Graz, 25 March 2014

Conference proceedings

Breaking fresh grounds in protecting Alpine Environments – Flood Risk Management Plans

Platform on Natural Hazards of the Alpine Convention PLANALP

Das Land Steiermark

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Preface – Maria Patek (PLANALP)

The large rivers Rhine, Danube, Drau, Po and Rhône originate in the Alpine range; therefore the Alps play an important role within the European water regime. However, the areas mostly affected by floods, also with respect to serious economic implications, are located outside of the Alpine region. Therefore the focus of the European Flood Directive is clearly on these flat and densely populated areas. The specific characteristics of Alpine catchments are merely ancillary.

Inherent characteristics for the Alpine region are a wide range of hydrological and gravitational natural hazards (e.g. debris flows or flash floods), appearing suddenly and without warning plus transferring huge volumes of sediment. Consequently the threat and risk for human lives is often higher in comparison to areas alongside low lying river courses. Especially in the last years extreme floods and debris flows occurred frequently in the Alpine region and thereby revealed the specific problems in this special environment. The close alliance of the countries located within the Alpine Arc, confronted with similar challenges, is necessary to reassure the increase of resilience of Alpine areas against flooding disasters. The common hazard scenarios and resulting risks cannot be managed in established river partnerships or bilateral boundary water commissions only, but need a forum on the basis of Alpine regions.

This forum is provided by the Alpine Convention and therein the platform on natural hazards – PLANALP - , which dedicates its work to the exchange of knowledge and development of strategies. The conference “Breaking fresh ground in protecting Alpine Environments – Flood Risk Management Plans” in Graz in March 2014 offered a unique opportunity to discuss Alpine flood risk management among politicians, academics, practitioners, and stakeholders.
It became apparent, that close cooperation among experts and stakeholders from the Alpine Space is needed to represent the needs of Alpine flood protection on a European level more efficiently. In respect to the newest report of the IPPC this issue is especially relevant because the Alps are most affected by climate change. The safety of the Alpine region therefore is a pan-continental issue for a water abundant Europe. With the conference in Graz this topic could reach a wider audience. As president of the PLANALP I hope that with breaking fresh ground regarding flood protection in Alpine environments we enabled further steps towards a sustainable implementation of the flood risk management plans in the Alps.

It was a pleasure to welcome more than 100 experts from 11 different countries in Graz, which in fact showed the great importance of knowledge exchange in the field of flood risk management. Hopefully the conference in Graz has moved us a few steps closer to promote further joint and transnational approaches for tackling the implementation of flood risk management plans and therefore contribute to a sustainable development of the Alpine region.

Vienna, June 2014

Maria Patek
President of the Platform of Natural Hazards of the Alpine Convention (PLANALP)

Preface – Markus Reiterer (Alpine Convention)

Experience from the past years has taught us that flood management in the Alpine region is an issue of utmost importance that has significant effects on downstream areas. At the same time, we should also be aware that the number of natural hazard events is likely to increase in the following years due to climate change. We need to adapt to this new situation and we need to do it fast. The Natural Hazard Platform of the Alpine Convention (PLANALP) has made a major contribution to that effect by preparing guidelines for an Alpine strategy for adaptation to climate change in the field of natural hazards in 2012.

At the recent "Breaking fresh ground in protecting Alpine Environments – Flood Risk Management Plans" conference held in Graz it was highlighted that smart and effective management of flood risks in the Alpine area can significantly reduce the damages in the lower areas. This conference was enriching for all participants and will have a lasting impact on the future in managing risks in our area. This is all the more important as water management issues, though listed as a priority area in the Alpine Convention, are not subject to further elaboration through a protocol or declaration. PLANALP is an important forum to focus on Alpine specificities and to showcase the fact that measures taken in our region have real life effects outside.

Exchange of experience is one of the priority fields of activities in the Alpine Convention since it represents a platform not just for the presentation of good practices, but also for a collective brain-storming on the possible solutions of common challenges. The current efforts towards a macro-regional strategy for the Alpine area will also have to focus on this type of exchange and cooperation. It is with great pride that the Alpine Convention can present the good experiences in this process, and PLANALP is a flagship example of the value of international cooperation. This was proven yet again through this conference. It also outlined the cross sectorial exchange of experience between different working groups and platforms, since the risk of flood management was addressed from the natural hazards and water management perspectives.

I would like to congratulate the organizers of this conference, in particular the president of the PLANALP working group, Ms Maria Patek, as well as the Austrian Ministry for Agriculture, Forestry, Environment and Water Management, the Land Steiermark and the City of Graz for their excellent efforts and hospitality.

Innsbruck, June 2014

Markus Reiterer
Secretary General of the Alpine Convention

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Structure of the conference

I. STRUCTURE OF THE CONFERENCE

Welcome notes

The president of the Platform on Natural Hazards, Maria Patek, welcomed the participants to Graz, expressing hopes for an "action-oriented discussion" across the various communities (academic, policy and science) represented in the auditorium. The topic today reflects one component of the present mandate of PLANALP and the conference should be understood as an opportunity to broadly discuss different aspects of Flood Risk Management Plans.

As representantive of the Styrian Government, Johann Seitinger welcomed also all participants to the conference and especially to the Austrian province of Styria. He referd to some notable impacts of climate change especially in the area of natural hazard management and stresses the importance of strengthen individual responsibility and self-provision.

The Secretary General of the Alpine Convention, Markus Reiterer welcomed all participants on behalf of the Alpine Convention and stressed the importance of sustainable flood risk management for a high-quality livingspace within the Alpine Arc. He reminded all participants that also some other natural hazards may endanger the space we live in and that collaboration and cooperation builds a fruitful ground to address the challenge of improving quality of life by integral natural hazard and risk management.

The City of Graz was represented by Stefan Haberler and he emphasized how important an effective flood risk management for a big city like Graz is. With the special flood protective programme "The Streams of Graz" several aspects of what the EU Floods Directive now is stipulating are already implemented in Graz.

Setting the Scene

The scene was set by a key note speech given by Mark Adamson, Head of the Flood Relief and Risk Management Division, Office of Public Works, Ireland.

Mark Adamson provided a broad overview about the framework of the EU Floods Directive, the principles, requirements, and administrative arrangements. He also stressed the challenges in the implementation of this directive for EU Member States, because of the very different flood risk contexts, governance arrangements and state of development of flood risk management in the different countries and regions. Mr Adamson advocated the flexibility of the current Directive that offers Member States a significant degree of subsidiarity in almost all areas to determine the approach to implementation that is most suitable for their own particular circumstances, including those concerning governance arrangements and available information and resources.

The focus of the discussion round afterwards was briefly on the special role of mountains in the Floods Directive implementation, the content of the Water Framework Directive and what incentives the state can offer to support people in manging their own risk or to strengthen resilience. Mark Adamson explained that the EU Commisson plans actually not to focus on mountains especially. The

Water Framework Directive is flexible; it is only a frame and allows room for each region to decide on how to implement it. If sediment transport, for example, is an issue, the Framework Directive allows treating it appropriately. Considering sediment management issues is not definitely excluded from all approaches at the moment and it is up to Member States to include that as well. Concerning incentives that a state can offer he remembered that sometimes the costs of a respective protection system are too high compared to the benefit. If a flood warning is given, residents can take measures themselves. There is a part funding for residents (up to 75%) for the purchase of protective measures. Self protection can be seen as a responsibility of every one of us – and that means also additional risk precaution (like insurance) measures.

Consecutive sessions

The rest of the programme was divided into three consecutive sessions, each chaired and moderated by Ms Karin Staller:

In **Session I**, Mr Rudolf Hornich, Styrian Federal State Government, Mr Clemens Neuhold from the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW), and Mr Heinz Stiefelmeyer from the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) gave insights into specific problems and challenges regarding flood risk management in Alpine catchments as well as pointed out the links between the Flood Directive and Water Framework Directive.

Rudolf Hornich remarks on specific problems regarding flood risk management in Alpine catchment areas. He described the significance that protection against natural hazards always had in the Alpine area. The presentation and mapping of hazard zones in the form of hazard zone maps – as a basis for planning and decision making in land use planning – has been applied in Austria for more than 30 years. His conclusion with the implementation of the EU Floods Directive was positive, because it will serve as a crucial basis for the security and future development of Alpine living spaces.

Clemens Neuhold stressed the links between the Floods Directive and the Water Framework Directive. There are several reasons for coordinating both Directives in terms of optimizing synergies and minimizing conflicts on the same medium: Water. Altough links are generally discussed on an administrative level there is a strong link due to wording, approach, and implementation cycle in both directives already determinable, what may also lead to a common reporting precedure in the future.

Heinz Stiefelmeyer explained the status quo of the implementation of the EU Floods Directive in Austria and especially the methodology and challenges to develop the required flood risk management plans.

The discussion with the panel afterwards focused on issues like conflicts between the safety goal of the Floods Directive and the ecological status of the Water Framework Directive, the priorisation of the basin scale instead of rivers, what incentives for land users are there or the role of sediment management. The panel remarked that the goal of both the Water Framework Directive and the Floods Directive is to gain good ecological status and human safety. However, there is a conflict between the safety goal and the ecological status – in terms of what the overriding public interest is. As the Floods Directive is very flexibel, the commission only gives general standards. Each country has the possibilities, to adapt the directive to their national needs (e.g. to consider bedload-

transport). Regarding the right scale, e.g. Austria is focussing on the catchment area because of considering all activities that are contributing to the management of floods (e.g. forestry measures, land use planning). Regarding incentives for land users there was consensus that it is important to shift the focus on non-technical measures (incl. legal instruments) when it comes to flood prevention. The community should also deal with it because dams are not an endless option for flood risk protection, nor a guarantee for success on the long run. Concerning sediment management, the panel referred that not in all reaches a plus of sediment is available, there are also some reaches that have less sediments. The question is how to balance sediment budget/transfer on the basis of a whole basin approach effectively, further input from research/science as well as practitioners is still needed.

Session II ("methodology and challenges") was intented to exchange status quo and experiences regarding the implementation of flood risk management plans across countries of the Alpine Convention. Mr Luka Stravs from the Slovenian Ministry for Agriculture and the Environment, Mr Riccardo Rigon, president of the Alpine Conventions' Water Platform, Jean-Michel Helmer & Marie-Pierre Meganck from the French Ministry for Ecology, Energy, Sustainable Development and Sea and Mr Andreas Rimböck from the Bavarian Environment Agency informed about methods, implementation and challenges in their country.

Luka Stravs informed that Slovenia is at the moment intensively working on the preparation of the Slovenian Flood Risk Management Plan. The Slovenian FRMP will consist of 17 smaller river basin FRMPs, which cover all of the identified 61 APSFRs.

Riccardo Rigon gave insight into the complex structure of water and flood risk management in Italy and stressed the importance to develop from a project view to a process view.

Jean-Michel Helmer & Marie-Pierre Meganck introduced into the status quo of the Flood Directive implementation in France. Focus was given also to the French national strategy for flood risk management, which set out three key objectives that should have to be achieved in the next 20-30 years: solidarity, subsidiarity and synergy.

Andreas Rimböck informed about the situation of torrential flood risk management in Bavaria and focused on the current state concerning the Floods Directive and the planned procedures for the future. Due to the strong consequences of the torrential hazard zones there is a high demand on exact data, modern and proved calculation procedures and comparability of the results. For the extensive mapping within the Bavarian torrents a standardized procedure is planned.

Topics of the discussion round were especially the role of science in the frame of implementing the Floods Directive, the role of building zone in Bavaria, the status of implementation in the Member States as well as what solidarity on a catchment level means. It reached consensus in the auditorium that more R&D is needed especially in torrent catchments, but also regarding social sciences. Integration of different levels of administration and regions as well as issues like communication/perception, urban/regional planning, cost-benefit analysis aspects are worth for improvement in this frame. Regarding the exceptions from the building ban and the arrangements in context to geo- and avalanche risks in Bavaria, Rimböck explained that the strictest exception is that if there are other non flood prone areas available for building there is no permit to build in a particular area. Also, building is allowed if there are no negative effects on discharge and the current. On the other hand there are no red zones for avalanche and rock areas – only a warning about the

possible dangers. This means that building is not strictly forbidden because more investigation is needed. Solidarity on a catchment level means that all people contribute to common risk transfer mechanisms. The mechanism is working on the national level already for all risks – not only floods. Money is given to the territories to manage the development for floods. The solidarity is given because money is provided for all catchment areas even if they are not directly flooded.

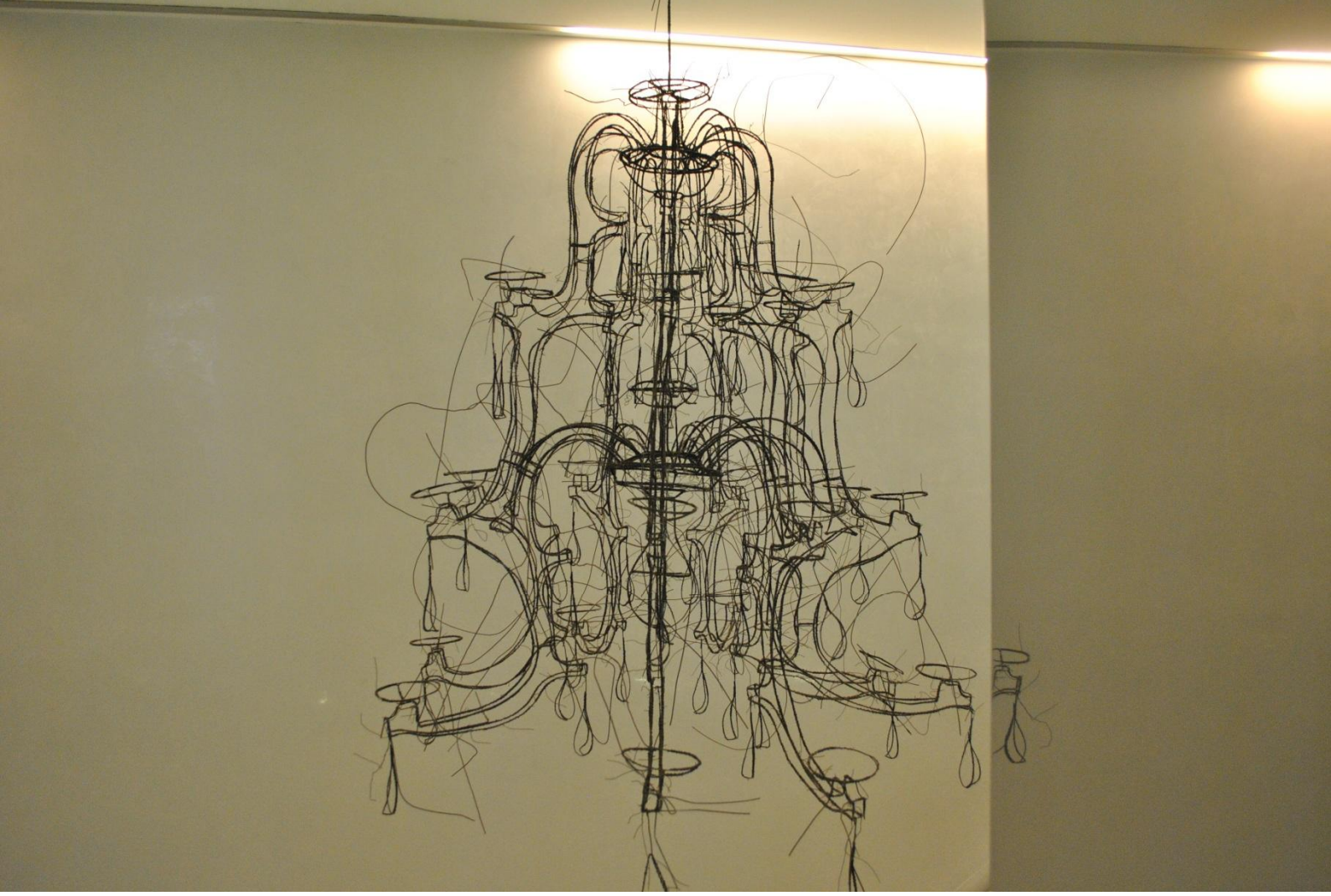
In **Session III** ("methodology and challenges – cont."), Mr Olivier Overney from the Swiss Federal Office for the Environment, Ms Therese Stickler from the Austrian Environment Agency, and Ms Eva Mayer from the Bavarian Ministry of the Interior, Building and Transport introduced further aspects of flood risk management.

Olivier Overney informed about flood risk management in Switzerland and stated that an efficient flood risk management can only be achieved if all possible measures are effectively taken thanks to a clear division of tasks between public authorities. Responsibilities must be clarified between the different state levels and the private sector (insurance companies and property owner). In addition good cooperation is crucial to the fulfilment of the stated objectives. The successful implementation of integrative risk management coordinates the action priorities: protective structures alone cannot guarantee safety. An optimal combination of response, recovery and preparedness measures must be sought under financial, social and ecological constraints.

Therese Stickler introduced into participatory approaches for risk management and risk communication which are crucial to involve the public in the development of flood risk management plans. She stressed the importance to involve concerned lay persons not only in the design of the hazard and risk maps or the risk assessments itself but in the cooperative elaboration of the risk assessment approach.

Eva Mayer explained the links between flood risk management plans and contigency planning in the case of Bavaria and underlined challenges and chances from a disaster prevention perspective. The creation and update of local alarm and action plans on municipal level as well as the creation and update of special flood disaster control plans on a county level are two main elements that concern the field of disaster management and the municipalities as local security authorities.

The discussion round concerning session III focused on the role of disaster management in the frame of Floods Directive implementation, what kind of channels are useful to convey information, the role of trust in public participation, as well as some specific question to the Swiss situation in flood risk management. It reached consensus in the auditorium that disaster management is an important aspect of a holistic risk management approach. The Floods Directive meets all fields of policies. Every field should take their own measures and should coordinate those. Disaster plans should not have specific priority, they are all equally important. Regarding public participation, it is important to adjust a map to a particular group and meet their use. Administration is often seen as neutral and trustful - wherefrom conflicts and mistrust can arise. A good idea is to get partners – maybe an environmental NGO, or influential people – into the process in order to strengthen credibility and common understanding.



Overall conclusions

II. OVERALL CONCLUSIONS

- **Flood risk management is a complex process among different policy areas, stakeholders, information sources and operating systems.**
- **To achieve future flood-resilient communities, it is essential to take an integrated approach – by considering a range of regulatory, social and economic responses.**
- **Flood risk maps are key in identifying which areas are most at risk and will help professionals to plan for and to tackle flood risks head on.**
- **There is a need to improve linkages across Europe on risk based, broad scale modelling and better exchange on common standards and harmonized definitions.**
- **Awareness of the risks from water is high among the community of experts but further work remains to propagate this awareness among the public.**
- **Capacity building is a main pillar for implementing an adaptive management structure in any river basin. The demand will be to improve education and communication in order to integrate stakeholders on all levels.**
- **Public stakeholders need to be involved in this learning process to enhance their capacity both to be willing to engage, and to engage effectively, with the communities they serve.**
- **Investments in training and exercises should be combined with a greater focus on identifying and sharing lessons learned on an international level.**

Speaker presentation notes

THE EU „FLOODS“ DIRECTIVE – PROGRESS AND CHALLENGES

Mark Adamason

Head of the Flood Relief and Risk Management Division,
Office of Public Works, Ireland
Co-Chair, EU Working Group on Floods (WG F)

THE EU 'FLOODS' DIRECTIVE

Between 2002 and 2013, floods in Europe have caused around 1000 fatalities, the evacuation of more than 1.7 million people, and have caused a total extrapolated cost of €150bn in damages[1]. Floods and storms are recognised as the major natural threat to people and communities in Europe, and have been identified as a major in risk in almost all of the National Risk Assessments submitted by Member States (MS) to date under the framework for EU cooperation on disaster prevention[2].

While floods are referred to in the EU Water Framework Directive (WFD) [2000/60/EC], the focus of this Directive is on the environment and water quality, rather than the reduction of flood risks.

To provide a common framework for flood risk management in Europe, and address the gap in EU water policy, the Directive on the assessment and management of flood risks [2007/60/EC], often referred to as the 'Floods' Directive, was brought into force on 26th November in 2007, only 20 months after publication of the first proposal on 18th January 2006.

Beyond transposition into national law (required to have been completed by November 2009 - Article 17), the key requirements of the 'Floods' Directive are that MS:

- Undertake a Preliminary Flood Risk Assessment (PFRA), based on available and readily-derivable information (Art. 4.), to identify areas of potentially significant flood risk (APSFR), to be completed by the 22nd December, 2011 (Art. 5)
- Prepare flood hazard and risk maps for the APSFR by 22nd December 2013 (Art. 6)
- Prepare by 22nd December 2015 Flood Risk Management Plans (FRMPs) at the level of the river basin setting out objectives for the management of flood risks in the APSFR, and a prioritised set of measures aimed at achieving those objectives (Art. 7, 8 and Annex).

The above requirements are then to be reviewed on a six-yearly cycle, with the exception of the first review of the PFRA that is due in 2018 (Art. 14).

MS are able to apply transitional measures (Art. 13) where certain requirements have already been met, or where MS decide to prepare flood maps and FRMPs for a river basin (or for certain types of floods within a river basin) without undertaking a PFRA.

[1] HKV Consultants and RPA Risk & Policy Analysts (2014). Study on Economic and Social Benefits of Environmental Protection and Resource Efficiency Related to the European Semester. (ENV.D.2/ETU/2013/0048r). Final Report prepared for DG Environment February 2014

[2] Council of the European Union, Council conclusions on a Community framework on disaster prevention within the EU, 30.11.2009

In addition to the three key stages set out above, there are three cross-cutting requirements that apply to each:

- Rivers do not respect borders, and so MS are required to exchange information and coordinate, and may prepare joint FRMPs, in trans-boundary river basins, supporting the principle of solidarity (Art. 4(3), 5(2), 6(2) & 8)
- While the WFD considers water as an asset and a resource that needs to be protected from human activities, and the 'Floods' Directive considers water as a threat that humans and human activities need to be protected against, both Directives deal with aspects of water and river basin management. Given the opposing paradigms, it is clearly necessary to ensure coordination in implementation to avoid or manage potential conflicts in objectives, and to achieve synergies and 'win-win' outcomes where possible (Art. 9), and MS may indeed integrate the processes and the FRMPs with the WFD River Basin Management Plans (RBMPs)
- As with all environmental Directives, and in accordance with the Aarhus Convention, there are also requirements for MS to publish outcomes of all of the key stages and to encourage the active engagement of the public in the preparation of the FRMPs (Art. 10)

Finally, there are certain definitions and administrative arrangements set out in the Directive as well as requirements on reporting to the Commission (Art. 15).

EU WORKING GROUP ON FLOODS - WG F

In 2005, an 'Expert Group' was convened by the European Commission (COM) to discuss the potential structure and contents of a Directive on the assessment and management of flood risks. This Group met twice early in 2005, and then became the 'Stakeholder Group' for meetings in late 2005 and 2006. In December 2006, the Water Directors adopted the establishment of WG F (the 'F' being fortuitous but coincidental, with Working Groups 'A' to 'E' already in existence) within the CIS, which met formally as WG F for the first time in spring 2007.

The purpose of WG F, that includes representatives of COM, the MS and other relevant organisations and stakeholders, is to facilitate the effective implementation of the 'Floods' Directive by providing a forum for the exchange on information between MS and between MS and COM, including providing feedback on implementation. The Group also provides a focal point with respect to flood risk management in the EU for links with other WFD, and wider COM, activities.

WG F has met since it's formal establishment on a regular six-monthly basis, with sub-groups being formed to address specific issues; particularly the preparation of the reporting sheets and schema (defining what the MS need to report to COM and how), but also on other matters such as the preparation of a resource document outlining the links and synergies between the WFD and the 'Floods' Directive.

The Group has also organised and held a number of workshops; with each covering in detail one of a wide range of specific topics, including (in order of occurrence):

- Land Use Planning (two workshops)
- The PFRA
- Flood Mapping
- Climate Change (two workshops)
- Natural Flood Risk Management
- The Preparation of FRMPs

- Flash Floods & Pluvial Events
- Economics and Flood Risk Management
- Stakeholder Involvement
- Decision-Making under Uncertainty
- Objectives, Measures and Prioritisation
- Trans-boundary Issues

The 'thematic workshops' are, in the view of the author, probably the most productive and fruitful activities of WG F, at least beyond the critical tasks of preparing reporting requirements and discussing the formal issues of implementation. They allow for in-depth discussions on specific issues, common problems or uncertainties and methods and approaches for implementation. This is through open and informal debate and where possible, the description and sharing of past practice and experience and lessons learned. A report is prepared for each workshop outlining the discussions held and the key findings.

The documents of WG F, including the workshop reports, are publicly available from the DG Environment website pages on the 'Floods' Directive[3] and links from this page to the on-line repository; CIRCA.

CHALLENGES OF IMPLEMENTATION OF THE 'FLOODS' DIRECTIVE

Overall Approach

The overall approach being adopted by MS differs widely across the EU. This was to be expected given the very different flood risk contexts, governance arrangements and state of development of flood risk management in the different countries and regions. The variability was intentionally provided for in the Directive in so far as it was established only as a framework with a significant degree of subsidiarity provided in how each MS would work within the framework to meet the stated requirements.

Notwithstanding the above, there are examples where approaches between different MS have similarities; often due to the information exchange made possible and promoted through WG F. An example of this would be the approaches used to undertake the PFRA in Finland and Sweden and in Ireland and the UK, between which some meetings and discussions were held bi-laterally early in the PFRA process to compare ideas and methods.

The Preliminary Flood Risk Assessment

For many or most MS, the PFRA would have been the first such spatially extensive, indicative assessment of flood risk undertaken, and hence required the development of new methods, taking into account what information and technical data was available to, or could be readily-derived by, each MS. This naturally gave rise to some significant challenges, of which some are outlined below.

Spatial Scale: Many MS would have significant experience of assessing flood risks in detail at a local level. Working at a river basin or national level however requires different methods and approaches, as detailed datasets will often not be available, and on-the-ground validation of data and conclusions may not be possible within reasonable costs. MS would typically have had to deal in undertaking the PFRA with very large, national datasets that may lack the detail usually required for local risk assessments, or may not have had datasets with full spatial coverage that they would have liked to

[3] http://ec.europa.eu/environment/water/flood_risk/3_compo.htm

have used. This would have necessitated various assumptions and approximations being made, and the adaptation of familiar and tested methods to work with the limited information available.

Sources of Flooding: Across Europe, MS have historically undertaken flood risk assessments for fluvial and coastal / tidal flooding. However, the definition of flood risk under the 'Floods' Directive is open and all-inclusive (with the optional exemption of floods from sewers). This required MS to consider sources of flooding that some may not have had previous experience of assessing, such as pluvial or groundwater flooding. However, the Directive only requires for the PFRA the consideration of past floods (with the predictive assessment of flooding, e.g., based on modelling, optional), and for assessments to be based on available and readily-derivable information. As such, some MS may have, at this stage, undertaken assessments as to whether significant floods from atypical sources have occurred in the past, with consideration being given to undertaking more detailed, and potentially predictive, assessments for the second cycle of implementation.

Assessment of Risk for Certain Sectors: Many MS would have established methods for determining economic losses and the risk to people. The 'Floods' Directive however requires the assessment of risk to people, the environment, cultural heritage and the economy. Methods are not well established for determining the risk from flooding to our cultural heritage and the environment, particularly if it is intended that the risk be monetarised, and the spatial scale of the assessment would generally have prohibited detailed assessments on a site-by-site basis. Some MS would have tackled this using a count of flooded sites (e.g., cultural assets or potential sources of pollution), or making use of reported impacts from past events, while others undertook some work to assess the potential vulnerabilities and degree of loss if such sites were flooded.

As an example, Ireland, building on and adapting some previous work undertaken in the UK, developed a method of determining the value of cultural assets, and their vulnerability to damage in the event of flooding, and then using this combined with the probability of flooding in a broader (multi-sectoral) risk analysis to derive a numerical, but non-monetarised, Flood Risk Index.

Definition of Significant Risk: As noted above, for the PFRA MS were required to undertake a cross-sectoral assessment of risk, and hence needed to consider this range of sectors in determining what constitutes significant risk. MS have taken different approaches to this challenge. Some have applied thresholds to each sector (e.g., whether the number of properties flooded, or whether the level of economic losses, exceeded a given threshold), while others made use of an integrated threshold (such as in Ireland based on the non-monetarised Flood Risk Index as described that described risk in each sector).

Provision for Climate Change: The consideration of climate change was not obligatory for the first cycle of the PFRA. However, for the second cycle, this is required and will introduce another dimension of uncertainty to be taken into account along with those related to scale, sources of flooding and cross-sectoral assessments of risk.

Further Information: The PFRA undertaken by the MS, and the outcomes of these (the defined APSFR) will soon be published by COM through the Floods Directive Viewer on the Water Information System for Europe, WISE[4], which will allow readers to examine, on a country-by-country basis, how each MS met the above challenges.

[4] http://www.eea.europa.eu/themes/water/interactive/floods-directive-viewer

Flood Mapping

Most MS have extensive experience of preparing flood maps, and so from a technical perspective, this stage of implementation might have appeared to have been less challenging than others, although clearly the scale of work involved has been a very significant challenge; particularly during such times of economic difficulty. However, some non-technical aspects have, and will continue in future cycles, require considerable work and thought.

Transboundary Coordination: The Directive requires the exchange of information between MS in Transboundary RBDs / UoMs, which might include the exchange of, and preferably agreement on, cross-border flows and levels, as well as other data such as survey information. The exchange may extend beyond this to agreements on the use of common hydraulic models, such as has been achieved between Ireland and Northern Ireland (UK), and between Finland and Sweden.

This requires good communication and strong relationships between the relevant parties to be effective and efficient. It appears that the degree of transboundary coordination has been variable around Europe, although seems to be stronger in areas within International River Commissions or where pre-existing cross-border relationships exist.

A WG F workshop has been held in March 2014 on transboundary issues for implementation of the 'Floods' Directive, and the report on this workshop will be available from the DG Environment website in due course.

Communication of Risk: Flood maps are a critical tool in the communication of flood risk to the public and other users, such as land-use and emergency planners, and it is important that the maps are formatted and presented in a way that will facilitate the intended users clearly understanding the information presented. This is however difficult to achieve, in particular noting that different users have different needs and may have differing levels of familiarity with the use of maps. The issues and difficulties in communicating flood risk through flood maps were considered during the WG F flood mapping workshop and EXCIMAP work (see below), and also in the workshop on stakeholder involvement hosted by Romania.

Climate Change: As with the PFRA, the preparation of flood maps indicating the potential impacts of climate change was not obligatory in the first cycle of the implementation of the 'Floods' Directive. However, the issue has been discussed by WG F, and it is clear that there are diverse views, with some MS taking the view that it is important to provide information on potential future risks and/or uncertainties to help users better understand the information provided, while others have the view that the information provided should be clear and simple, and that providing such information might confuse users and / or undermine confidence in their use.

Further Information: The reporting date for the flood mapping was 22nd March 2014, and so this information is not yet available on WISE but will be so in due course, linking down to national websites or map-viewers, to indicate how MS have implemented the flood mapping requirements.
A WG F workshop was held on flood mapping in Dublin in September 2008, and the report of this workshop is available through the DG Environment website. This workshop built on the work of EXCIMAP, an information exchange circle that was formed around the same time as WG F, and that

produced the Handbook on Good Practices for Flood Mapping in Europe' (2007), available from the DG Environment website[5].

Flood Risk Management Plans

The Flood Risk Management Plans (FRMPs) are the final requirements of the Floods Directive (other than future monitoring and reviews), and will set out prioritised sets of measures aimed at achieving the defined flood risk management objectives. While some MS have experience of preparing such Plans, many do not, and those that have may not have developed them in the way required under the Directive. As such, and although the FRMP delivery deadline is still some time away, it is already clear that there are a range of common challenges MS are considering.

Setting Objectives: At the WG F / StarFlood workshop on Objectives, Measures and Prioritisation held in Brussels on the 16th October 2013 (and available from the DG Environment Website), it became clear that MS were adopting quite different approaches to the definition of objectives, such as in the following ways:

- At a high level in terms of a general intention to reduce risk, and / or to implement the broad areas of flood risk management (prevention, protection and preparedness, response and recovery)
- As the implementation of types of measures
- As achieving defined standards of protection
- As reduction in risk to certain sectors
- As a combination of two or more of the above

The level at which the objectives are set (i.e., nationally, regionally, locally) also varies between MS, with some defining a nationally-consistent set of objectives centrally, while others define guidelines on setting the objectives centrally with specific objectives then set regionally or locally, to allow for greater local responsibility and flexibility.

There is no specific, or 'correct', way to define objectives, as this is a matter within the competence of the MS, and the range of approaches has evolved from the different contexts in each MS in terms of governance arrangements and legacy of how flood risk management is viewed and approached in the MS, and each MS needs to determine which approach is most suitable in their specific context.

Coordination with the Water Framework Directive: As noted above, there may be conflict in the implementation of the 'Floods' Directive and the WFD, but also synergies, and so there is a clear need (as well as a requirement) for coordination in the implementation of the two Directives. It is considered that the area of most potential for both conflict and synergy is at the Plan preparation stage, where objectives are set and measures considered, appraised and defined. However, as this is the first cycle of implementation of the 'Floods' Directive, there is limited experience in coordination to build upon to ensure that the coordination process at this stage is effective and efficient, and so this aspect of implementation is a challenge for most MS.

WG F has developed a resource document exploring the links between the 'Floods' Directive and WFD that has been approved by the Water Directors (available from the DG Environment Website), although the limited experience has been recognised and it is proposed to review and update this document after the first cycle of implementation.

[5] http://ec.europa.eu/environment/water/flood_risk/flood_atlas/index.htm

Climate Change: Again, taking account of climate change in the preparation of the FRMPs is not obligatory in the first cycle of the 'Floods' Directive. However, investment in measures without consideration of the potential impacts of climate change on flood hazard and hence risk could lead to the implementation of measures that are not adaptable to future change and that could require significant additional costs to adapt or that otherwise might reduce in standard of protection or effectiveness over time.

While there is strong evidence that mean sea level is rising, there is uncertainty over the future rate and degree of rise, and there is significant uncertainty over the impacts of climate change on rainfall patterns over many parts of Europe. This uncertainty makes decision-making with consideration of the potential impacts of climate change difficult to implement, where there may be hesitancy to invest slightly more or to reserve land now for flood risk management measures for a future scenario that may or may not occur, or where there may be merit in making lower-cost interim investments now to permit an appropriate long-term investment at a future point when changes might be occurring or be understood with greater certainty. While, approaches exist to put a framework on this decision-making process, such as using representative futures to test decision-trees, MS and regional and local flood risk management authorities will face challenges in working through sustainable approaches and developing public and political acceptance of decisions where such uncertainty exists.

Land-Use Planning: Sustainable decision-making in land use, through planning and development management that is cognisant of flood risk, is a corner stone of 'prevention' within the flood risk management cycle and is essential for long-term effective flood risk management.

Thematic workshops were hosted by Norway and then jointly by Austria / Slovenia on the topic of land-use planning, with reports available from both workshops through the DG Environment website. The workshops found that the approaches to land-use planning across Europe were variable, from very limited regulation through to strict legal controls based on defined flood zones, but that there was a general trend towards stronger regulation.

The consideration of climate change in land use planning is a matter also considered at the WG F workshops. Addressing the related uncertainty is challenging, where land-use decisions can have significant financial, social or economic consequences, and great care is needed when making such decisions under significant uncertainty.

The 'Floods' Directive requires that MS address prevention within the FRMPs. Consideration needs to be given as to how this should be set out, bearing in mind that the FRMPs will often be a parallel set of plans to the land use management plans. It may be that the measures related to prevention in the FRMPs might reflect the legal requirements for planning taking into account the flood maps produced under the Directive or refer horizontally to the land use plans with land use zoning coordinated (perhaps over time) with the objectives in the FRMPs. As with so many aspects of the implementation of the requirements of the Directive within the framework established, the appropriate approach will depend on the context of the individual MS.

Prioritisation: MS will have published flood maps identifying people, properties and assets at risk from flooding. The public and stakeholders may well then have an expectation that the state (at whatever level) will implement measures to reduce that risk. In Ireland, and quite possible in many other MS, there is a strong preference that the reduction in risk is by way of protection measures. However, at all times, and in the current economic conditions in particular, the state will have limited

budgets and will not be able to implement measures to reduce the risk to all areas immediately. There is hence a need to prioritise, and to select which measures to implement and when.

The effects of prioritisation, while aiming to ensure maximum return on investments (by way of benefits achieved and / or losses avoided per euro spent) or to reduce risk in certain critical areas, are that some areas will not be scheduled to receive protection or risk reduction measures; either for a considerable period of time or indeed, at all. This outcome will naturally be unwelcome news for those not prioritised for the implementation of measures in the near future.

The system for prioritisation therefore must be fair and transparent to facilitate understanding and acceptance by those detrimentally affected as above, and this may often involve democratic procedures and agreements. Metrics, such as benefit-cost ratios, or the outcomes of multi-criteria analyses, can often be helpful to demonstrate the processes involved in arriving at the prioritisation outcomes. The introduction of resilience measures (see below) can also facilitate acceptance of prioritisation outcomes.

As noted above, the WG F Workshop held on 16th October 2014 included discussion on the issue of prioritisation, and the workshop report will be available on the DG Environment website.

Resilience: The state, be it at national, regional or local level, can not, due to budgetary constraints as discussed above, or should not, due to general or specific rules on public expenditure, provide protection or reduce the risk to locally desirable levels in all areas. As a result some areas may benefit from no significant state expenditure on flood protection, or may have to wait a considerable period of time before such expenditure can be committed.

However, people, businesses and communities are able to reduce the risk to themselves through their own actions. As an example, the City of Cork in Ireland recently suffered floods where a large number of streets and businesses in the city centre were flooded. However, the flood risk in the area was known and many businesses were prepared such that within hours of the flood waters receding, many businesses were open and operating again as normal.

Relatively low-cost measures that build resilience can be introduced in areas assigned a lower priority for major investments in risk reduction; either in the short-medium term pending the implementation of protection measures, or as a long-term approach to managing flood risk or residual flood risk in the area.

It should not be assumed however that community resilience will develop by itself. Some investment by the state can greatly enhance the rate and degree of development of resilience through measures such as awareness raising and capacity building programmes (for example, by establishing, promoting and empowering local flood groups), providing information on how to prepare and how people and businesses can protect themselves and then recover quickly from a flood event, the implementation of incentive or grant schemes for the purchase and installation of individual property protection measures, etc. These programmes would generally require some state financing and investment of resources, often at a local level, but can achieve reductions in risk at a low cost relative to major structural community protection works.

Further Information: The FRMPs are not due for completion under the 'Floods' directive until December 2015, and so no information will be available on WISE until at least 2016. However, many

topics relevant to the preparation of FMRPs have been discussed in WG F Workshops for which reports are available through the DG Environment website.

SUMMARY

The EU 'Floods' Directive has set out a common framework for managing the adverse impacts of flooding on people, the environment, cultural heritage and the economy. The Directive sets out requirements for MS to undertake a Preliminary Flood Risk Assessment (PFRA), prepare flood maps and develop Flood Risk Management Plans (FRMPs). Each of these requirements pose significant challenges that MS across Europe have been working, and will continue to work, to overcome. Common challenges are generally related to governance and communication, rather than technical issues, although the scale of work involved is, in its own right, a significant challenge to be met.

While the Directive does set out some specific requirements that MS must meet, the Directive is very flexible and offers MS a significant degree of subsidiarity in almost all areas to determine the approach to implementation that is most suitable for their own particular circumstances, including those concerning governance arrangements and available information and resources. As such, MS are able to implement the Directive according to their own context, and there is rarely any one 'correct' approach to overcome the challenges and meet the requirements of the Directive, and equally rarely a 'one-size-fit-all' best practice.

It might also be remembered that we are only in the first cycle of implementation of the 'Floods' Directive. There are requirements to be met, but there is always scope to improve and expand the approaches taken in future cycles of implementation.

Disclaimer and Author's Note

The views expressed in this paper are the personal views of the author only. They do not constitute a formal interpretation of the EU 'Floods' Directive or any other legislation, and do not represent the official position of the Irish Government, the Office of Public Works, Working Group F, or any other organisation, group or committee.

Reference is made herein to examples of implementation and practice in Ireland. This is not intended to imply that the examples presented represent best practice. These examples are used solely due to the familiarity of the author with practice in Ireland.

SPECIFIC PROBLEMS REGARDING FLOOD RISK MANAGEMENT IN ALPINE CATCHMENT AREAS

Rudolf Hornich

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The Alps encompass an East to West length of about 1200 km, a width between 150 km and 250 km and a surface of about 190.600 square kilometres (Figure 1). Due to the topographic circumstances and a particular climatic situation there are specific natural hazards with which the population of the alpine areas has learned to live over centuries. Because of the high amounts of precipitation – which are distributed throughout the year in both solid and liquid states – floods are a constantly present hazard in alpine living environments. In order to manage flood risks the Council of the European Union and the European Parliament implemented the European Floods Directive 2007/60/EC in November 2007. However, not only the applications of this new strategic instrument, but also the specific problems in alpine catchment areas pose a challenge to alpine countries.

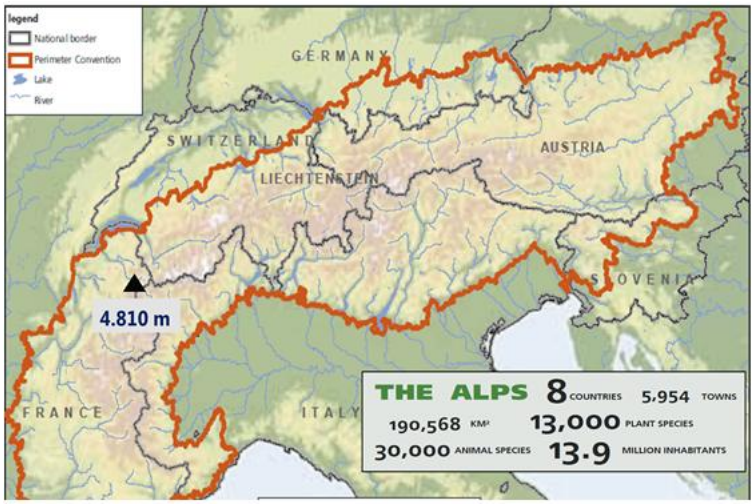

Figure 1: Alpine region

BED LOAD, BED LOAD TRANSPORT, SEDIMENT MANAGEMENT AND DRIFT WOOD

The alpine area is often affected by the European general weather situation – for example the Vb-weather situation. As a consequence of rainfalls for days the effects are extreme natural disasters – such as the floods in 2002, 2005 and 2013. Extreme precipitation with high intensity and short duration can also cause floods with high damage. Flood catastrophes have been the most frequent natural disasters in recent years in the alpine area

In article two of the Floods Directive the following definition can be found: "flood" means the temporary covering by water of land not normally covered by water. This shall include floods from rivers, mountain torrents, etc.

However, in alpine catchment areas this definition is not sufficient. Due to the geological and topographic situation there is a difference between flood events in the alpine area and the lowland. With alpine rivers it is important to not only consider the pure water mass – in case of torrential rain and floods huge masses of rubble are mobilised by landslides and erosion processes. The discharge processes are affected by sediments and drift materials, which not only cause great damage, but also

cause problems with cleanup efforts due to the huge amounts of rubble and debris mass. Huge amounts of driftwood that is carried along aggravate this situation. Log jams lead to uncontrolled discharge and, consequently, to great damage in residential areas. In the course of creating the catalogue of measures for the flood risk management plan structural measures (bed load retention dam, drift wood rack) as well as grove tending strategies and maintenance procedures and suitable measures for drift and sediment management are to be provided. Currently there are some international projects, surveys and academic works dealing with this topic (for example: www.sedalp.eu).

MORPHODYNAMICS

Rivers in alpine areas are characterised by their pronounced morphodynamics. In his project Floodrisk II Professor Habersack has proved that the river Trisana in Galltür, Tyrol, showed an enlargement of the river width by a factor of 3,47 and a change of its run length by 1% - this happened during the extreme flood event of 2005 after the discharge of the flood wave. This means that the rivers have to be provided with an appropriate space for the flood discharge. In addition to this safety aspect, in case of floods there is also an improvement of the morphological situation of the stream (synergy effect with the Directive 2000/60/EC). The protection of the drainage space and the consideration of the flood discharge areas in the course of the creation of flood risk management plans is one of the most important tasks for land use planning.

Land use planning, restricted settlement area, retention spaces

When creating flood risk management plans in alpine areas, great significance is given to the measures of land use planning. In the whole alpine region the areas for permanent settlement are very restricted. In Tyrol, for example, only 12% of the land surface is available for permanent settlement. Additionally, there is pressure from various sectors, such as economy and industry, nature conservation, tourism, agriculture and infrastructure. Thereby, they mostly claim the surfaces in the valley floors which are also of importance for the retention areas in case of floods. The task of land use planning is to consider the possible effects and scenarios of natural hazards and a detailed weighting of interests with regard to land use. It is important to turn attention to surface areas that are relevant for flood discharge and retention use. In doing so, suitable measures and legal frameworks should be provided in order to secure these spaces in the long run or to improve already existing flood retention spaces or to create new ones. The University of Natural Resources and Life Sciences, Vienna – with guidance from Professor Habersack – has created a method for the evaluation of flood retention spaces. With the help of the Floodplain Evaluation Matrix (FEM) method it is possible to assess the effects of flood retention spaces (in case of floods) on the downstream and upstream residents in terms of reduction of the water level or retardation of the peak flow. Thus, an important basis for the creation of management plans is available.

Further specific problemsTourism effects on PFRA

The touristic use of the alpine area represents a specific problem for flood risk management. Depending on the season the number of people living and staying in a locality differs strongly. A provincial town with some dozen inhabitants during off season sometimes has to accommodate thousands of tourists during peak season. In the course of flood risk management it is important to consider this both during the preliminary evaluation of the flood risk as well as in the preparation of the hazard zone maps and in planning the measures for the flood risk management plan.

FORECAST MODEL

Another big challenge for the alpine area is the fact that there are no suitable forecast and advance warning models of good quality at the moment. Forecasts from weather data are difficult to derive

for the mostly small catchment areas. Due to a short flow path and a high flow velocity, the reaction time from the start of the precipitation event to the effect of the floods on protected property is very short. An improvement of the forecast data would be of great advantage particularly for the action force. Measures for the improvement of the forecasts are to be included in flood risk management plans.

CLIMATE CHANGE

The effects of climate change are an important topic for the alpine region as well. The rise of temperature causes additional hazards – especially in high alpine regions where the combination of higher temperatures and permafrost leads to new dangerous situations which have to be considered. The deglaciation and possible flood waves caused by broken dams of glacial lakes pose new threats which have to be addressed in flood risk management in certain regions.
As regards discharge, there seem to be no clear trends which can be attributed to climate change. Already existing test series from discharge sites in the alpine area often only encompass a maximum period of 50 years. Statistic deductions for extreme events are difficult to make due to this rather short observation period. However, changes in intensity and discharge characteristics have been noticed in various alpine streams. Therefore, it is important to consider the effects of climate change in the creation of management plans and to think about new strategies for assimilation.
Living with floods
Living with floods and natural hazards has been part of peoples' lives in the alpine areas for generations. Due to many historic events and constant threats these people have developed a greater awareness for floods than, for example, city residents. Therefore, the local population should be involved and participate in the process of creating flood risk management plans. Local experience should especially be used when choosing the measures to reduce flood risks.

Cultural heritages
The alpine flood events of the recent years have hardly affected historical cultural assets. Since their construction these buildings have not only survived the floods of our century but also numerous natural disasters. This means that their locations and building materials were chosen carefully with regard to natural hazards. The consideration of cultural objects in the alpine area is, therefore, not only rooted in the area of flood risk management but also in local aspects.

SUMMARY

Protection against natural hazards has always had a great significance in the alpine area. Apart from technical safety measures there were also early non-technical measures used for protection. The presentation and mapping of hazard zones in the form of hazard zone maps – as a basis for planning and decision making in land use planning as well as the construction and protection industry – has been applied in Austria for more than 30 years. The EU Floods Directive shifts the focus on flood risk management. Hence, flood risk management plans with regard to the specific circumstances in alpine regions are a crucial basis for the security and future development of alpine living spaces.

LINKS BETWEEN THE FLOODS DIRECTIVE AND WATER FRAMEWORK DIRECTIVE

Summary of the presentation given by Mr Clemens Neuhold by Catrin Promper

BMLFUW, Austria

In this chapter the Flood Directive and the Water Framework Directive are elaborated shortly in order to identify the links in between these directives. This serves further as a basis for emphasizing the main challenges and the chances within these links and synergies respectively.

FLOODS DIRECTIVE

The EU Directive on the assessment and management on flood risk [2007/60/EC] was adopted on 23 October 2007. The aim is to reduce the adverse consequences that floods pose to:

- Human health
- Environment
- Cultural heritage
- Economic activity

The origin of the Flood Directive was the huge flood that struck Central Europe in 2002. The principal objective is to reduce the risk of flood and to take future changes in the risk of flooding as a result of climate change into account. The implementation of the FD is segmented into three stages:

- Preliminary Flood Risk Assessment (PFRAs) by the Member states for river basins and for coastal zones by December 2011 to identify areas of existing or foreseeable future potentially significant flood risk APSFRs – Areas of Potentially Significant Flood Risk, flood risk being based on the probability of the process and its (adverse) consequences.

- Flood hazard and risk maps for the APSFRs should be identified by the member states by 22 December 2013. Therefore identify areas prone to flood with a high, medium and low probability of occurrence. These maps have to include extent and water depth as well as, economic activities potentially affected, number of inhabitants at risk and the potential environmental damage.

- Flood Risk Management Plans (FRMPs) have to be produced by the Member States by December 2015. Therein these have to be harmonized with the WFD River Basin Management Plans (RBMO) cycle. The focus will be on prevention, protection and preparedness, setting objectives for managing the flood risk within the APSFRs and setting out a prioritised set of measures for their achievement.

Therein increase of flood risk for neighbouring countries (e.g. due to measures) should be avoided. Additionally longterm developments should be taken into account. Overall public information and consultation is a key issue in the whole process.

WATER FRAMEWORK DIRECTIVE

The Water Framework Directive (WFD) was adopted in October 2000 [2000/60/EC]. The main aims are the improvement and integration of the way that water bodies are managed throughout Europe (Catchment based – integrated water resources management). Thereby the status of the aquatic ecosystems should be enhanced and further deterioration prevented. A long-term protection of water resources by sustainable use, reduction of pollution of water and ensure progressive reduction of groundwater and contribute to mitigating the effects of floods and droughts. Therein it should contribute to mitigating the effects of floods and droughts.

REASONS FOR COORDINATION

The coordination of the water framework directive and the flood directive enables to optimise synergies and thereby minimises potential conflicts. This coordination is further required due to overlaps of legal and planning instruments in various Member States, both directives use the catchment areas as geographical unit and it creates the potential of aiding the (resource) efficiency by the opportunity to maximise synergies by identifying measures serving both purposes. Additionally it is expected from many stakeholders that an integrated approach will be taken.
Moreover a holistic approach to water management is supported; through references to the WFD in the FD to support coordination and possible integration. Summarizing the benefits of the coordination of the FD and the WFD are:

- Improving the efficiency by presenting information to the public in one place, ensure mutual benefits by cross referencing the objectives and the coordination of the consultation of the FRMPs and the RBMPs increases opportunities for synergies to be recognised.

- Information exchange by collecting data once and using it also for other purposes, the integration of the data allowing easier identification of pressures on water environment and sharing data assists understanding the problems and solutions to identify reductions in flood risk, thus improving the environment.

- Approving common synergies and benefits with regard to environmental objectives (in article 4 of the WFD) includes improved integrated river basin management and the identifications of areas where measures can meet objectives if the FD and the WFD e.g. use of Sustainable Drainage Systems (SuDS).

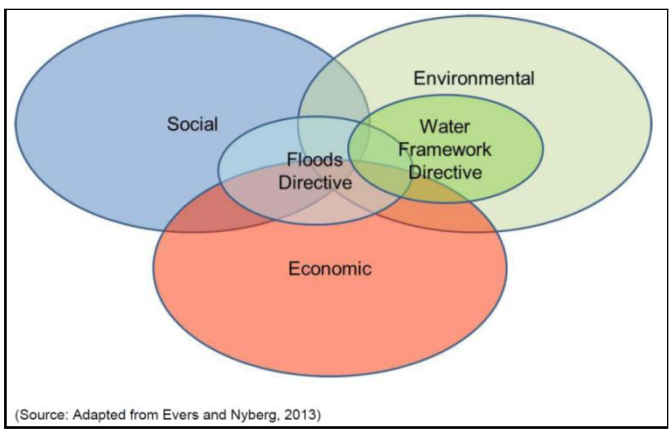

Figure 2: Sustainability aspects addressed by the FD and WFD

There are different dimensions of sustainable development: economic, social and environmental, see Figure 2. The WFD covers wide parts of the environmental aspects whereas for the FD all aspects are relevant. Therefore there are areas where FD and WFD overlap, which does not only imply challenges but also synergies in different dimensions.

This text is based on:

Neuhold C., 2014, Links between the Floods Directive and the Water Framework Directive, oral presentation at PLANALP Cofererence Breaking freh ground in protecting Alpine Environments – Flood Risk Management Plans, 25 – 26 March 2014, Graz Austria

Evers M. and Nyberg L., 2013, Coherence and inconsistency of European instruments for integrated river basin management. International Journal of River Basin Management 11:2, 139-152

EC, 2014, Links between the Floods Directive (FD 2007/60/EC) and Water Framework Directive (WFD 2000/60/EC) Resource Document, Office for Official Publications of the European Communities, Luxembourg

ON THE WAY TO THE AUSTRIAN FLOOD RISK MANAGEMENT PLAN: METHODOLOGY AND CHALLENGES

Summary of the presentation given by Mr Heinz Stiefelmeyer by Catrin Promper

BMLFUW, Austria

There are various challenges associated with the implementation of the flood risk management plans in Austria. Firstly the legal and administrative framework and secondly the topographic characteristics and the high vulnerability pose challenges to the responsible actors. It was necessary to elaborate an approach meeting these challenges and find a suitable way for all administrative levels, stakeholders and actors.

CHALLENGES

In Austria the legal and administrative framework is based on the Federal State where the water act is anchored. However the land-use management and spatial planning, the building code and the emergency management are based in the nine Provinces. Further the 2,354 communes are responsible for building permissions. This high diversity of accountabilities increases the complexity among the implementation process. The second big challenge is the topography of Austria limiting the space for permanent settlements to 37.5% for Austria (see Figure 3) in combination with a very dense river network.

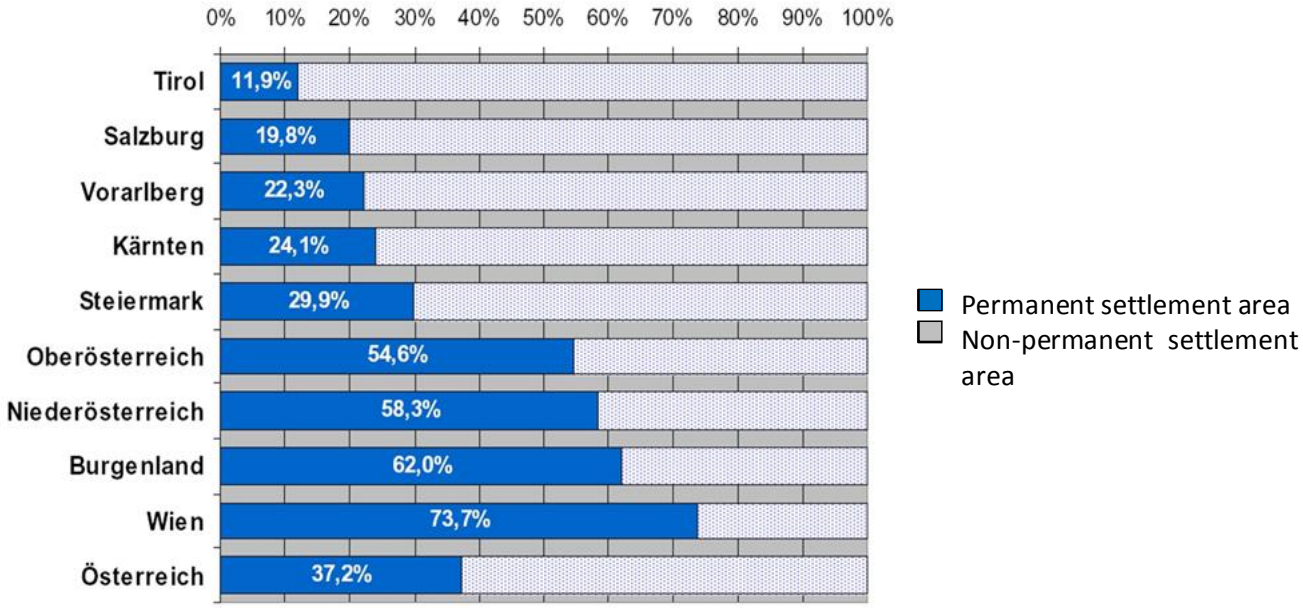

Figure 3: Permanent settlement area for Austria

Additionally there is a high vulnerability related to floods with high frequency incorporating a high number of houses and subsequently high values affected. All these factors underline the need for a working committee on the EU Floods Directive complemented by associated working groups which were established to meet the challenges and foster the implementation of the flood risk management plans.

OBJECTIVES

In the first cycle of the implementation of the risk management plans the following four objectives were identified:

- Prevention of new flood induced risks
- Reduction of existing risks before a flood
- Reduction of existing risks during / after a flood
- Strengthening risk and hazard awareness

To achieve these objectives the risk management plan incorporates measures (§ 55l Abs. 3 WRG 1959). These and the prioritization targeting the realization of the aims related to the flood risk management plans are to be outlined. This obliges the description of the prioritization and the methods according to which the progress of the implementation of the plans can be monitored and documented.

The catalogue of measures contains 22 (types of) measures related to the different fields of action related to the risk cycle: Prevention (5), Protection (8), Awareness (3), Preparedness (3) and Recovery (3). Each measure is described generally and illustrated with examples. Additionally there is a characterisation of the measures including the contribution of the measure to achieve the objectives, the assessment of the impact of the measure on risk reduction, the assignment of the impact to a field of action (risk cycle) and additional decision support for prioritisation. Examples of these measures incorporate:

- Consideration of hazard zone plans (M2)
- Restoration of retention areas (M7)
- Structural measures (planning and building) (M08)
- Edit information about Flood hazards for the public (M14)
- Create/control early-warning and forecast systems (M17)

Each measure contributes to reach on or more of the four objectives however, is related to only one field of action. All measures are characterised by the following parts:

1. Title
2. Description
3. Examples
4. Legal frame
5. Relevant divisions, work steps

Regarding the prioritisation of measures three possible ways (reporting sheets by the EC) are outlined: 1) either a timetable for implementation, 2) as a category of priority or 3) a summary text. The status of the prioritisation can be from (x) not possible to (5) periodical implementation and on

another meta level ordered by the point in time of implementation: “current cycle”, “next cycle” or “later than next cycle”.

PARTICIPATIVE PROCESS

The need for a harmonisation process for the different sectors was overcome by public participation and therefore the process indicated in Figure 4 was established. The federal blueprint is edited on the provincial level before optional workshops on either APSFR or provincial level take place. In a next step the consultation of the public starts and is followed by workshops on the level of the APSFRs including stakeholders as well as representatives of the municipalities.

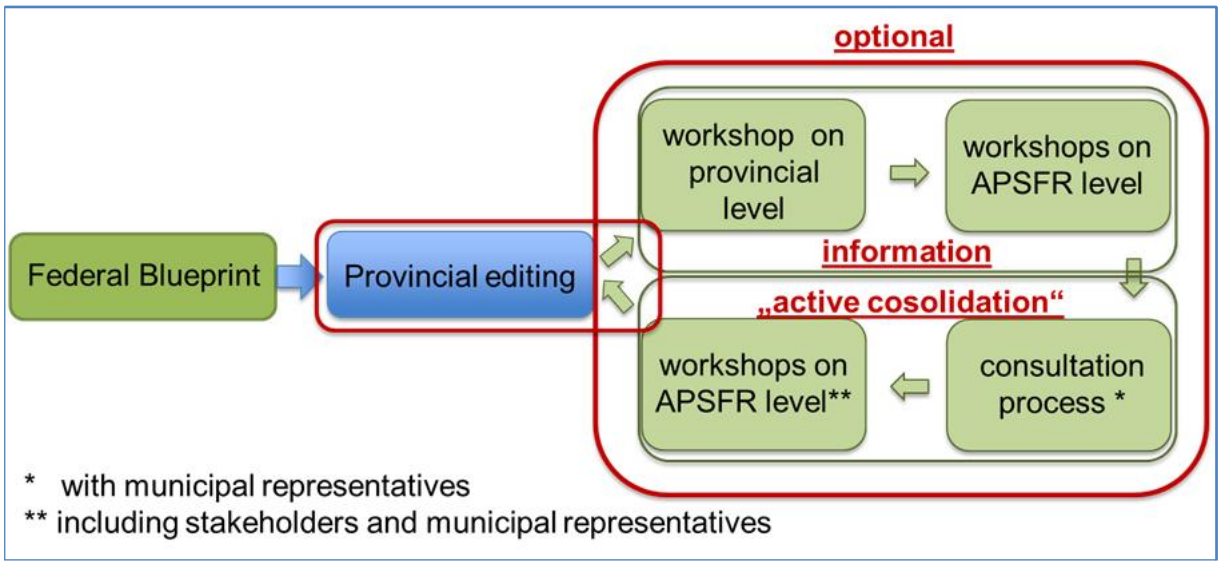

Figure 4: Public participation prior to legal obligation

STATUS QUO AND OUTLOOK

At the moment the provincial editing is conducted and in May/June 2014 two mid-term workshops are planned. The information of the public and the consultation therein will start at the end of 2014 together with the water framework directive. The kick-off is planned for January 2015 and for the first half of 2015 three to four provincial events are planned.

This text is based on:

Stiefelmeyer H., 2014, On the way to the Austrian Flood Risk Management Plan: methodology and challenges, oral presentation at PLANALP Cofererence Breaking freh ground in protecting Alpine Environments – Flood Risk Management Plans, 25 – 26 March 2014, Graz Austria

FLOOD RISK MANAGEMENT AND FLOODS DIRECTIVE (2007/60/EC) IMPLEMENTATION IN SLOVENIA

Luka Stravs

Ministry for Agriculture and the Environment

INSTEAD OF INTRODUCTION

Republic of Slovenia has suffered some substantial direct damages after larger flood events in the last 25 years:

- 1990: cca 580 mio EUR,
- 1998: cca 180 mio EUR,
- 2007: cca 200 mio EUR,
- 2009: cca 25 mio EUR,
- 2010: cca 190 mio EUR and
- 2012: cca 310 mio EUR.

Based on the fact that these values represent only direct damages we can make a quick and simple estimation that average yearly flood damages in Slovenia ammount to approx. 100 to 150 mio EUR.

FLOODS DIRECTIVE IMPLEMENTATION IN SLOVENIA

Premilinary Flood Risk Assessment (by applying Article 4 of the Floods Directive) was published on 22.12.2011 and reported to European Comission on 22.03.2012. It is publicly available Link 1 (only in Slovene language).

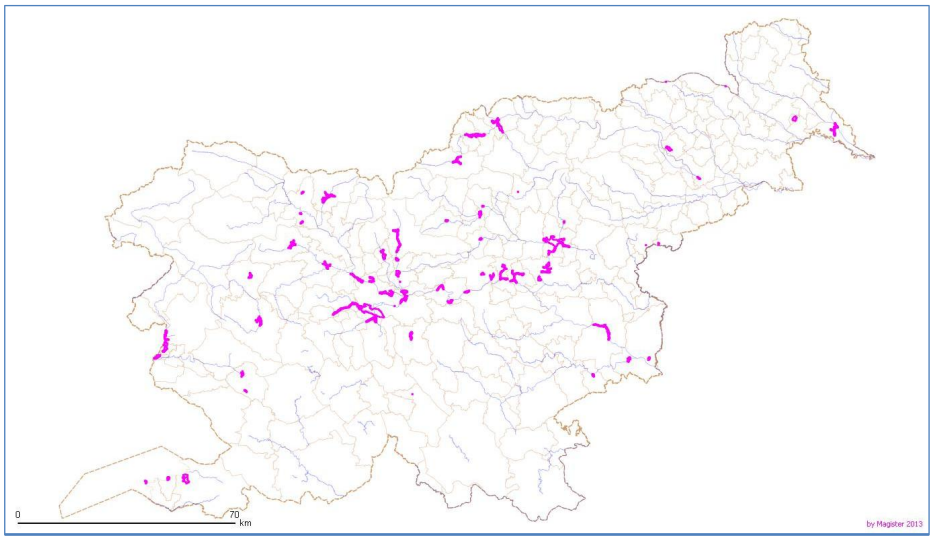

Figure 5: Map of the Slovenian APSFRs

Areas with Potential Significant Flood Risk (Article 5 of the Floods Directive) were identified on 14.02.2013 and reported to European Commission on 21.03.2013. Map of all 61 Slovenian APSFRs is published and available at Link 2.

It is estimated that approximately 600 mio EUR would have to be invested into reduction of the flood risks at these 61 areas of potential significant flood risk. 600 mio EUR of needed investments include both structural and non-structural flood protection measures.

Flood Hazard and Flood Risk Maps for most of the Slovenian APSFRs are done and can be viewed and accessed by browsing through the following table/framework (links to the 10-year, 100-year and 500-year flood scenario hazard maps and links to the flood risk maps are available on the right side of the table) (see Link 3).

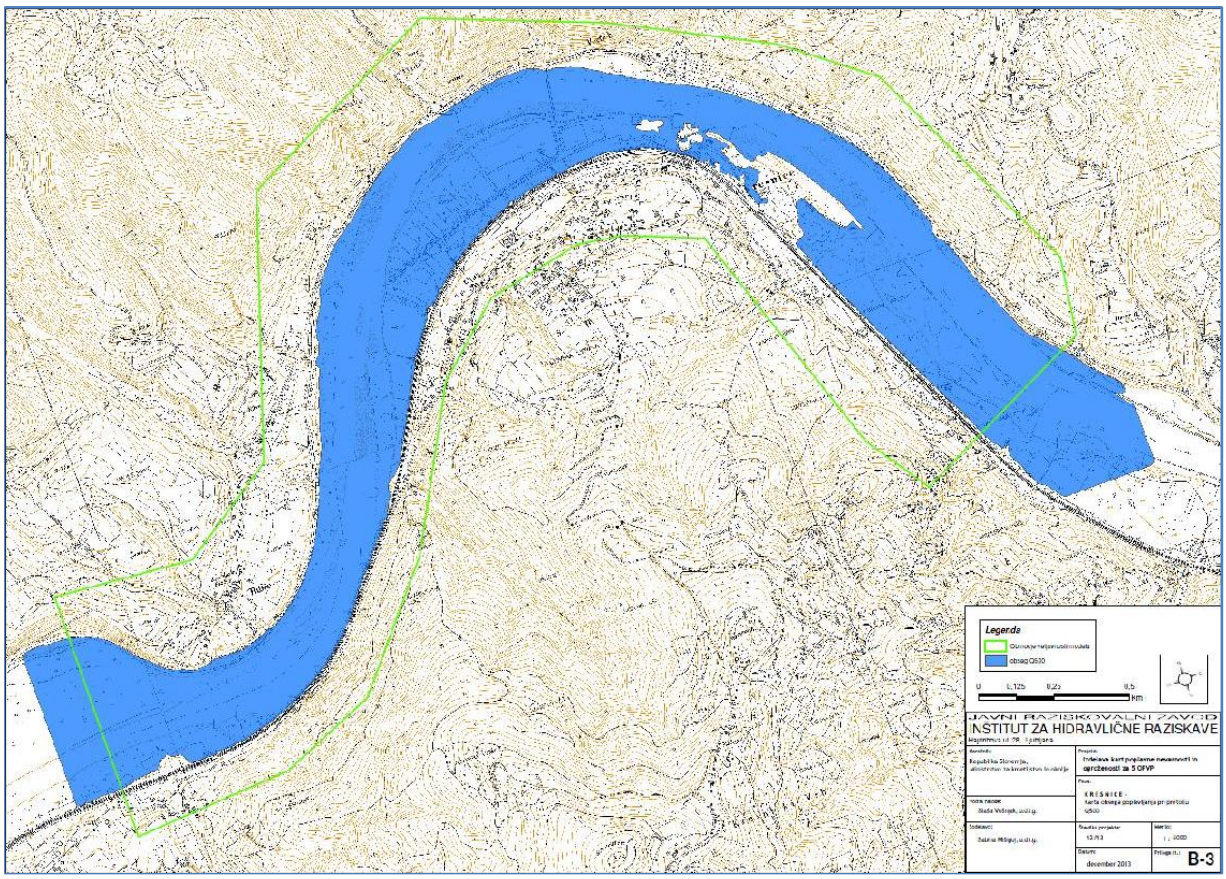

Figure 6: An example of flood hazard map (500-year flood scenario for the Kresnice APSFR)

At the moment Slovenia is intensively working on preparation of the Slovenian Flood Risk Management Plan. Slovenian FRMP will consist of 17 smaller river basin FRMPs, which cover all of the identified 61 APSFRs.

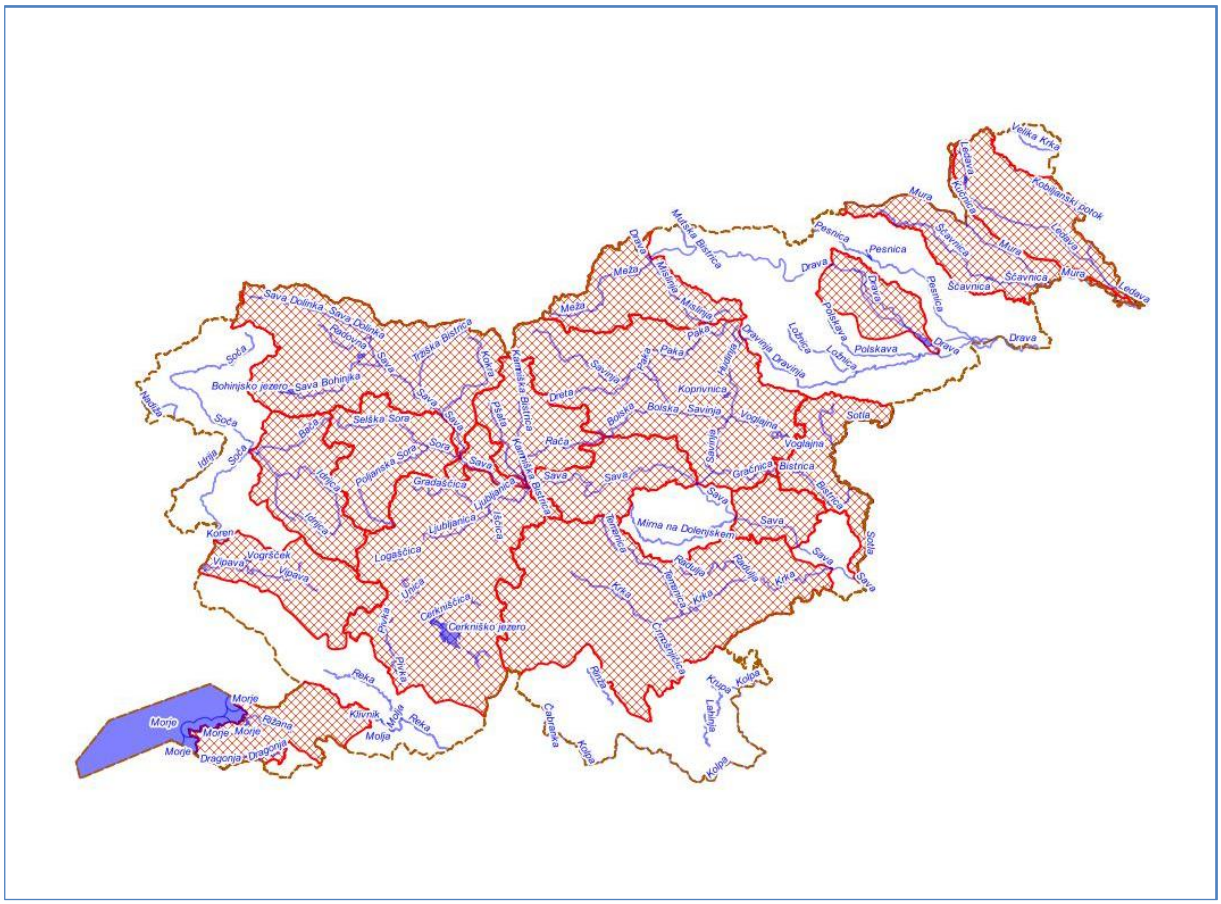

Figure 7: A map of 17 Slovenian river basins with APSFRs.

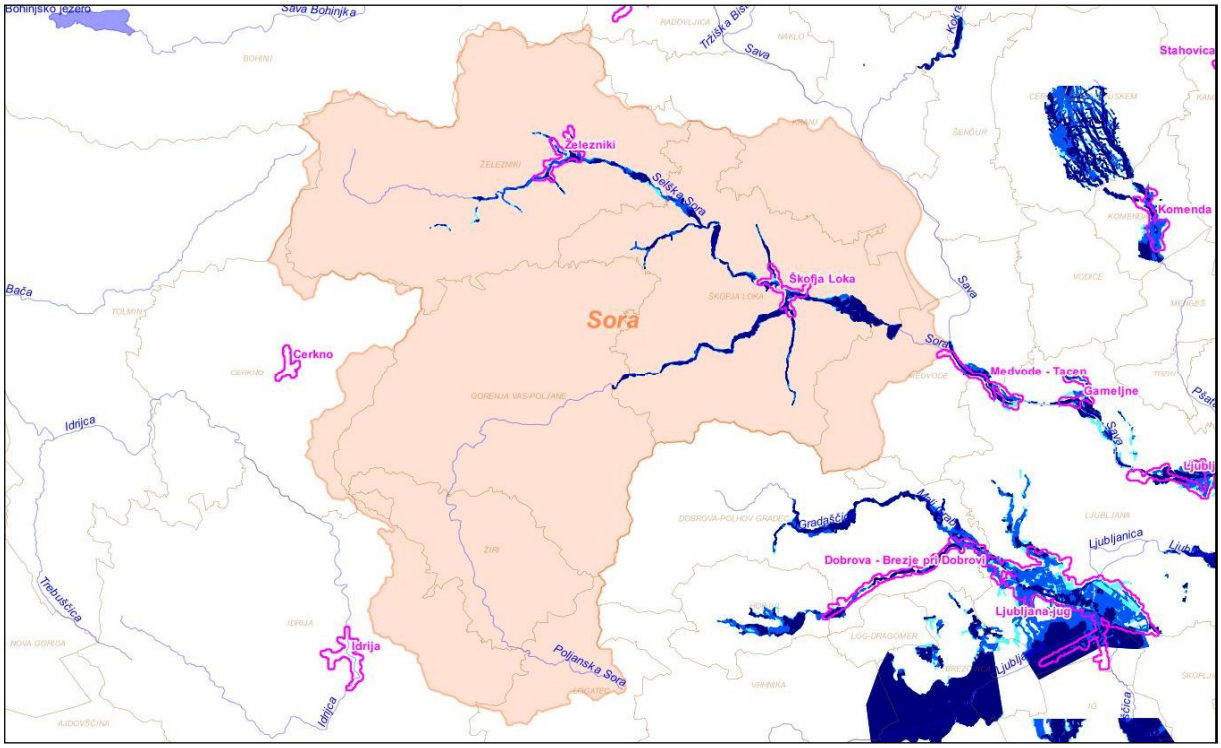

Figure 8: A map of the Sora River Basin with two identified APSFRs (Zelezniki and Skofja Loka).

Always updated additional information regarding the Floods Directive implementation in Slovenia can be found here:

http://www.mko.gov.si/si/delovna_podrocja/voda/poplavna_direktiva/

All relevant flood-related interactive maps (APSFRs, flood hazard maps, past flood events, etc.) can always be viewed at the homepage of Environmental Agency of Republic of Slovenia:

http://gis.arso.gov.si/atlasokolja/profile.aspx?id=Atlas_Okolja_AXL@Arso

LINKS

Link 1:
http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/predhodna_ocena_poplavne_ogrozenosti.pdf

Link 2:
http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/karta_obmocij_OPVP.pdf

Link 3: http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/opvp/OPOPO.xls

METHOD, IMPLEMENTATION AND CHALLENGES - ITALY

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INTRODUCTION

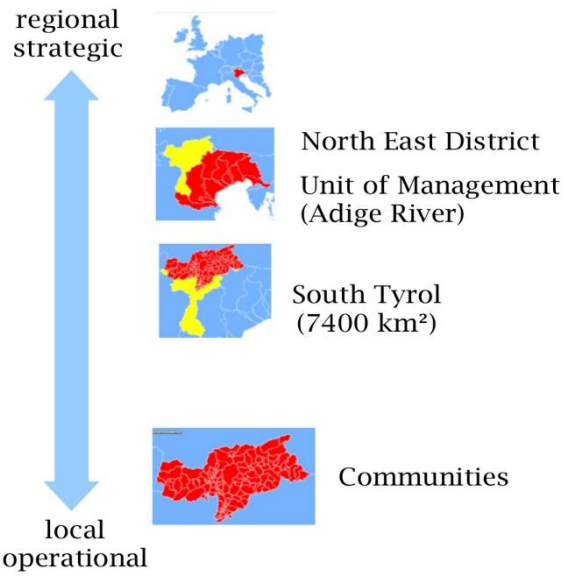


Figure 9: From regional to local level.

The 2007/60/EC Directive (art. 7) prescribes the production of the flood risk management plan (FRMP) coordinated at the level of the river basin district. The production of the FRMP and the successive updated is encouraged to be realized through the involvement of the public (art. 9 and 10).

In Italy the jurisdiction on the planning phase of water management has been assigned to 8 River Districts (Decree 49/2010 and 152/2006), interregional administrations competent on one or more river basins. In the italian Alps, two river districts are present: the Po river district, corresponding to the whole territory of Piedmont, Aosta Valley, Lombardy, Emilia Romagna and part of Trentino and Veneto; the Easter Alps district that comprehends multiple river basins like Adige/Etsch, Piave, Tagliamento etc. and includes the territory of Alto Adige-Süd Tirol, part of Trentino, Veneto and Friuli Venezia Giulia. The jurisdiction on water management during the emergency has been left to the single Regions. This fragmentation in multiple decision levels requires a high coordination between the various levels of planning (national and regional to set the strategic targets) and local level (communities) to set the operational procedures (Figure 9).

HAZARD AND RISK MAPS

Before the emission of the 2007/60/EC Directive, in Italy the hydro-geological risk management was handled through the "Hydro-geological Arrangement Plans" (*Piani per l'Assetto Idrogeologico*: PAI), introduced by the Law 267/1998. These plans, produced by 41 Rive Basin Authorities, were aimed at localize and delimitate the areas prone to flood, landslides and snow avalanches according to multiple probability scenarios, and to determine the necessary mitigating actions (both planning and structural measures).

The risk was calculated according a pre-defined classification, considering the exposition and the vulnerability. However, the risk classification was not shared among the different Districts, creating heterogeneity in the number of classes and in the interpretation of the risk. As far as the vulnerability is concerned, the most used methodology was to assume a value equal to 1 for all the "exposed"

elements, however, in some basins, different approaches lead to calculate the vulnerability as a function of the exposure and the number of inhabitants.
The transposition of the 2007/60/EC Directive has created the necessity to homogenize of the various methodology in order to produce a national standard for the representation of the hazard and risk maps, in particular the agreement on standards to calculate the vulnerability and then to assess the risk. In particular, the Decree of transposition in the Italian law (Decree n. 49 dated 23 February 2010) states that the hazard maps must be calculated according to three probability scenarios (low, medium and high probability) and for each scenario the phenomenon intensity must specify the extension, water height ad velocity. Furthermore, it states that the risk maps must indicate the potential negative consequences of a flood event, according to 4 classes: 1) number of inhabitants; 2) presence of strategic infrastructures e.g. highways, hospitals, schools, etc.; 3) presence of cultural heritage; 4) presence of industrial plants that could cause pollution in case of flooding; 5) areas subject to debris flow or solid transport or to pollution risk.
The hazard and risk maps have been completed and the information is available on the internet sites of the River Districts.

PLANNING PHASE

Numerous initiatives are present for mountain basin management plans.
For example in South Tyrol four mountain basin management plans and five river area management plans have been undertaken (see Figure 10), with a plan structure that includes information, public involvement and engagement. So far, the key lessons learned in this process are:
1) the organization structure of the working practice needs to be "institutionalized" and include a watershed manager with "leadership";
2) the river management plan require a careful planning of the implementation phase, where the catalogue of measures should be not too general and not too detailed, leaving space to a consensus-based decision making process, and then a regular monitoring of implementation;

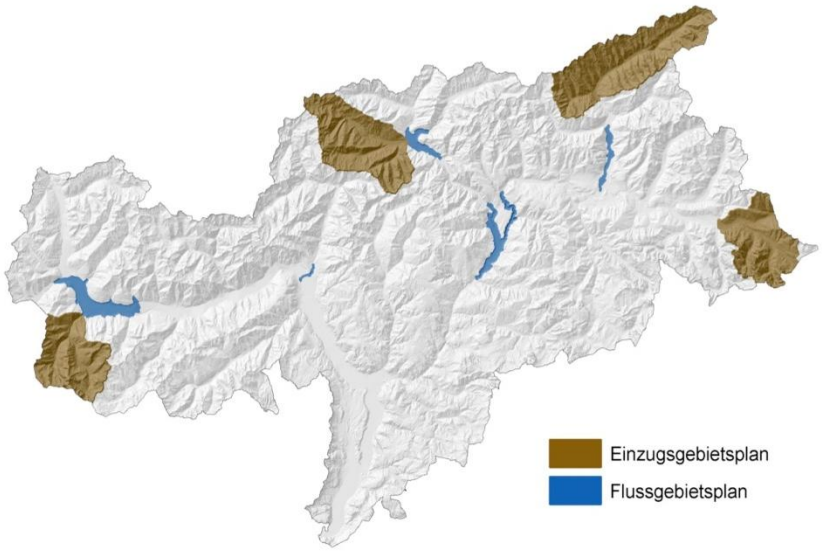


Figure 10 River and basin management plan in South Tyrol

3) the public participation process requires continuity, information exchange and transparency, the adaptation of technical language to the demands of the involved stakeholders and a careful planning of public participation according to the 5 W (where, who, when, what, how).
Among other experiences, it is worth to mention, the Eastern Alps district, inside the framework of the FP7 financed project KULTURisk, has participated in an experimental laboratory on communication of the hydraulic risk in the international basin of the Vipacco river (Italy, Slovenia). The risk communication has been faced according to the following phases:

1. hazard and risk mapping: with the objective of deriving the most appropriate accuracy and representation modality of the information, together with the best communication channels.

2. Structural mitigation interventions: the objective was to understand the criteria used by the auditory to evaluate the intervention. It emerges that the stakeholder are most interested in "how" and "where" the structure is posed rather that on the type ("what") of the structure.

3. Non-structural mitigation interventions: it is crucial that the information is provided by the technical representatives coming from the local territory with a high reputation. Furthermore, the information should stress the "security conditions" rather that the "hazard conditions"

The methodology developed by the project can be found with details in the project's website (http://www.kulturisk.eu/), and constitutes the basis of the application of the FD in the North-East district as a whole.

All other institutions are equipped with similar procedures, and tables are ongoing to arrived to homogeneous and common solutions along the whole Italian Alpine Arc.

EMERGENCY PHASE

During the emergency phase, it is necessary to be endowed with a decision support system that allows to monitor the phenomenon and to predict future evolution system, in order to take decision for the civil protection. In this context the new research available in hydrology, meteorology and hydraulics science play a crucial role. Among the Institutions above mentioned, models are available that, given the meteorological predictions, the current discharge measures in rivers and dam water levels, allow to estimate the future evolution of the flood in the main rivers, given the appropriate meteorological inputs.

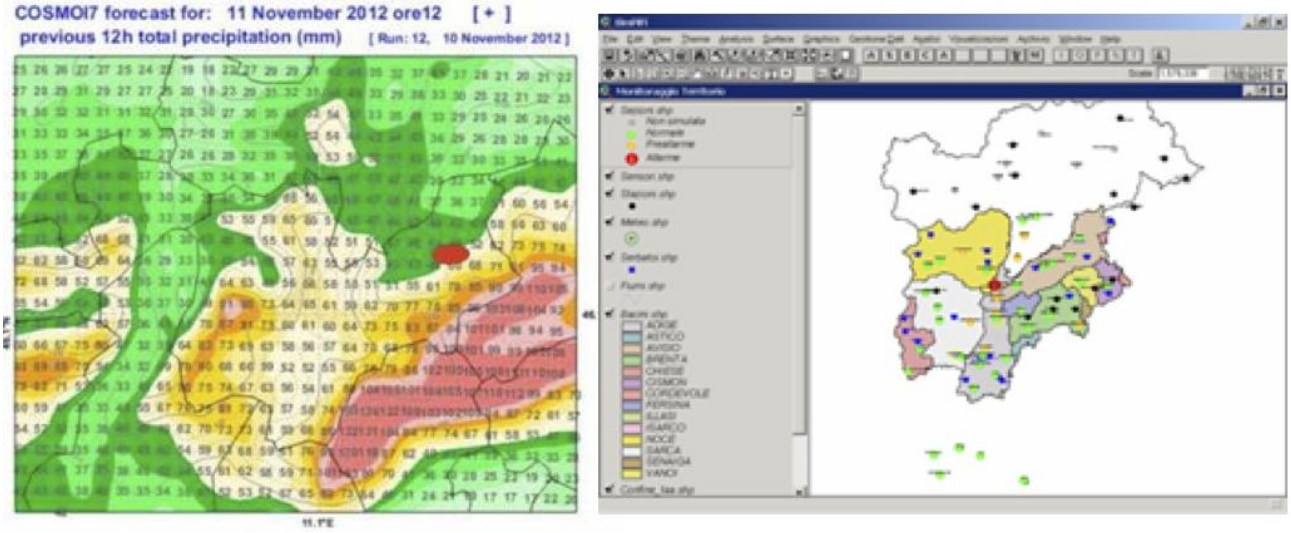


Figure 11: Example of precipitation forecast for the flood emergency plan in Trentino

To give an example, the administration of PAT in this context is now operative with a H24 special personnel availability for the flood service. In real time are available the data on the precipitation and on the water level in the dams (see Figure 11) and, in case the prediction given by the hydraulic-hydrologic-meteorological modeling suggest the necessity of dam regulation and/or civil protection measures, the procedure foresees to activate the regulations and a warning message is given to the various Civil Protection Units of the surrounding regions and river authorities. These models served for instance to successfully act during the recent emergencies of 2010 and 2012.

ONGOING ACTIVITIES IN THE FRAMEWORK OF THE ALPINE CONVENTION

At the moment the Autonomous Province of Trento is organizing a workshop oriented at outlining the problems in complying with the Directives 2007/60/EC and 2000/60/EC, inviting all the partners of the various Regions in the Italian Alps. The objectives are: 1) to outline common experience in combining both human life defense (2007/60/EC) and the maintenance of a good ecological status (2000/60/EC) in mountain rivers (objectives that, sometimes, appear conflictual); 2) to find indicators for the evaluations of the morphological modification of alpine streams better tuned to mountain context, that for example, accounts not only for the number of cross-profile constructions (dikes and weirs) but also for the type and the dimension of the installations (e.g. slit dam allows the fishes to pass whereas a high weir does not).

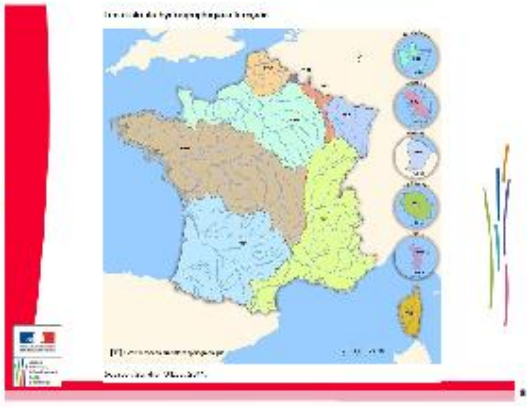
ACKNOWLEDGMENTS
We would like to thank dott. Pierpaolo Macconi, ing. Roberto Bertoldi, the Adige River Authority and the Autonomous Provinces of Trento and Bolzano for the supporting material.

METHOD, IMPLEMENTATION AND CHALLENGES – FRANCE

Jean-Michel Helmer & Marie-Pierre Meganck

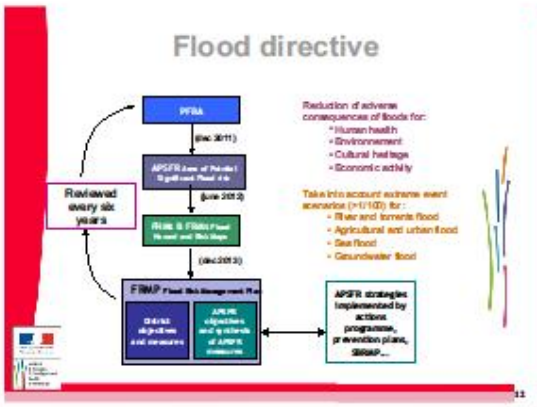
French Ministry of Ecology, Sustainable Development and Energy

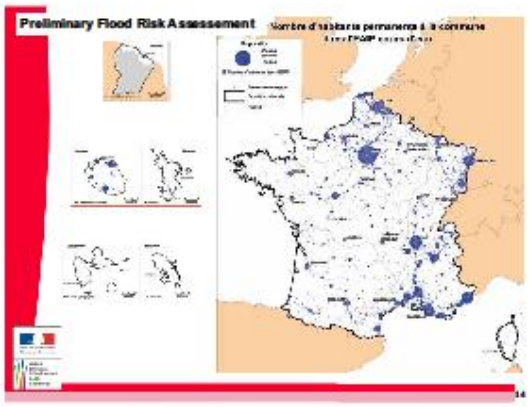

Groundwater floods

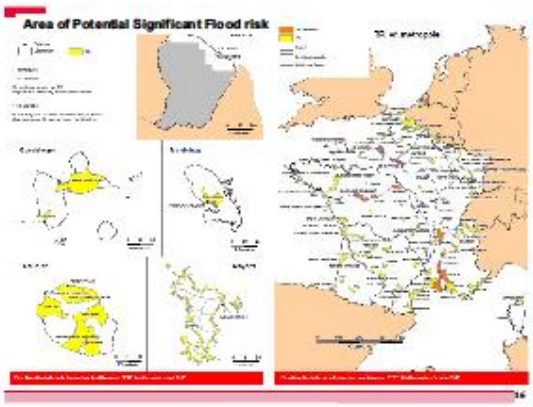


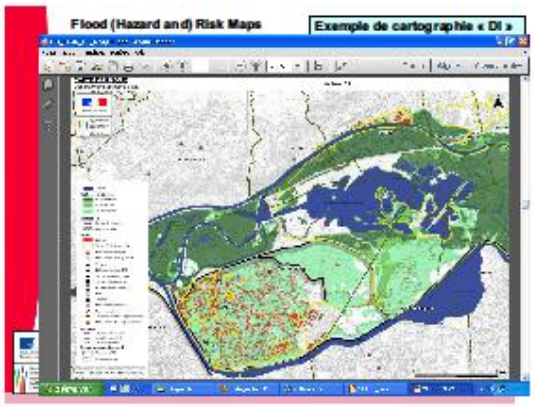

Expecting for the Floods Directive
Floods Directive request to establish a framework for the assessment and management of flood risks
Aiming at the reduction of adverse consequences of floods for
Human health
Environment
Cultural heritage
Economic activity
However
Unlike the WFD, FD don't set objectives at the European level
Each Member State have to define it


French background
Since 1807 (draining of swamps) and 1856
First mapping with the law of 1935 with the plans of submersible surfaces
Cat Nat and Risk law in 1982
Water laws in 1964 and 1992
Risks law in 1995


Flood directive
PFRA
Reviewed every six years
FRMP
Reduction of adverse consequences of floods for:
Human health
Environment
Cultural heritage
Economic activity
Take into account extreme event scenarios (>1/100) for:
River and torrents flood
Agricultural and urban flood
Sea flood
Groundwater flood
APSFR strategies implemented by actions programmes, prevention plans, SRMAP...


Preliminary Flood Risk Assessment


Area of Potential Significant Flood risk


Flood (Hazard and) Risk Maps
Exemple de cartographie « DI »


National strategy
National frame for all flood management
Mobilisation of everybody on identified priorties
Planification of public budget on prior and more efficient actions
2 main principles :
Principle of subsidiarity
Collaboration between all public policies

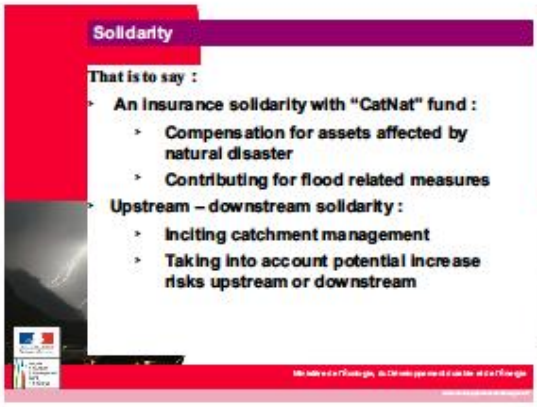

National strategy
The French national strategy for flood risk management set out 3 key objectives (20-30 years)
Increase the safety of people exposed to flood
Stabilize at short term, reducing at the middle term, the cost of damages
Improve resilience territories

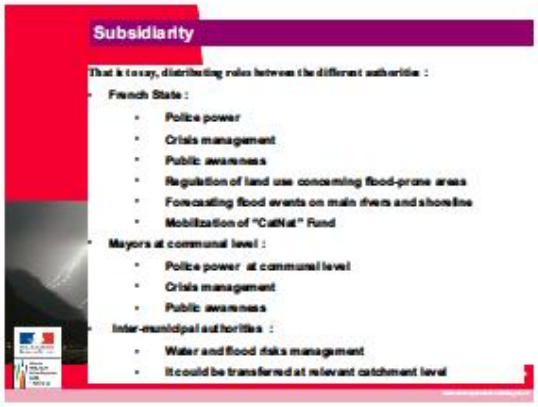

Increase the safety of people exposed to flood
That is to say implementing measures of :
Preparedness :
Developing flood forecasting and warning
Ensuring the safety of people
Public awareness and preparedness
Prevention :
Preserving natural floodplains, wetlands and dune ridges
Prohibiting construction for unsafe flood-prone areas
Limiting setup of sensitive facilities for crisis management issues
Reducing vulnerability on flood-prone areas
Prohibiting construction behind dykes
Protection :
Imposing sustainable management and maintenance for protective works against floods (dykes and dams)
Facilitating procedures for emergency works (with safety issues for people)

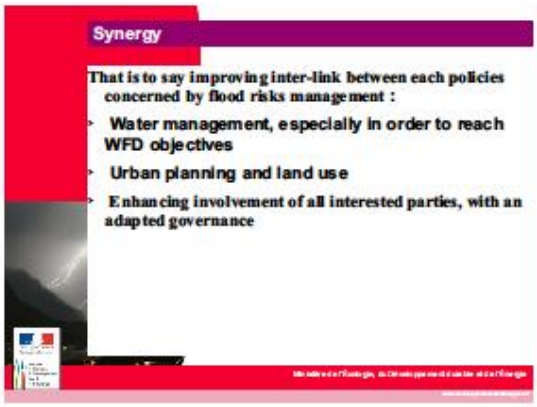

Control the cost of damages
That is to say implementing measures of :
Protection reducing the cost of damages for floods with a high probability
Streamlining efficiency investments for building works (cost-benefit analysis)
Encouraging catchment management, water flow regulation, coastal and floodplain works
Prevention stabilizing cost of damages for floods with a medium probability
Reducing vulnerability on flood-prone areas
Regulating land use on flood-prone areas

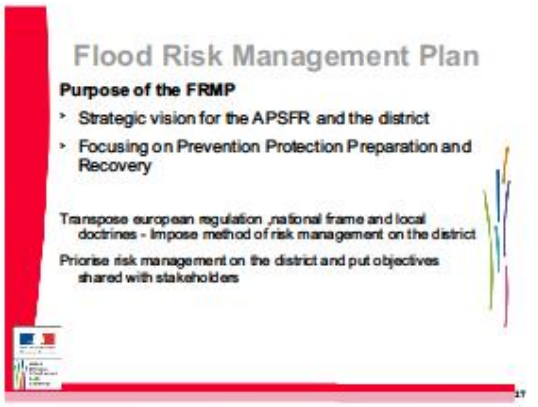

Improve resilience territories
That is to say, when floods are unavoidable, implementing measures of :
Preparedness :
Performing operational tool of crisis management for each decision level
Improving interlink with each decision levels
Enhancing knowledge of territorial vulnerability
Sharing knowledge with stakeholders
Recovery and Review :
Clean up, restoration activities and quick reboot after damages,..
Lessons learns from events

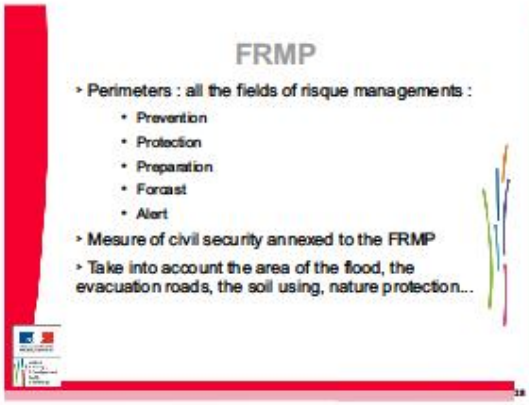

Main pillars for French policy in flood risks management
Solidarity
Subsidiarity
Synergy


Solidarity
That is to say :
An insurance solidarity with "CatNat" fund :
Compensation for assets affected by natural disaster
Contributing for flood related measures
Upstream – downstream solidarity :
Inciting catchment management
Taking into account potential increase risks upstream or downstream

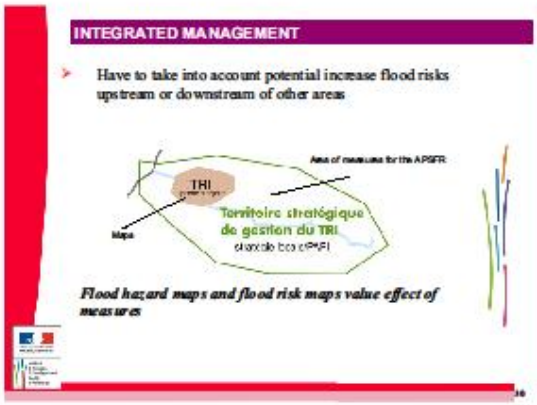

Subsidiarity
That is to say, distributing roles between the different authorities :
French State :
Police power
Crisis management
Public awareness
Regulation of land use concerning flood-prone areas
Forecasting flood events on main rivers and shoreline
Mobilization of "CatNat" Fund
Mayors at communal level :
Police power at communal level
Crisis management
Public awareness
Inter-municipal authorities :
Water and flood risks management
It could be transferred at relevant catchment level

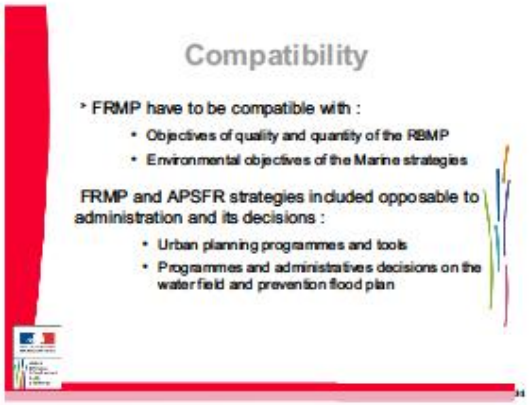

Synergy
That is to say improving inter-link between each policies concerned by flood risks management :
Water management, especially in order to reach WFD objectives
Urban planning and land use
Enhancing involvement of all interested parties, with an adapted governance

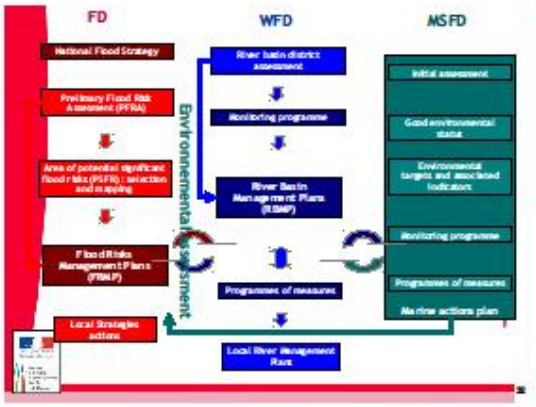

Flood Risk Management Plan
Purpose of the FRMP
Strategic vision for the APSFR and the district
Focusing on Prevention Protection Preparation and Recovery
Transpose european regulation ,national frame and local doctrines - Impose method of risk management on the district
Priorise risk management on the district and put objectives shared with stakeholders


FRMP
Perimeters : all the fields of risque managements :
Prevention
Protection
Preparation
Forcast
Alert
Mesure of civil security annexed to the FRMP
Take into account the area of the flood, the evacuation roads, the soil using, nature protection...


FRMP and APSFR strategies
Purpose of the FRMP=to implement the priorities of the national strategy, to prioritize measures, to allocate public budget on efficient and urgent actions
FRMP=strategic vision for the APSFR and the district:
Impose method of risk management on the district
Prioritize flood management on the APSFR and put objectives shared with stakeholders (20-30 years)
Clarify and decline national frame and local doctrines


INTEGRATED MANAGEMENT
Have to take into account potential increase flood risks upstream or downstream of other areas
TRI
Territoire stratégique de gestion du TRI
Flood hazard maps and flood risk maps value effect of measures


Compatibility
FRMP have to be compatible with :
Objectives of quality and quantity of the RBMP
Environmental objectives of the Marine strategies
FRMP and APSFR strategies included opposable to administration and its decisions :
Urban planning programmes and tools
Programmes and administratives decisions on the water field and prevention flood plan


FD
WFD
MSFD
National Flood Strategy
Preliminary Flood Risk Assessment (PFRA)
Flood Risks Management Plans (FRMP)
Local Strategies actions
River basin district assessment
Monitoring programme
River Basin Management Plans (RBMP)
Programmes of measures
Local River Management Plans
Initial assessment
Good environmental status
Environmental targets and associated indicators
Monitoring programme
Programmes of measures
Marine actions plan
Environmental Assessment


Thank's for your attention !

TORRENTIAL FLOOD RISK MANAGEMENT IN BAVARIA

Andreas Rimböck

Bavarian Environment Agency

INTRODUCTION

This paper gives some insight to the situation of torrential flood risk management in Bavaria. It focuses on the current state concerning the EU flood directive and the planned procedures for the future. It is to say, that risk management as an integrated approach to reduce the damage by natural hazards has a long tradition especially in torrential catchments. Due to the interactions between vegetation, land use, sediment balance, water balance and far more, torrent control ever since tried to reach integrated solutions, regarding protection forests, biological measures, technical measures and so on. Of course these strategies can be improved and especially the coordination between all involved parties is a steady challenge.

LEGAL AND ORGANIZATIONAL FRAMEWORK FOR TORRENT CONTROL

All measures in torrent control are based on the concerned legal and organizational boundary conditions. Therefore this framework has to be introduced in the beginning.
The responsibility for water resources management in Germany mainly lies by the federal states. The Republic of Germany only gives some boundary rules. Torrent control is regulated by the Bavarian Water Law, where also the duties for construction and maintenance are addressed. These are:

- large rivers (1st and 2nd order rivers): free state of Bavaria
- small watercourses (3rd order): the municipalities
- torrents (special 3rd order water bodies with torrential characteristics): Free state of Bavaria for construction and maintenance of the developed sections; municipalities for the maintenance of the natural sections.

The torrents are defined in a special regulation, which names 13.300 km of torrents within 7.700 km² catchment areas. About 1.500 km of these watercourses are modified with the target of flood control. Due to the topographic situation the torrents are concentrated in the southern, eastern and northern edge of Bavaria within the Alps and the uplands (comp. Figure 12).

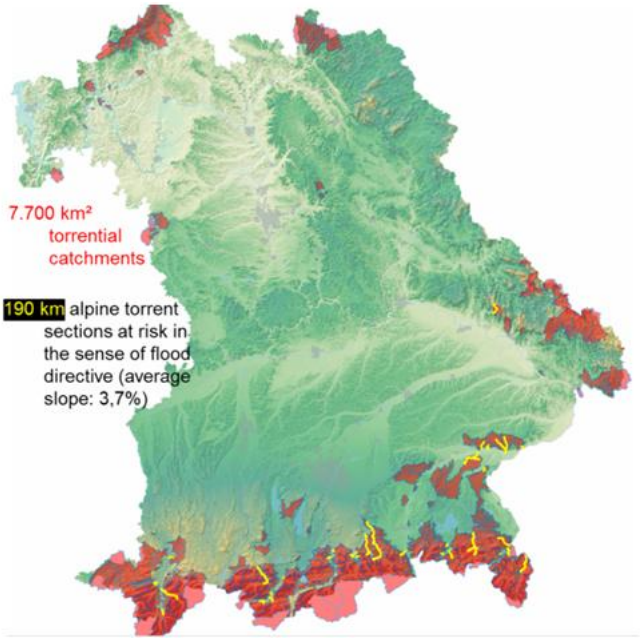


Figure 12: torrential catchments in Bavaria

The Water law demands the identification of torrential hazard zones, but without a deadline. They then have to be legally determined with the consequence that building is forbidden in these zones. Exceptions of this restriction have to fulfil severe criteria. In Bavarian law it is not foreseen to differentiate into zones with total building prohibition and zones where there have to be considered special constraints, like in Austria or Switzerland.

TORRENTS WITHIN THE EU FLOOD DIRECTIVE

PRELIMINARY RISK ASSESSMENT

The preliminary risk assessment was made in the same way for all Bavarian watercourses (comp. Figure 13). First of all the potentially flood prone areas were identified. Therefore, the soil mapping and the mapping of the alluvial fans were used. Within the soil mapping all those soils, which come up in fluvial influenced areas were chosen. Then in these areas along the watercourses the subjects of protection (human health, environment, cultural heritage and economic activity) were identified. In the next step the belonging sections of the water course were cut by projection of the protection zones to the watercourse and defined as “possible risk”.
After that the length of the watercourse at risk was summed up, beginning at the mouth going upwards to the last section “possible risk”. If this length was more than 66% of the total length, the whole section of the watercourse was named as potentially at risk in the sense of flood directive.
The results of this procedure are only 190 km of torrential sections “potentially at risk”, close to the mouth of these torrents into the receiving water courses. In average they only have a slope of 3,7% and therefore are not the typical steep torrents.

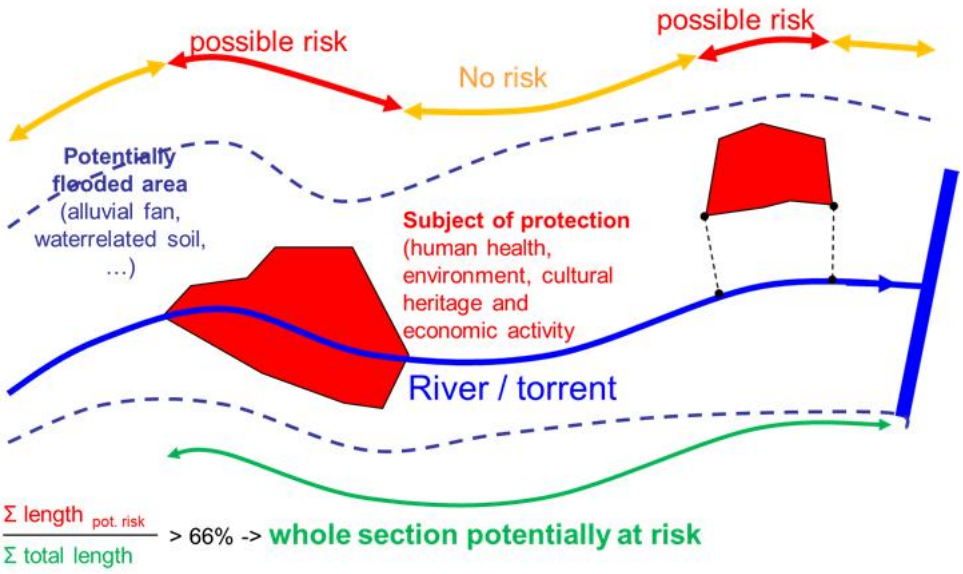


Figure 13: preliminary risk assessment for torrents in Bavaria

PROCEDURE FOR HAZARD MAPPING

In Bavaria, the following scenarios are regarded within the calculations for the flood directive:

- Frequent flood: (5), 10, (20) years return period (whereas those in brackets are just a working basis, but not reported to the EU)

- Medium flood: 100 years return period
- Extreme flood: 1,5 * medium flood

For hazard mapping the Bavarian climate factor (15% surcharge to 100 years flood for new protection structures) is not considered, as the hazard maps have to be actualized, when new knowledge is available.
Due to time restrictions and necessary simplifications the few torrents were mainly handled in the same way as the large watercourses. Only in single cases, special torrential rainfall-runoff models were used to assess the discharge. The hydraulic calculation (2-dimensional) did not concern blockage scenarios. Debris flows do not occur in the treated torrent sections and bedload was regarded in form of an "all-inclusive" addition to the clearwater discharge.

PROCEDURE FOR RISK MANAGEMENT PLANS

It is foreseen, that the risk management plans will be worked out in a combination of a top down and bottom up approach (comp. Figure 14). For whole Bavaria there will be three flood risk management plans, one for the Main, one for the Danube river basin and one for the Lake Constance. Torrent specific topics can be regarded at a local level, due to necessary summary and aggregation they won´t be mentioned in the general management plans.

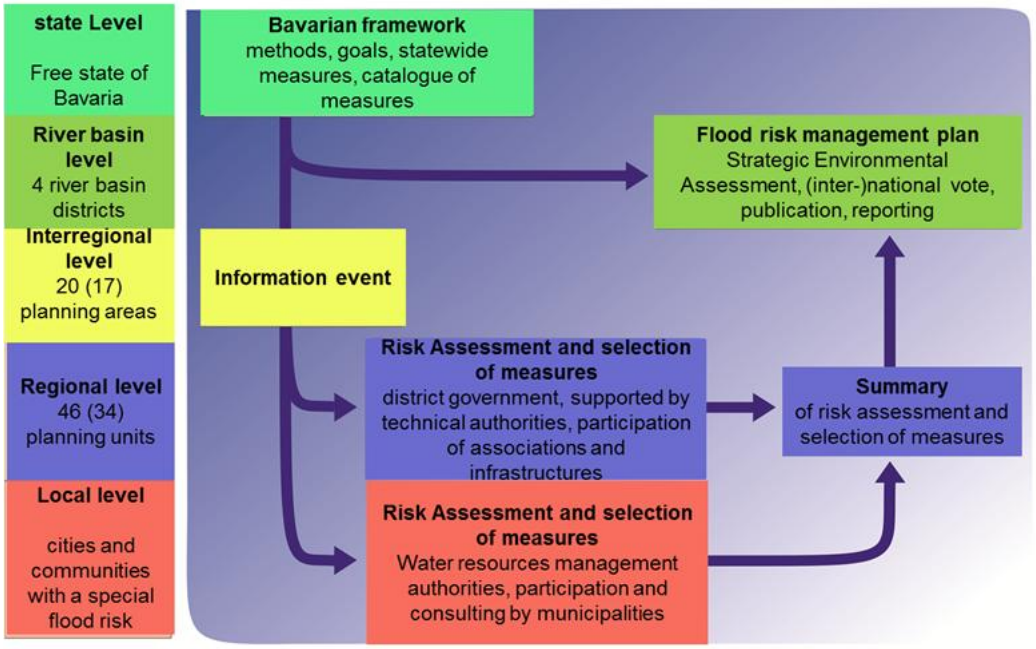


Figure 14: procedure for elaboration of risk management plans in Bavaria

THE FUTURE OF TORRENTIAL HAZARD MAPPING

Since that time the need for torrential hazard mapping was introduced by law the priority was to fulfil the EU flood directive. But for the future also the other torrents have to be assessed step by step.
Due to the strong consequences of the torrential hazard zones there is a high demand on exact data, modern and proved calculation procedure and comparability of the results. For the extensive mapping within the Bavarian torrents a standardized procedure is planned. It should fulfil the demands, balance the effort with the quality of results and also build on the experience of the flood directive and of our alpine neighbors. Therefore a technical concept will be worked out, which is

based for example on the results of the working group OptiMeth of the research organization Interpraevent (comp. Rimböck et al 2013).
Target is, to just give torrent specific amendments to the already existing procedure in the large watercourses, to have as much accordance as possible and as much differentiation as necessary.

FURTHER ASPECTS OF TORRENTIAL FLOOD RISK MANAGEMENT IN BAVARIA

Keeping up the existing protection level, based on more than 50.000 existing structures, will be a great challenge for the future. It has to be considered, that many of the existing structures are up to 100 years old and theses challenges come together with major changes of the boundary conditions for torrent control. So our existing protection systems aroused over long time, in which the general framework changed significantly. Therefore in many cases the parts of our systems do not fit together in the best manner.
To handle these protection systems and to optimize them step by step, we want to work out integrated torrential development concepts (comp. Rimböck et al 2012). They should fulfil the following targets:

- gain flexible and adaptable concepts to face past and future changes in boundary conditions
- optimize the existing protection systems in terms of maintenance effort, financial and personal efforts, residual risk, sustainability and so on
- long term consideration

Our vision is to reach the optimum situation step by step and being able to adjust the concept to new developments. The hazard analysis will be essential basis for this work and all the procedure, both for hazard mapping and for elaboration of the development concepts. All the technical basis and description will be written down in a “loose-leave-collection torrents”, where single chapters easily can be adopted and updated.

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FLOOD RISK MANAGEMENT IN SWITZERLAND

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Swiss Federal Office for the Environment

Reference: N144-1678

Switzerland has a long history and experience in dealing with natural hazards. However, only in 1987 in the aftermath of major floods, it became clear that structural measures alone are not sufficient to guarantee protection. Since then spatial planning (master planning and land-use planning) has obtained far greater priority in the context of sustainable and hazard-conscious land use. The idea that sufficient space must be given to watercourses also became accepted.
Recent events also showed that damage could be significantly reduced with the help of modern protection concepts: robustly designed protection structures that are conceived to cope with excess loads are the key factors for successful prevention. Moreover, the damage caused by floods can be reduced by around one fifth if the authorities issue timely warnings and alerts and people takes suitable measures to protect their lives and property as part of their own individual responsibility.
Switzerland's approach on integrated flood management is based on three basic steps and two continuous processes:

- Evaluation of the hazards
- Steering the risks through management measures
- Recording events in order to learn from the past
- Continuous monitoring of the risks on both hazard and vulnerability aspect

An integrated and holistic risk management assumes that all types of measures for natural disaster reduction are considered. Generally, measures of preparedness, response and recovery (reconstruction) are equally applied. Planning flood protection works needs to integrate both ecological and security aspects. All measures must complain with sustainability and must provide a good cost-benefit relation.
Integrated flood risk management deals, on one side, with the natural hazard processes and, on the other side, with damages and risks. Sound scientific knowledge in hydrology and hydraulic are fundamental to evaluate correctly flood hazards. Access to information of land use planning and to insurance data is also necessary for the evaluation of vulnerability and resilience. Only with sufficient appropriate data, flood risk management will achieve an optimal use of all chances to influence hazards and risks
As Switzerland is a federal state, the institutional implementation of flood risk management is based on the delegation of competence at different levels. Subsidiarity play an important role as a principle of delegation: the federal state defines the strategy and the legislative framework, the cantons and the municipalities implement the strategy through land use planning, as well as maintenance and construction of flood protection works. The federal state support hazard mapping and flood protection measures through financial subsidies.
Property owners and insurances play an important role, as they have to bear residual risks through flood proofing or compensation.

In 2011 the Federal Office for the Environment has defined 6 priorities for action in a strategy paper on "living with natural hazards":

1. Comprehensive knowledge of hazards and risks
2. Increased awareness of natural hazards
3. Holistic planning of measures
4. Protective structures designed to accommodate excess loads
5. Emergency preparedness
6. Timely identification of hazard events
7.

Three of these 6 priorities for action will be illustrated with the example of the most important actual flood protection project in Switzerland, the third correction of the Rhone River. On its 180 km length from the Rhone glacier to the lake of Geneva, the flood protection works of the Rhone cannot give a protection against the 100-year flood. Like many other flood protection works in Switzerland, peak flow values of the Rhone River have been revised in the last 20 years to take into account higher potential damages, recent extreme flood events and statistic uncertainties. Hydraulic capacities that were designed at the beginning of the 20th century are not sufficient to ensure contemporary safety standards.

1ST PRIORITY FOR ACTION: COMPREHENSIVE KNOWLEDGE OF HAZARDS AND RISKS

Central to the integrated flood risk management cycle are hazard and risk assessments. A society can only deal sensibly with natural hazards if it has an in-depth knowledge of the hazards, assesses them objectively, takes preventive measures and reacts quickly and correctly in the case of an emergency. Therefore, hazard fundamentals (incl. event analysis to support economic viability for resilience building) are of primary importance for effective and efficient flood risk management.

Hazard assessment is relevant to determine the magnitude and frequency of environmental processes in affected areas, taking into account already existing protective structures. The result of the hazard assessment is represented in a hazard map. The results of assessments and simulations are compared with the records of previous natural hazard triggered disasters.

Whether due to dam break or hydraulic capacity topping, 12'000 hectares of the cantons of Valais and Vaud are endangered by inundation from the Rhone River. These surfaces are mainly agricultural areas (60%), as agriculture is the dominant land in the plain valley. Inhabited areas, where the potential damages are much higher, represent nevertheless 30% of the potentially inundated area. Total potential damages are estimated up to 10 billion Swiss francs (8 billion €). Hazard maps, based on detailed 2D hydraulic modelling, show that dam break scenarios lead to very high intensity in terms of flow velocity or inundation depth on more than 40% of the surfaces at risk.

The hazard map of the Rhone River in the section of Visp (Figure 15) shows high intensity of both dynamic and static flooding (red zone with more than 2m water depth). The endangered area includes an industrial site with chemical plants. The necessity for action is widely accepted. A priority measure for flood protection has been decided at the regional level and is under construction.

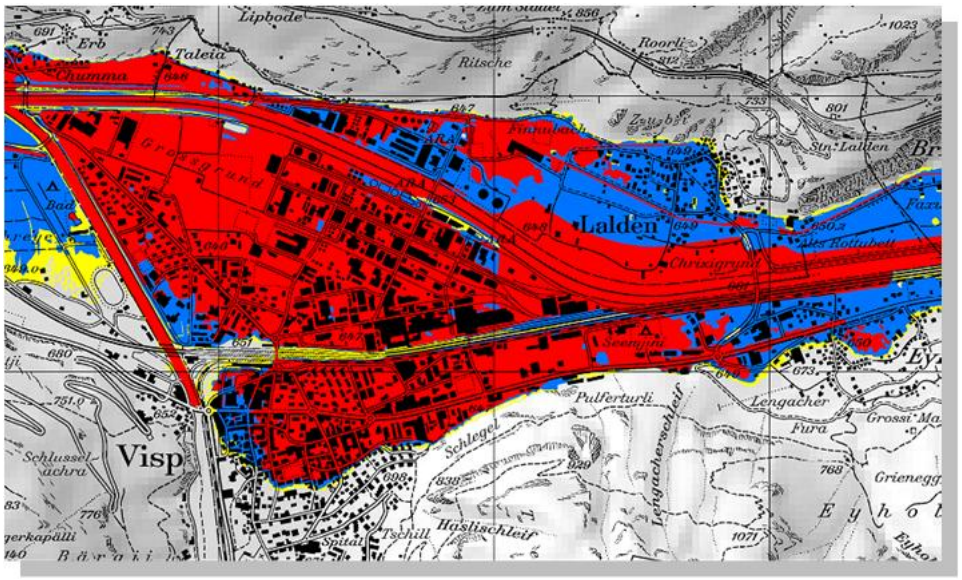

Figure 15: Flood map of the Rhone River in Visp

3RD PRIORITY FOR ACTION: HOLISTIC PLANNING OF MEASURES

Switzerland has developed an integrated and holistic flood risk management approach in order to achieve a level of safety that is ecologically acceptable, economically viable and socially acceptable. The principle of flood risk management is the optimal combination of structural, biological, land-use planning and preparedness measures along with insurance protection. Whereas comprehensive hazard fundamentals are central to the approach and preparedness, response and recovery are the main complementary parts.

In the phase before an incident, measures of prevention and mitigation and measures to cope with an incident (preparedness) are taken. Prevention pays out. Investment in flood risk reduction protects lives and livelihoods, public assets and private property. It pays off on a major scale through minimizing the vulnerability of people and material assets to natural hazards. On the one hand damage is primarily avoided by an appropriate land-use planning based on hazard and risk mapping. Where it is not possible to avoid hazards structurally, technical measures (dikes, dams, etc.) or biological measures (silvicultural and eco-engineering measures) have to be taken, which are supposed to minimize the intensity of the hazard. On the other hand damage is avoided by managing and coping with the disaster. Preparedness measures are provisions for emergency situations that can occur and must be managed. Examples of such organizational measures are the implementation of warning systems, emergency intervention and rescue planning, training and public simulation exercises or insurance purchasing for house owners etc.

Because of insufficient hydraulic capacity and high risk of dyke failure, the profile of the Rhone River must be entirely new designed. The main constraint is not to enhance the dyke height and therefore the water level during flood event.

The riverbanks should be large, not steep, so that protective works against side erosion are simple, robust and adaptive. A riparian vegetation can grow on these banks and contribute to the bank stability and to the biodiversity. All in all the Rhone River bed should be widen for 60%, which implies an augmentation of the river corridor of 870 hectares for an actual surface of 1380 ha.

The redesign of the river through systematic dam elevation was dismissed. A hydraulic analysis has shown that dam elevation was not a robust solution because the water level would rise higher during extreme event and so increase residual risk due to dam break. The flood plain would face the same hazard than today but on a much higher level and lower probability. Moreover raising the dams has

negative consequences for the groundwater level and makes the drainage of the floodplain almost impossible. Finally this solution is not sustainable as it offers very limited possibilities for later adaptations.

4TH PRIORITY FOR ACTION: PROTECTIVE STRUCTURES DESIGNED TO ACCOMMODATE EXCESS LOADS

A lesson learnt from previous flood events in the Alps is the possibility of events of much higher magnitude than the design value used for protection work. As we cannot afford to design our works for all possible magnitude or process, we try to take into account an overload case in the design of our protection systems. The first goal is to avoid uncontrolled collapse of the protective works and the second is to handle the overload with non-structural measure.
The Rhone River project is designed to deal with extreme events well above the design value of the dyke. Through a combination of flood routing and flood diversion measures extreme floods are conducted in flood corridors. Although damages are expected to occur during extreme floods, they can be reduced if only one side of the valley is flooded.

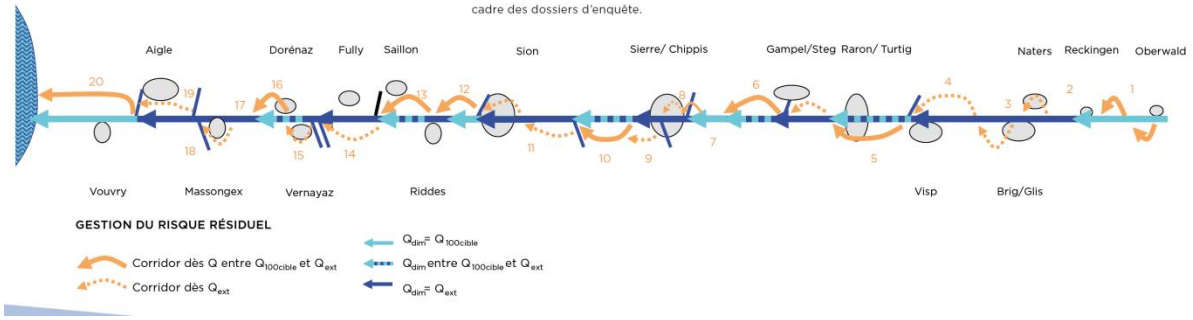

Figure 16: Combination of routing and diversion measures along the 180km of the Rhone River

This principle has been implemented on the section of the Rhone River in Visp, where potential damages of the right side of the valley have the value of a quarter of those of the left side.

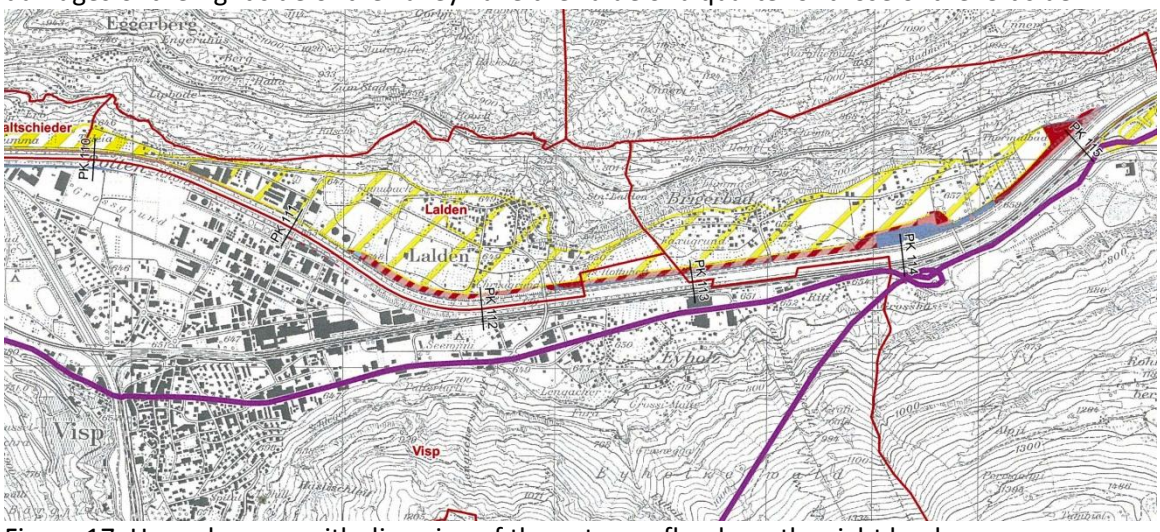

Figure 17: Hazards maps with diversion of the extreme floods on the right bank.

6TH PRIORITY FOR ACTION: TIMELY IDENTIFICATION OF HAZARD EVENTS

Damages can only be limited if timely action can be taken at local level. This necessitates the perfect functioning of forecasting and warning chains and the interpretation of the available information at the end of this chain through on-site observations in the local context.

The retention volume in the Rhone basin is not sufficient to laminate rare events. A detailed hydrologic study has demonstrated that artificial lakes in the lateral valleys and natural retention areas in the floodplain could not laminate the volume of a panel of synthetic hydrograms based on stochastic meteorological scenarios. However the study has shown that the retention volume in artificial lakes and in the floodplain could laminate the peak flow during an extreme event and so contribute to reduce residual risks.

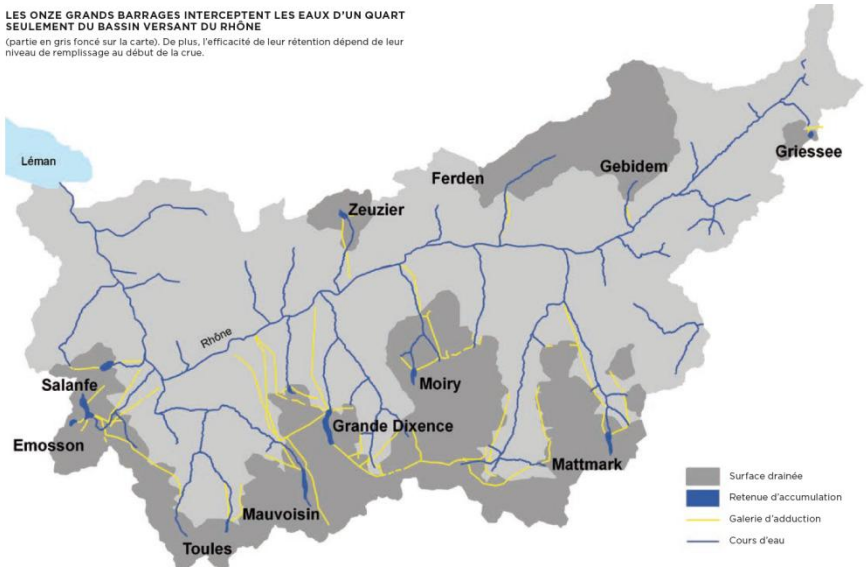

Figure 18: Retention in artificial reservoirs in the Rhone valley

CONCLUSION

An efficient flood risk management can only be achieved if all possible measures are effectively taken thanks to a clear division of tasks between public authorities. Responsibilities must be clarified between the different state level themselves and the private sector (insurance companies and property owner). In addition good cooperation is crucial to the fulfilment of the stated objectives.
The successful implementation of integrative risk management coordinates the action priorities: protective structures alone cannot guarantee safety. An optimal combination of response, recovery and preparedness measures must be sought under financial, social and ecological constraints.

PUBLIC PARTICIPATION IN FLOOD RISK MANAGEMENT- EXAMPLES FROM PROJECTS IN AUSTRIA AND CROATIA

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INTRODUCTION

In the following chapters a few selected participatory approaches for risk management and risk communication will be presented.
All these examples were done within three different projects, embedded in scientific concepts and accompanied by additional information and participation measures. For this paper the more innovative elements that were implemented and tested in these three projects are presented. The projects and the corresponding examples are:

Project	Example	Country
ERA-Net CRUE-IMRA	Workshop comprehensibility of information material	Austria
ERA-Net CRUE-IMRA	Approach of social milieus	Austria
DANUBE FLOODRISK	Participatory flood risk mapping	Austria
Risk Map Twinning CROATIA	Participatory flood risk mapping (Sketch &Match)	Croatia

Table 1: Examples for participation within flood risk management.

EXAMPLES FOR PUBLIC PARTICIPATION

The first two examples are activities from the ERA-Net CRUE project IMRA (Integrative flood risk governance approach for improvement of risk awareness). Goal of the project was to influence and change risk perception and to support decision-making regarding flood risk. The project aimed at an optimization of the flood risk management process by increasing procedural efficiency with an explicit involvement strategy.
To reach this goal the project partners were testing – additionally to rather common methods (e. g. stakeholder analysis tool, stakeholder workshops, questionnaires on risk perception) –two new approaches for dealing with risk perception and risk communication. One of them was the approach of social milieus for risk communication.

EXAMPLE 1: SOCIAL MILIEUS AS A TOOL FOR PLANNING RISK COMMUNICATION

The IMRA risk governance concept was based on an extensive theoretical background on participation, risk communication and stakeholder analysis, using the concept of social milieus for the definition of the target groups, as well as on monitoring indicators and measuring values. Risk perception is affected by attitudes and values – values filter information and color perceptions. To plan a risk communication strategy it is necessary

- to find out what the status of knowledge and risk perception of the local population is,
- to find out which values and attitudes of the target groups can affect their risk perception.

Attitudes, values and other socio-cultural features can be assigned to social groups, to "milieus". Research about social milieus is traditionally performed by market research and psychology. It was not foreseen or possible within the CRUE-IMRA project to perform a detailed socio-cultural analysis of the target groups in the regions of the subprojects. But an overview of the target groups on the national level does exist, including their attitude and values and the kind of information material which might reach them. This can give valuable input to a risk communication strategy.

To have a basis for this discussion the project team decided to use the Sinus Milieus®, developed by the market research companies INTEGRAL (Austria) and SINUS Sociovision (Germany). These Sinus Milieus® give an overview of social groups on the national level. The Sinus Milieus® combine demographic characteristics such as education, profession and income with the real living environments of the people, which means with fundamental value orientations and attitudes towards working and leisure time, family and relationship, consumption and politics. (INTEGRAL, 2009)

The social milieus are not just a theoretic exercise but were used to design tailor-made communication strategies in the case study areas of the project. Social milieus can act as a means to discuss how to reach local target groups. In the Austrian case study in the valley of the River Möll in Carinthia, the project team used statistical data about formal education, age, income, employment rate, sectors of employment as well as the results of the last elections of the municipality of Großkirchheim. Großkirchheim has a population of 1,621. Most of the people are between 14 and 54 years old. Nearly 80 % of the people have a compulsory education (Grundschulabschluss) or a graduation from apprenticeship training; only 7 % have a high formal education. 720 persons do have a job, 600 of them working full time, about 50 are unemployed. Tourism (45,000 overnight stays per year) as well as agriculture and forestry are main economic factors for employment. Most voters (over 70 %) voted for the BZÖ (a right wing party) at the last elections for the municipal council. According to this demographic information it was assumed that most parts of the population belong to the social milieus of rural-traditionalists, the working class and the middle class.

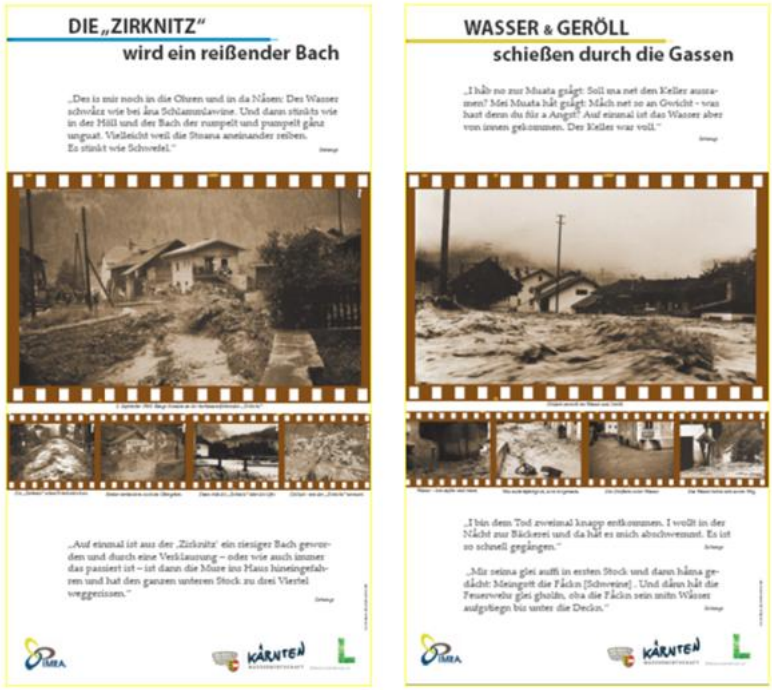

Figure 19: Two examples of the exhibition panels

Basic principles therefore were that all communication activities need to have a strong local focus, have to be written in an easy comprehensible text; people from the region are to be included in activities, such as witnesses of local flood events.
As an example: an exhibition concerning flood risk had only one panel with scientific-technical information, other exhibition panels were designed with emotionalising pictures and text from flood witnesses in the regional dialect. (Stickler et al, 2011).

EXAMPLE 2: WORKSHOP "COMPREHENSIBILITY OF INFORMATION MATERIAL"

This workshop was also an activity within the ERA-Net CRUE project IMRA (Integrative flood risk governance approach for improvement of risk awareness).
Information is the basis for all participatory activities – but do the people we want to reach with information activities understand the content? To test and improve the comprehensibility of already existing information material on flood risk, a workshop with local stakeholders and lay people from the municipality Großkirchheim was performed.

In the workshop existing flood hazard maps, a folder explaining how to use these maps as well as information material about flood risk projects in the region (orthofotos as well as graphical maps showing the water depths, inundation areas, probability of floods etc.) were tested.

Figure 20: Impressions from the workshop on comprehensibility of information material.

During the discussions input for improvement was collected and used for an update of the requirements for map design as issued by the Departement for Water Management of the Provincial Government of Carinthia. Also a tailor-made folder on flood risk of Großkirchheim was elaborated (Stickler et al 2011, Firus et al, 2011).

EXAMPLE 3: WORKSHOP SERIES "PARTICIPATORY FLOOD RISK MAPPING"

In the ETC SEE project "DANUBE FLOODRISK – Stakeholder Oriented Assessment of the Danube Floodplains" (2009-2012), hazard and risk maps harmonized across borders for the Danube main stream were produced. The Austrian pilot area was the city of Krems, upstream of Vienna and located in the province of Lower Austria. Krems has long-standing experience with floods and covers all four receptors mentioned in the EU Floods Directive: human health, economic activity, environment, and cultural heritage. Additionally, it is located in an Area of Potentially Significant Flood Risk (APSFR).

Two scenarios were investigated:

- A medium probability flood event on the Danube (Q100) with the harbour gate failing to close before peak discharge, resulting in possible risks to human health, environment, and economy;
- A medium probability flood event on the Danube (Q100) with a failing mobile defence wall before and at peak discharge, with and without upright second defence wall, resulting in possible risks to human health, environment, economy, and cultural heritage in the area of Krems-Stein.

The most innovative step regarding participation was not the methods used for participation but the involvement of concerned lay persons not only in the design of the hazard and risk maps or the risk assessments itself but in the cooperative elaboration of the risk assessment approach especially for the harbour area. This happened not as an education process of uninformed lay persons by experts but as an iterative learning process on eye-level. With the companies being very different in character, the assets at risk were very different as well, and assessment with respect to only one criterion alone (e.g. land use, hazardous substances) would not give a level picture. Assessment of insurance values or of monetary values was too time-consuming and issues like data protection would limit such approaches. It needed five workshops to agree on a common understanding of risk and risk assessment used for the final risk map of this area that was seen as useful by all participants (Fuchs et al, 2013; Stickler et al, 2012).

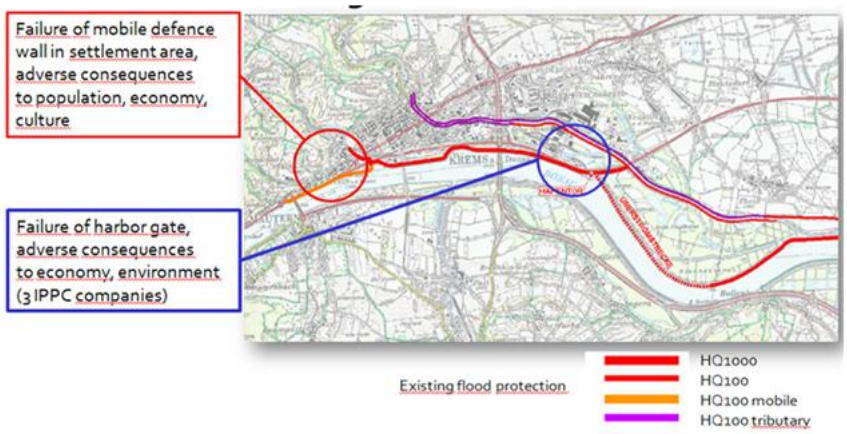

Figure 21: Flood protection structures in Krems and failure scenarios investigated

EXAMPLE 4:"PARTICIPATORY FLOOD RISK MAPPING WITH SKETCH & MATCH"

In Article 10 of the Flood Directive it is said that member states shall encourage the active involvement of interested parties in the production, review and updating the flood risk management plans. The flood risk management plans in Croatia, like in other states, are still in progress, but the flood hazard maps and flood risk maps, which are are important instruments for making the management plans are being developed.
To gain experience with active stakeholder participation during the Twinning Project "Development of Flood Hazard Maps and Flood Risk Maps", a workshop with several stakeholders was organised in one of the pilot areas, the city of Karlovac.

Objectives of the workshop were:

- to inform the stakeholders
- to build up a better understanding between Croatian Waters and stakeholders
- to get feedback and input for flood risk maps

Figure 22: Sketch & Match exercise with flood risk map

Sketch & Match is an instrument, developed by DLG Netherlands, for interactive planning with stakeholders. Instead of long meetings with a lot of papers, a Sketch & Match session is based on the idea that images say more than a thousand words. Under the lead of a landscape architect and moderator, the participants gathered around the map and this was the beginning of an interactive process. Because this was an exercise, this time it only took 45 minutes. In real situations, a Sketch & Match will take at least a half day, depending on the complexity of the problems.
The method is different to the stakeholder discussions on risk mapping presented in example 3, were input was collected on flipcharts or various designs of risk maps printed out and the comments on this designs collected on paper. In Sketch & Match the moderator draws directly on a map covered with transparent tracing paper and includes continuously the comments and discussions of participants by drawing on the map. (Stickler et al, 2013)

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FLOOD RISK MANAGEMENT PLANS AND CONTIGENCY PLANNING: CHALLENGES AND CHANCES FROM A DISASTER PREVENTION PERSPECTIVE

Eva Mayer

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The German federal system is mainly based on the principles of devolution and subsidiarity. Because of that the German federal states (Länder) have a wide range of legislative (and executive) competences. Also the legislative power for disaster management is assigned to them. The legal foundation of the disaster management in Bavaria is the Bavarian Act on Disaster Control of 24 July 1996.

The administrative organization of Bavaria has below the state government a three-tier structure. At the bottom we have 2,056 municipalities, 96 county authorities and above seven administrative regions (also called districts). Apart from the municipalities, the general administrative structure is largely consistent with the one of the disaster control authorities. The supreme disaster control authority is the Bavarian Ministry of the Interior, for Building and Transport, at medium level we have the administrative regions and the county authorities as the disaster control authorities low-level.

The Bavarian disaster management system is efficient and resilient because of its structure and the (human) resources for disaster response. There are approximately 470,000 (disaster) relief forces, thereof are about 450,000 volunteers. The main pillars of the Bavarian disaster management system are the disaster control authorities themselves and the forces, their education and training for the case of emergency and especially an efficient contingency planning. As effective disaster management requires planning the “unpredictable“.

The base of every disaster control planning is the analysis of hazards and risks. In Bavaria, we follow the bottom-up principle. So the county authorities (as disaster control authorities low-level) are first and last self-responsible for risk assessment, the disaster control planning and the overcoming of severe damages and disasters in their administrative area. An efficient disaster control planning enables the timely, consistent and coordinated response to possible disasters.

We differentiate between the general disaster control plans and the special disaster control plans. The general disaster control plans include the recording of all material and human resources for coping with possible disasters. In contrast, the special disaster control plans refer to certain areas or institutions which are subject to specific risks or from which specific hazards emanate (e. g. traffic, thunderstorms or nuclear power plants)and include the special and proper instructions to follow in the case of emergency (alarm and deployment commands).

In the context of the general disaster control plans and in preparation for certain disasters, for example flooding, the Bavarian Ministry of the Interior, for Building and Transport has established special kinds of fire brigade task forces for the transregional, nationwide and cross-border disaster relief. These special task forces have a certain scope of application, e. g. flood- sandbags or flood-pumps and comprehend usually about 110 persons together with the technical equipment. In terms of numbers, for floods we have 31 special task forces flood-pumping and 32 special task forces flood-sandbag throughout Bavaria.

Because of the experiences of former severe floods the Bavarian Ministry of the Interior, for Building and Transport financed together with the Bavarian Ministry of the Environment and Consumer Protection a strategic reserve of sandbags. This reserve contains eleven centres of distribution

throughout Bavaria with about 2,100,000 sandbags. These centres are built up and provided by the water resources authorities. But in the case of emergency the requests of sandbags and their distribution are operated centrally by the Ministry of the Interior, for Building and Transport as supreme disaster control authority.
Especially the flood of June 2013 showed the success of the special contingents and the strategic reserve of sandbags.
In the framework of the implementation of the Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (EU-Floods-Directive) and in order to be consistent throughout Bavaria a guideline for the creation of flood risk management plans was designed. This guideline includes general information of the subject and also a uniform catalogue of measures, of which single measures can be chosen to get implemented.

Two measures of this catalogue concern the field of disaster management and the municipalities as local security authorities:

a) Creation and update of **local alarm and action plans** (municipalities)

This measure should complement and enhance the preparedness of floods in Bavaria. If the municipalities (as local security authorities) want to implement this measure, they should proceed as listed below:

- Analysis of the flood hazard and risks and identification of the geographical areas and the objects or infrastructures which are likely to be affected by floods inside the area of the municipality

In this stage the flood hazard maps and the flood risk maps, which had to be built up till 2013 in the context of the EU-Floods-Directive and persons with local knowledge are very helpful for the risk assessments.

- Risk assessment and scenarios, planning assumptions
- Identification and definition of measures to ensure rapid response and resources mobilization
- Specification of the defined measures and translation of them into alarm and deployment commands

The summary of these alarm and deployment commands forms the local alarm and action plan.

b) Creation and update of **special disaster control plans flood** (lower disaster control authorities = county level)

The special disaster control plan flood contains all local alarm and action plans in the administrative area of the respective county authority as disaster control authority. The aim of this plan is to manage and coordinate the local alarm and action plans in order to ensure a rapid, consistent and coordinated response to the threat of floods. In this manner we integrate the municipalities into the disaster management system, ensure its consistency and enhance the disaster response capability.

Poster session abstracts

List of posters

Anticipatory flood risk management - Development of adaptation strategies under changing flood risk

Apperl Benjamin, Herrnegger Matthew*, Löschner Lukas***, Nachtnebel Hans-Peter*, Neuhold Clemens**, Nordbeck Ralf**, Scherhaufer Patrick**, Seher Walter***, Senoner Tobias*, Hogl Karl***

* University of Natural Resources and Life Sciences, Vienna; Institute of Water Management, Hydrology and Hydraulic Engineering

** University of Natural Resources and Life Sciences, Vienna; Institute of Forest, Environmental an Natural Resource Policy

*** University of Natural Resources and Life Sciences, Vienna; Institute of Spatial Planning and Rural Development

C3-Alps: creating a knowledge hub for climate change adaptation in the Alps

Marco Pregnolato, Boglarka FenyvesiKiss*, Wolfgang Lexer**, Hermann Klug***, Lydia Pedoth*, Stefan Schneiderbauer**

**EURAC (European Academy Bolzano/Bozen) – Institute for Applied Remote Sensing;*

***UBA-A (Umweltbundesamt GmbH, Abteilung Umweltfolgenabschätzung & Klimawandel)*

**** PLUS/Z-GIS (Z_GIS Zentrum für Geoinformatik, Paris-Lodron-Universität Salzburg)*

Improving flood prevention through the development of a standardized approach for small dams risk assessment and management

Mavrova-Guirguinova Maria

University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria

Program Graz Streams - Flood Management in urban areas I and II

Styrian Federal Government, Department 14 Watermanagement, Resources and Sustainability & City of Graz Department A10/5

Rainfall Surface Runoff Maps – Pilot Project Kapfenberg

Josef Terneak Stefan Haider***

**hydrosim*

***BÜRO PIELER ZT GmbH*

Risk Adapt - Flood Risk assessment for Austria under dynamic conditions

Apperl Benjamin, Herrnegger Matthew*, Löschner Lukas***, Neuhold Clemens**, Senoner Tobias*, Nachtnebel Hans-Peter*, Seher Walter****

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Streams of Graz - working progress 03/2014

Bernhard Egger-Schienerl

Received poster summaries

IMPROVING FLOOD PREVENTION THROUGH THE DEVELOPMENT OF A STANDARDIZED APPROACH FOR SMALL DAMS RISK ASSESSMENT AND MANAGEMENT

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Over 2000 small dams for irrigation were constructed in Bulgaria until 1963, most of which of earth-fill design, primarily of clay with low filtration coefficients. Many of those dams were constructed with little preliminary surveying, using equipment available to the then-existent cooperative farms, influencing the quality of construction. Presently, with the return of agricultural land to its private owners, all small dams and reservoirs are treated as public property of the municipality. Since the municipalities lack the resources to maintain and operate the dams many of these facilities are in inoperable or critical condition. When a cooperation for irrigation is formed, the municipality gives the dam and its related facilities as a part of irrigation system over to the cooperation and discontinues the concession agreement.

The project DAMSAFE was implemented in 2011-2013 with the contribution of the Civil Protection Financial Instrument of the European Union. The project was focused on the improvement of flood prevention as both a study of the influence of small dams in flood risk assessment for flood prone populated areas and as an assessment of the possibility of using or reconstructing a small dam into a flood retention basin. All lessons learned and conclusions drawn from the implemented project studies were used to elaborate a manual for small dams' flood risk assessment and management. www.damsafe.eu

DAMSAFE project partners were: Directorate General Fire Safety and Civil Protection, Bulgaria as a Coordinating Beneficiary; Institute of Hydraulic Engineering and Water Resources Management, TU Vienna, Austria; Department of Flood Water Management, Federal Government of Styria, Austria; WALD+CORBE Consulting Engineers, Germany; Irrigation Systems (Ministry of Agriculture and Foods), Bulgaria; University of Architecture, Civil Engineering and Geodesy in Sofia, Bulgaria; National Institute for Meteorology and Hydrology (Bulgarian Academy of Sciences), Bulgaria; Sofia University "St. Kliment Ohridski", Bulgaria.

C3-ALPS: CREATING A KNOWLEDGE HUB FOR CLIMATE CHANGE ADAPTATION IN THE ALPS.

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C3-Alps is an INTERREG project funded by the Alpine Space programme with the main objective of collecting, analyzing and transferring the knowledge produced in the last years about climate change adaptation in the Alps.

This process is deemed fundamental for supporting municipalities and regions to tackle challenges and opportunities of climate change. The project considers sector specific knowledge such as natural hazards, agriculture and biodiversity. As of great relevance for the Alpine region, great attention is paid to the topic spatial planning and flood risk. It addresses also cross-sectorial issues like awareness raising or CCA communication. The projects main output and tool is the C3 Knowledge Inventory Portal (C3-KIP).

In the C3-Alps project (financed by the European Commission's Alpine Space Programme), „capitalizing" is meant to let significant information and knowledge last in time and be easily retrievable on the web. One of the most important function of the tool that the project is developing is to avoid that people get lost in the „flood" of documentation and data retrievable from countless project websites, when in need and searching for information on the web.

Many projects have generated an own website and a correspondent repository for all the material produced. In the years this process has created a great number of websites, often scarcely visible for the general public, hindering the dissemination of potentially very useful knowledge products. Moreover, often this information is lost when the project website is shut down. Aim of C3-Alps is therefore to save the knowledge asset, make it available, make it useful, in one word: enable it.

C3-Alps is in the process of creating a dedicated portal for the existing „pieces of knowledge", coming primarily from transnational cooperation projects in the Alps and all the contexts that have produced information relevant for the Alps. For instance, regarding flood risk management, the projects AdaptAlp, Dis-Alp, CatchRisk and Paramount may be mentioned. After a criteria-driven selection, a pool of experienced researchers and practitioners in the various sectors of adaptation, have collected the knowledge, inserted it into a dedicated repository and described each item through a series of customized attributes.

After having collected the material in the portal, the so-called C3-KIP, the experts involved in the project analyzed the documents and data with the aim to guide the users and support them in the use of the existing information. From the „pieces of knowledge", organized into sectors of interest (e.g. Natural Hazards, Spatial Planning, Water Management etc..) and typologies (e.g. Adaptation policies, Tools, Practice examples), we created Thematic Collections (TCs). These TC's contain a

presentation of the state of the art of the knowledge, synthesis and considerations on CCA in the Alps regarding the sectors in form of a short document (4 pager) and a list of existing reports, studies and tools. In order to offer additional knowledge, we also looked at „Hot Topics“ involving special aspects of CCA such as costs and benefits, communication, awareness raising and created additional TC's.
Our C3-KIP offers sustainability, evolution and user involvement. Through the system of „search and select“ in the portal, it is always and for every user possible create more Hot Topic collections for its needs: „Flood risk management“ is meant to be one of them.
The portal is still under construction and the first public version will be available in October 2014.

RAINFALL SURFACE RUNOFF MAPS – PILOT PROJECT KAPFENBERG

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For the flood risk management plans, all aspects of flood risk should be considered, with the focus on prevention, protection and preparedness (Article 5 of the EU Floods Directive, RL2007/60/EG).
New developments in the field of hydrodynamics and constantly improved data base, make possible that flood risk maps can be created also for rainfall surface runoff.
A pilot project, commissioned by the city of Kapfenberg, was accomplished by the consulting offices Pieler ZT GmbH and hydrosim in collaboration with the city of Kapfenberg and the department urban water management of the styrian government.

The objective was to obtain rainfall surface runoff maps as a basis for urban areas development and to assess a building site suitability. The investigation included the extended urban area of the Kapfenberg from about 40km².

Three different methods were applied and compared each other, to identify an optimum method in terms of effort and result quality.

- GIS Analysis
- 2d Rainfall Surface Runoff (simplified) - FloodArea©
- 2d Rainfall Surface Runoff - Hydro_As-2D©

The main data are the elevation model, land use and soil map and the statistical heavy rainfall amounts.

The resulted maps are:

- flow paths and catchment areas from GIS analysis
- classified water depths from 2D hydraulics

The rainfall surface runoff maps can be used for:

- identification of flood risk areas
- planning of flood mitigation
- urban development (concepts, control systems, risk mitigation)
- constructive design of the buildings
- alarm and emergency plans

The rainfall surface runoff maps are hazard maps for rainfall events with potential damages in extended settlement areas. Small structures such as walls, fence bases, sidewalks and the sewage network affect the results. Therefore the results have to be understood as indications of possible flood risks and have to be more exactly proved.
The maps supplement river flood investigations to a broader representation of flood hazards in the extended settlement areas. The maps deliver a better understanding of the processes and support the planning of protective measures, the development of the urban areas and operational planning for emergencies.

STREAMS OF GRAZ, EFFECTIVE FLOOD PROTECTION FOR THE URBAN AREA (THE FLOOD PROBLEM)

Summary by Rudolf Hornich

Land Steiermark

The City of Graz has an extension of about 13,000 hectares, of which somewhat more than half are building land and roads. Besides a multitude of smaller watercourses, the Graz urban area counts more than 50 streams plus 10 torrents. The streams of Graz have a total length of about 270 km, of which some 125 km are located within the urban area of Graz. This means that only half of their entire catchment area of 140 km^2 lies in the city itself.
Innumerable historic flood disasters have been recorded in the urban area of Graz. The memory of the 1975 flood prompted the first steps towards a flood prevention strategy.
In 1997, after several years work, an assessment of discharge values with indication of catchment areas for the 1-in-30 and 1-in-100-year event (HQ_{30} and HQ_{100}) for all main Graz streams was finally ready. Calculations revealed that there are about 1000 flood-endangered objects in Graz
As built up areas and higher-order land use are moving more and more towards watercourses, the following results can be observed in urban areas in general and along most streams in Graz: along the lower course, flood catchment areas are disappearing while discharge cross sections are falling rather than rising. The room required to safely take up the arriving floodwaters, therefore, is no longer there. Tubing and covers as well as canalisation out of the depth contour compound the situation by utterly separating run off from the stream bed and leaving water masses to flow off uncontrolled through the urban area. The main flood problems concerning floods in Graz are:

- Pressure of settlement
- Infrastructural and locational problems
- Approach of buildings to streaming waters
- Construction/Covering of discharge cross sections
- Drastic decline of water discharge areas
- Hillside- and surfacewater problems

To solve the flood problems in the city of Graz a study carried out in close cooperation between the Graz City Council, the Government of the Province of Styria, the Forest Technical Service for Torrent and Avalanche Control and the Federal Ministry for Agriculture and Forestry, Environment and Water Management yielded a strategic paper called “Graz Streams Program”.

STREAMS OF GRAZ, EFFECTIVE FLOOD PROTECTION FOR THE URBAN AREA (SACHPROGRAMM - INTERDISCIPLINARY COLLABORATION)

Summary by Rudolf Hornich

Land Steiermark

Taking into consideration the requirements posed by the departments for spatial planning, urban development, open space planning, water ecology, water management in urban areas and civil protection, the primary objective was formulated as follows: “To achieve sustainable flood protection of endangered objects in the City of Graz”. In the course of the study, the slope water problem, affecting many quarters in Graz, and problems connected to flooding due to surface water were examined and pointed out.

Seven civil engineering firms were hired to develop a flood control plan. Two further firms were tasked with specific assessments in the fields of water ecology and spatial planning. In August 2006 work was completed. The proposed catalogue of measures is very extensive and includes the following objectives:

- Improving flood Protection
- Enhancing the safety for the population
- Improving the ecological condition
- Improving the quality of life in the city by creating and upgrading nearby recreational areas

Implementation will take place within a 10-year programme period (2006-2015) and according to a priority list taking into account the individual flood risk and possible damage at each site. The total cost of this ten-year programme has been estimated at € 65.0 million on the price basis of August 2006. Funding will be provided by the Federal Government, the Government of the Province of Styria and the City of Graz.

The Programme of measures covers the following activities:

- Conservation and activation of inundation areas

- Construction of 29 flood retention basins (retention capacity approx. 1.0 million m^3),
- Streambed widening/elimination of tubing cases
- Mobile flood protection
- Flood RISK Managementplans/risk analysis
- Alarm and disaster contingency plans
- Individual responsibility/self-protection/private emergency plan
- Flood damage insurance
- Public-Relations and awareness reaising

PLANALP conference

“Breaking fresh grounds in protecting Alpine Environments – Flood Risk Management Plans”

Conference proceedings
Graz, 25 March 2014