new measures, their behaviour in the case of overload should be checked. If not already tested, new projects should be tested for the case of overload.
- The dimensioning parameters (rate of flow, runoff volume, bedload) should be defined in the upper range in anticipation.
- The decision-makers and participating actors should be informed of the need for action.
- The necessary resources should be provided.

It is clear that flood protection measures can ultimately only be used to tackle the individual symptoms of climate change. Prompt and enduring action to overcome the causes of climate change represents a priority task for society. (11)

As part of the ClimChAlp project, a European expert committee dedicated its efforts to this topic. Their findings can be found on the Interpraevent website (12).

Early warning – an important tool for avoiding damage

Early warning by means of technical safety systems, in particular for the protection of transport axes against avalanches, landslides and rockfall, are gaining in significance. The reasons for this are, first, the usually lower cost of such systems as compared with other safety measures and, second, the fact that the new generation of monitoring systems have attained a level of quality which facilitates risk-appropriate use and operation (fig. 6)

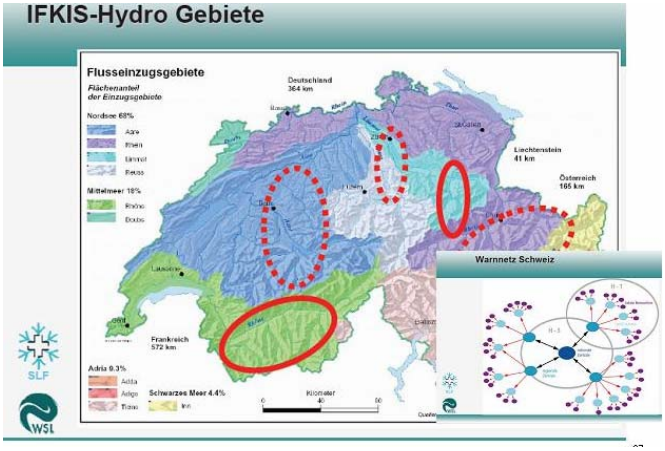

Figure 8

Early warning in Switzerland will be extended to smaller catchment areas (J. J. Rhyner, Swiss Federal Institute for Snow and Avalanche Research, SLF)

2.6 Organisational matters

Three authorities become two
In 2005, the Swiss Agency for the Environment, Forests and Landscape (SAEFL), the Federal Office for Water and Geology and the Swiss Federal Office of Energy were merged to form two authorities. Thus, three authorities became two: the Federal Office for the Environment (FOEN) and the Swiss Federal Office of Energy (SFOE).

Protection against natural hazards is now represented in the Federal Office for the Environment by the Hazard Prevention division. The former Swiss Forest Agency has become the Forest division. The Protection Forest and Natural Hazards section which was part of the Swiss Forest Agency under SAEFL was assigned to the new Hazard Prevention division as the Landslides, Avalanches and Protection Forests section. The Hunting and Game section was assigned to the FOEN Species Management division as the Wildlife and Forest Biodiversity Management section.

This organisational development at federal level is indicative, on the one hand, of the attempt to increase efficiency and effectiveness in the administration and the adaptation of topics to societal development , on the other. What remains to be implemented is a success analysis of these organisational changes.

Swiss National Platform for Natural Hazards (PLANAT)
With the National Platform for Natural Hazards (PLANAT), which was established in 1997 and is affiliated to the FOEN Hazard Prevention division, Switzerland has a consultancy body whose objective is to improve the way in which the risks associated with natural hazards are dealt with, and to promote synergies between the stakeholders and to help the various bodies and authorities involved to work in coordination. This is possible to large extent because the platform involves representatives of business, insurance companies, research, the cantons, the federal authorities and professional associations.

PLANAT published its brochure “How to create and run a platform? PLANAT 1997-2007: Ten years of experience” last year (13). Information about the platform’s main activities can be found in this publication.

2.7 Resources

The extreme weather events of the years 2000, 2002, 2005 and 2007 prompted the implementation of large-scale follow-up projects. At the same time, several major protection projects are under preparation in different regions of Switzerland. All of the cantons are also working on the production and/or completion of hazard bases.

As a result, the resources earmarked for such activities are nowhere near sufficient to meet the assistance requirements of the cantons.

Politics must first decide whether the federal funding provided for hazard prevention should be increased in order to meet the very strong political demands being made by the cantons and municipalities.

3. The greatest challenges for the promotion of mountain watershed management in the future

The following issues will need to be tackled and resolved to ensure the future development of the integrated approach to watershed management:

- The integrated approach will only be effective if sectoral planning and action on all of the relevant organisational levels are replaced by the integrated perspective. A precondition for this is the abandonment of the sectoral financing systems found at all organisational levels.

- Greater use should be made of the existing potential for the creation of added value through the use of experience and knowledge of the operative and practically active mountain population and recognised by science and politics.
- The cross-border exchange of knowledge and experience of operative and practical activities in the mountain region should be promoted using suitable measures. This applies in particular for young and innovative actors from the private sector and the administration. These possibilities already exist in the context of research.
- Climate change does not stop at national borders and, for this reason, all kinds of joint cross-border projects of a very high quality level and with extensive preventive effects are particularly worth promoting.
- Integrated natural hazard risk management should be optimised in such a way that a "mix of measures" based on the principles of sustainability can be used to protect human beings and their material assets sustainably against natural hazards.
- Risk dialogue must be recognised and used as the key element for participative risk-based planning, decision-making and action.

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