REX-INTEGRATED PREVENTION

Return on Experience for Enhanced Integrated Prevention

01 October 2010 – 31 December 2011

Project Outcomes - Return on Experience for Enhanced Integrated Prevention

Implemented by

DKKV
Deutsches Komitee Katastrophenvorsorge e.V.

IMGW

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1 Foreword

Experience with implementing improvements in natural disaster prevention has shown that the level of success is heavily influenced by the magnitude and implications of the adverse effects of the relevant disaster. Such events have often had serious social and economic consequences and led to an enhancement in disaster risk reduction (DRR) activities. In the immediate aftermath of disastrous natural events, investigations are frequently initiated to reveal the factors which allowed the disaster to happen and to highlight possible improvements. Usually, such extraordinary events heighten awareness of the risk factors, not only among those directly affected, but also the decision makers, leading public opinion to call for better protection and more preventative measures. In this way, success in disaster risk reduction is not based solely on theoretically-deduced threshold values or concepts, but is largely shaped by social perceptions, interests and experience.

Effectively improving DRR is far from easy, since a wide range of conditions have to be met in order to develop and implement the adequate and "high quality" lessons learned. These prerequisites include the availability of information and data, legal provisions, clear reporting structures, clear administrative responsibilities, inter-administrative and interdisciplinary approaches, risk-awareness and knowledge of DRR among affected stakeholders and resources. In addition, a general consensus is required in order to avoid conflicts of interest and space which may arise during the planning or implementation processes of structural or non-structural disaster-prevention activities. The task of making appropriate adaptations becomes even more complex when considering the non-static character of the framework conditions (e.g. changes in vulnerability of population, structures, climate, etc.).

2 Introduction and Objectives

The EU-financed project REX-INTEGRATED PREVENTION began on the 1st of October 2010 and concluded its activities at the end of March 2012. This project was implemented by all four members of the European Network of National Platforms (ENNP): project coordinator *Deutsches Komitee Katastrophenvorsorge e.V.*, (German Committee for Disaster Reduction), *Association Française pour la Prévention des Catastrophes Naturelles* (French Association for Disaster Risk Reduction), *Instytut Meteorologii i Gospodarki Wodnej* (Polish Institute of Meteorology and Water Management) and *Český hydrometeorologický ústav* (Czech Hydrometeorological Institute).

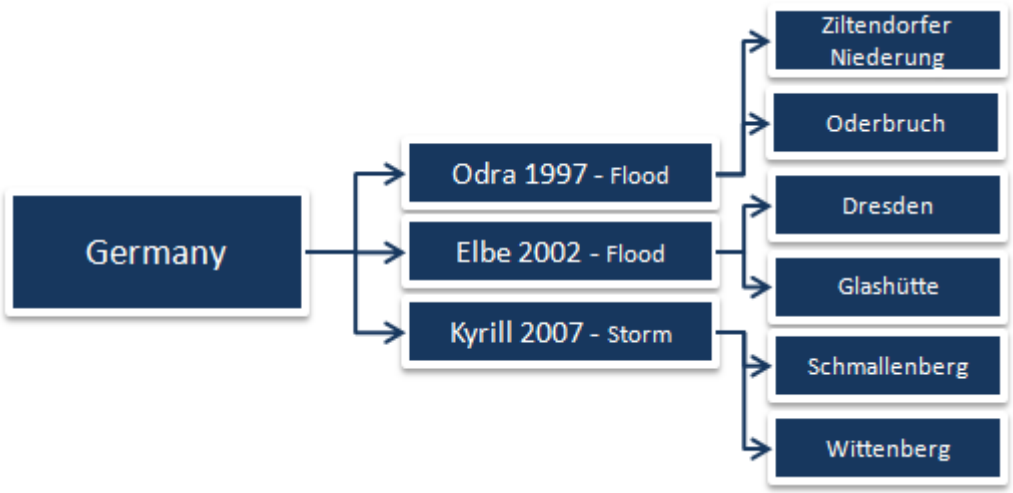
The fundamental task of the project was to evaluate if the original design criteria and qualitative disaster risk reduction measures currently in place are adequate enough to offer appropriate protection with regard to extraordinary events. It estimated the extent to which collated knowledge of previous disasters was implemented after those events and how effective these actions were. In this context the topics of climatic and societal changes were included as part of the investigations.

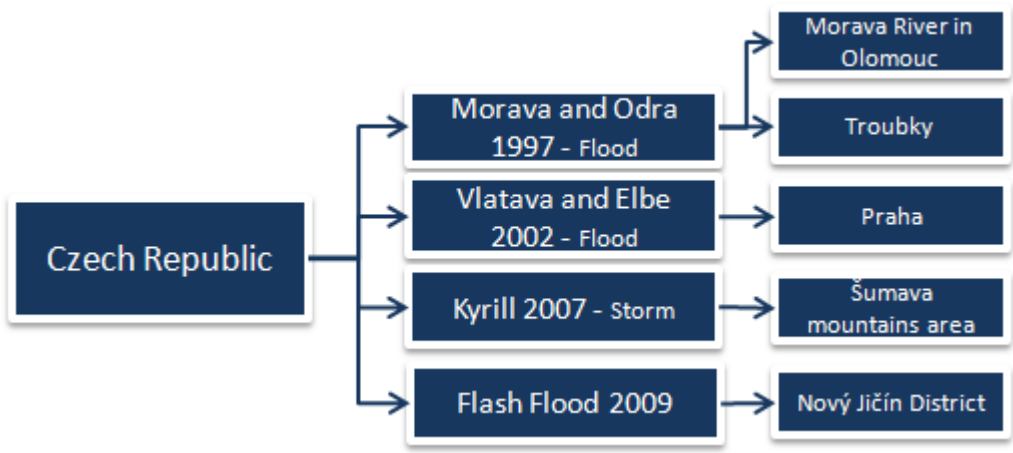
The overall objective of the project was to contribute to the development of knowledge-based disaster-prevention policies.

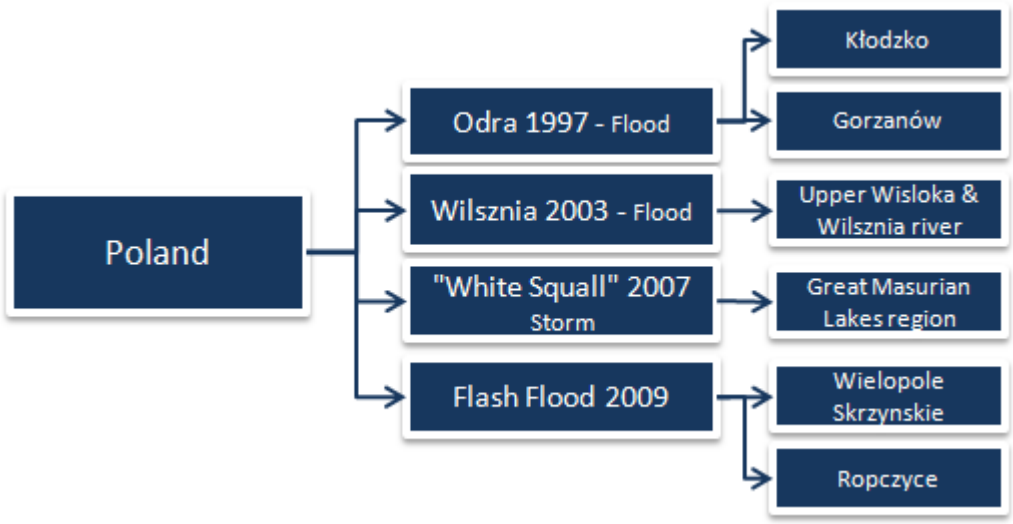
Central to the project were:

- Tackling the critical issue of whether the existing technical frames and qualitative preventative measures are sufficient in dealing with extraordinary natural events.
- An assessment of how effectively, and to what degree, prior knowledge has been implemented, with the aim of improving civil protection.
- An evaluation of the extent to which design criteria and experience drawn from previous events have been adapted and integrated into existing prevention strategies or led to the readjustment of preventative arrangements.
- A consideration of the adaptation of the frameworks and prevention quality in view of societal changes (e.g. urbanization or demographic change), and the projected weather-induced extreme events caused by climate change.

The project was based on the analysis of 15 case studies from Germany, the Czech Republic, Poland and France, and within this framework an analysis of 28 so-called ‘hotspots’ took place. The hotspots in this context were small spatial areas (in most cases towns and villages), which had been severely affected by a disastrous natural event. The French case studies extended the concept of hotspots to include supply networks, forestry, urbanism, alert and emergency planning.


Germany
Odra 1997 - Flood
Elbe 2002 - Flood
Kyrill 2007 - Storm
Ziltendorfer Niederung
Oderbruch
Dresden
Glashütte
Schmallenberg
Wittenberg


Czech Republic
Morava and Odra 1997 - Flood
Vlatava and Elbe 2002 - Flood
Kyrill 2007 - Storm
Flash Flood 2009
Morava River in Olomouc
Troubky
Praha
Šumava mountains area
Nový Jičín District


Poland
Odra 1997 - Flood
Wilsznia 2003 - Flood
"White Squall" 2007 Storm
Flash Flood 2009
Kłodzko
Gorzanów
Upper Wisloka & Wilsznia river
Great Masurian Lakes region
Wielopole Skrzynskie
Ropczyce

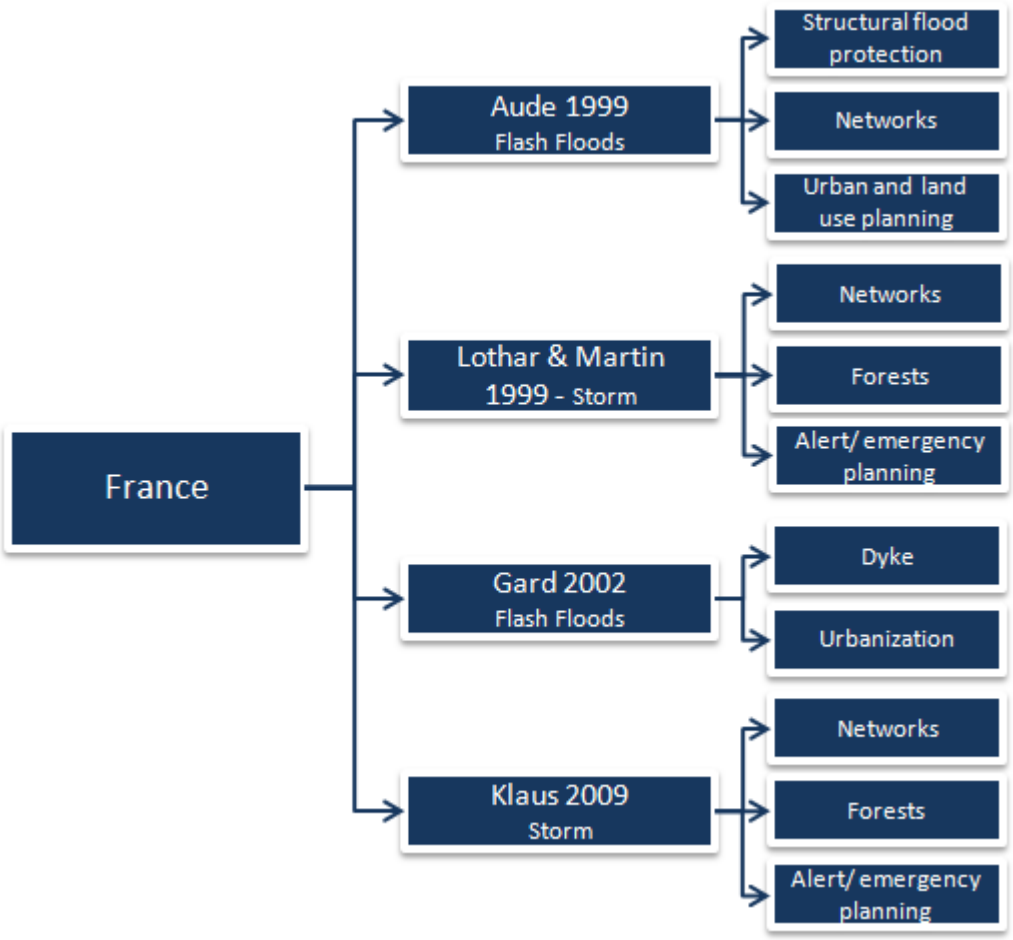


Figure 1: Overview – Case Studies and Hotspots. Information was collected based on the questionnaires for the above listed case studies (second column) and hotspots (third column)

The milestones of the project were: A) the development of a project questionnaire to gather required information, B) the collection of data and information, C) the synthesis of the data, D) the review of the synthesized information, E) the workshop and F) the final report.

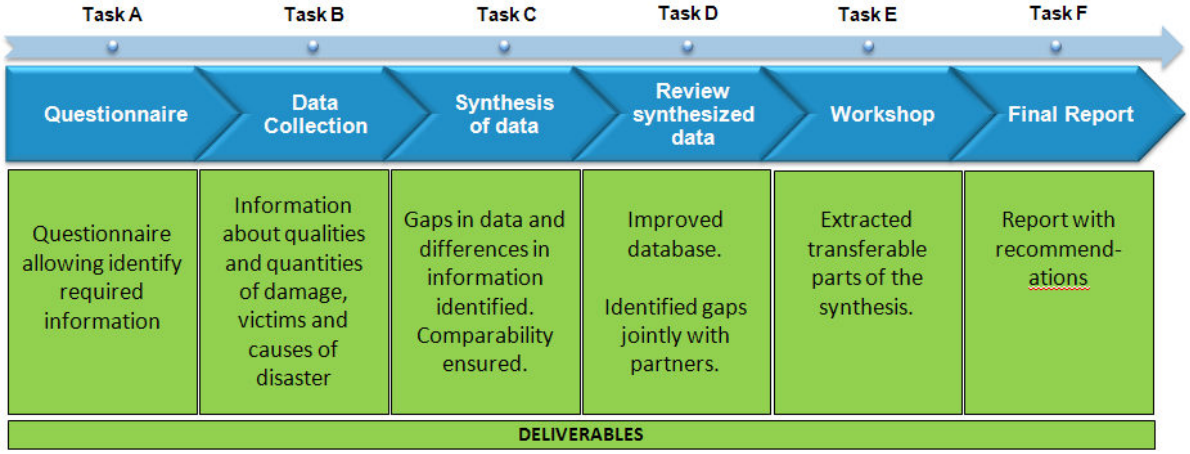


Figure 2: REX-INTEGRATED PREVENTION tasks

The data and information collected from the jointly-developed questionnaire were based on the evolution and magnitude of each event, annuities, causalities, damages/losses, information about capacities, functions and properties of civil protection and response, forecast and warning capabilities and structures of the disaster management. This information was then inserted into a REX-INTEGRATED PREVENTION database.

In order to be able to improve on DRR, it must first be known what needs to be improved. Consequently, during the organisational period the underlying reasons for failure and drawbacks needed to be detected and synthesised. These were defined as issues, which may be understood as actions contributing to a worsening of the overall evolution of a disaster.

A crucial task was therefore to collect and synthesise the information with regard to the reasons for the failures of protective infrastructures (e.g. dikes) and disaster prevention. Based on the REX-INTEGRATED PREVENTION composition, 5 main areas for these reasons were derived. As can be seen in the diagram below, each category is almost equally represented.

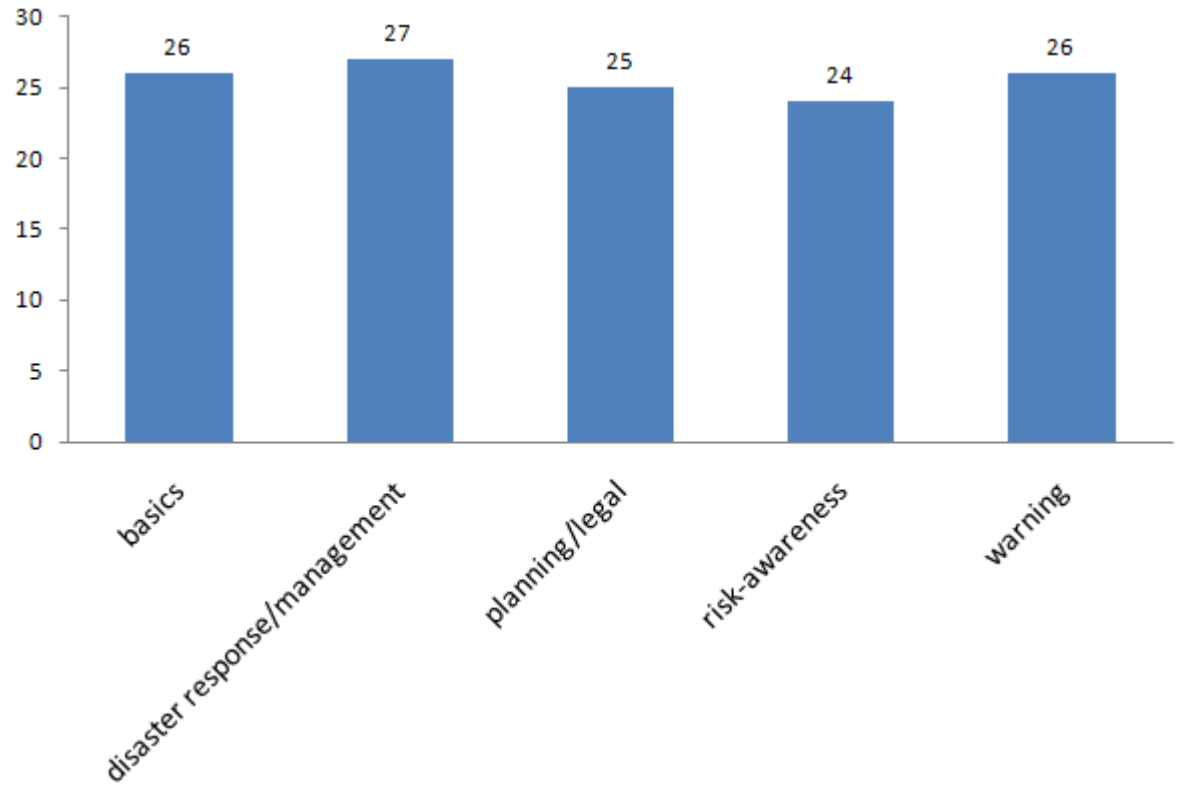


*Figure 3: Categorized Issues. The category **basics includes**: Design Criteria and Hazard Assessment (n=128)*

Compiling the categories simplified the procedure of checking whether knowledge gained from previous disasters had been implemented in the specified areas and estimating if they had been effectively applied in practice. These processes were also accompanied by the detection of hindrances in administering prior knowledge and investigating the structures for this execution at national levels. In recognising the reasons for failure, the structures and previous knowledge suggest a set of recommendations.

The project results are part of the final report, which is open to the public and can be provided on request. Furthermore, it describes the structural and non-structural issues detected for the hotspots, and presents the collated knowledge, estimates the effectiveness of lessons learned and gives a set of recommendations. It also comprises the results of the REX-INTEGRATED PREVENTION workshop held in Bonn from the 19th to the 21st of October 2011.

3 Results

a) The project tackled the critical issue of whether the existing technical frames and qualitative preventative measures are sufficient in dealing with extraordinary natural events.

The investigative actions regarding the existing frames revealed technical deficiencies in designing protective infrastructures (dikes, retention reservoirs, etc.) and the maintenance of such structures, including a lack of assigned administrative responsibilities (e.g. Gard). Moreover, upon analysing the flood case studies it could be displayed that in all cases the design thresholds of the protection structures were significantly exceeded during each considered event, pointing to the necessity of continuously surveying and adapting protection structures as suggested in the European Flood Directive. Furthermore, they also clearly show the limits of large-scale structural protection planning, instead calling for work on a smaller scale with a stable mix of DRR measures including qualitative preventative measures such as risk-awareness, spatial planning and advanced warning.
In the case of windstorms, investigating design limitations proved more challenging as the design criteria of residential areas or buildings was unknown (e.g. in the city of Wittenberg), and magnitudes and speeds of wind gusts were often not available for public consumption, confirming widely suspected problems of information/data availability and accessibility, and the necessity for this area to be improved.

b) The project assessed how effectively, and to what degree, prior knowledge had been implemented, with the aim of improving civil protection.

In roughly half of the cases improvements were implemented in the categories presented above with an overall positive effect on DRR, while 25 % of knowledge gained and lessons learned were estimated to have had a restricted impact. However, in about one quarter of the cases no prior knowledge seems to have been implemented, although issues had been identified for certain hotspots and categories. In implementing the collated knowledge learned from previous disasters, approximately 50% of the cases show a great need for improvement (see Chapter 7.7 of the full report).

Regarding the amount of knowledge implemented in the different areas, there are only slight differences. However, the important area of risk-awareness seems to have been underestimated. In contrast, good progress seems to have been achieved in the fields of hazard assessment and the adaptation of design criteria.

The analyses of the issues and gained knowledge show that DRR is not an issue limited to one entity and that in order to improve it, these characteristics of the topic need to be kept in mind. Although in many hotspots the knowledge learned had been implemented across different DRR-aligned fields, and the actions amalgamated, there are still areas where issues were identified but no course of action followed to improve the situation.

The project results show that structural protection is one important part of DRR but that other DRR instruments including adequate planning, warning, management and risk-awareness can contribute significantly to better disaster prevention. There appears to be a need for DRR knowledge guidelines to ensure that the most important topics are considered while implementing improvements.

c) The project evaluated the extent to which design criteria and experience drawn from previous events have been adapted and integrated into existing prevention strategies or led to the readjustment of preventive arrangements.

The current study identified issues in design criteria or thresholds for protective infrastructure and cases where adaptation of these thresholds based on past disasters took place. The project results show that for all investigated flood events the implementation of these was effective. A major field of action was identified as

being flash floods and the numerous deficits in how to cope with their rather frequent occurrence at disaster levels.

Major past disasters have not only led to technical adaptations but also to rearrangements of disaster prevention from local to international levels covering different DRR domains. The final report of the project displays the qualitative readjustments for all case studies. Among many others these are: the introduction of the *Vigilance* system in France after the windstorms *Lothar* and *Martin*, the implementation of the *OderRegio* program, different law amendments and changes in the organisation of disaster management, the introduction of a knowledge evaluation approach in France, the introduction of risk prevention plans in the city of Dresden and the Aude region, including aspects for more risk-sensitive planning, improvements of hazard monitoring and warning capabilities in all associated countries, risk-awareness campaigns, and improved involvement of local governments into DRR in Poland.

d) The project considered the adaptation of the frameworks and prevention quality in view of societal changes (e.g. urbanization or demographic change), and the projected weather-induced extreme events caused by climate change.

Adaptations of design criteria and thresholds with regard to climatological changes were discussed by the Climate Change Group in the framework of the REX-INTEGRATED PREVENTION workshop. The group identified that climate change in terms of higher intensity and frequency of events cannot be quantified when considering hydrology over the past 100 years, and this needs to be adopted on the basis of the currently insufficient data and information available. Hence, it was identified that the data and information base needs to be improved in all countries. Different paths pursued in different countries calls for a harmonisation of data (see EC Flood Directive) in order to achieve cross-border synergies in this field. There is also a need to address in more detail the cases of exceeding protection levels to discover how to design effective protection structures that can, and should, be applied before the next hazardous events occur. This may include the consideration of worst case scenarios.
Beyond climatological changes, changes in the vulnerability of different domains such as infrastructures, assets and demographic development also need to be considered in this framework, in order to be able to adapt thresholds appropriately to local and societal conditions. In general, the participation of the population and local governments is vital in improving preparedness and reducing adverse disaster effects.

4 Recommendations

4.1 Basics - Design Criteria & Hazard Assessment

The possibility of assessing design criteria for structures in order to evaluate their effectiveness as protective constructions is strongly related to the resolution of available data about past and future events. Local differentiation is unclear, leading to uncertainties in estimates and the risk assessments at those levels. Further investigations are therefore required in order to survey and update the conditions and the frameworks of protecting structures (Source: REX-Workshop). In addition, it is necessary to update disaster management-related information continuously over a longer period.
Clearly-assigned responsibilities and duties to constructions which plan, perform, maintain and communicate structural protection can facilitate both this process and the general process of improving protection levels. From the investigated case studies one could demand a coordinated, knowledge and information-based construction and rehabilitation of structural protection. Such activities should involve cost-benefit analyses conducted within the framework of corresponding feasibility studies, weighting and combining different protection and DRR options. Furthermore, they should be participatory in order to involve public views and the opinions of local governments, population and others affected. Critical infrastructures and networks need specific attention, since they may invoke hazardous cascading effects and place additional burdens on assets and the population during and after a natural disaster. Meeting appropriate standards is a long-term task, which should be achieved by implementing building codes and prolonged, ongoing surveys of networks and protection structures. This should also encompass maintaining any information about changes in vulnerability and risk emerging from climatological, spatial or socio-economic changes.

The integration of hazard assessments and flood risk zones into spatial planning is an important step which needs to be taken to ensure a more risk-sensitive and sustainable development of regions. Drawbacks related to the unavailability of hazard maps for different regions must be eliminated and ways of compensating landowners in highly-vulnerable regions need to be found. A higher risk-awareness from decision makers and planning authorities can contribute to a risk-sensitive spatial development by weighting economic and settlement benefits with risk factors. Flood risk assessment and management in member states of the EU is carried out in compliance with the EC Flood Directive, including coordination of activities within international river basins (Elbe, Oder and others). A positive impact for these topics is expected in connection with the EC 2007/60/EC Directive on the assessment and management of flood risks, which defines flood hazard maps and flood risk maps as

an obligatory standard for risk assessment and useful tools for disseminating information concerning flood risk to the public.

4.2 Warning

Among many of the investigated case studies substantial improvements were achieved in terms of warnings capabilities, including improvements in warnings at local levels. These improvements were identified for accuracy, punctuality and availability.

Warnings should be based on the single-voice principle assuring one piece of information to the relevant people. Given that different organisations or authorities are involved in the diffusion of alerts and forecasts, coordinated procedures and compatible methods may be helpful in improving warning quality. Broadcasting plans should be elaborated in terms of an effective warning chain, involving all relevant persons and locations, and it is extremely important to directly warn the people and businesses in danger, using different methods of communication. Highly crucial is that the alert is given early enough to allow individual protection and evacuation of personal property.

In the case of natural disasters, impact on the warning network can be high, leading in the past to breakdowns in the infrastructure. This shows the need for appropriate technical solutions to avoid interruptions in the operation of such infrastructure in order to ensure the availability of alerts in the case of these events.

Regarding flash flood warnings, further methodological and technical improvements are necessary to meet the requirements set by the typically short lead time of the event. Increased development and effort need to be put into nowcasting systems and the supporting expert system (e.g. Flash Flood Guidance), likewise the local installation of warning infrastructure including appropriate and up-to-date alert announcement techniques. Simple means such as warning signs can supplement the alerts and simultaneously raise the awareness of the population of a specific hazard at a certain location.

The availability of warnings and the implementation of improvements is, to a large extent, dependent on the availability and accessibility of information and data at specific points of interest. It is in many cases a pre-condition to implement warnings more accurately and adequately. Improving the density of, and modernizing, measurement networks should be an active and sustained task.

4.3 Risk-Awareness

Raising risk awareness is a crucial field of action in order to minimise the negative effects of natural hazards. During the REX-INTEGRATED PREVENTION workshop discussions, it was recognized that low risk awareness is a key factor leading to adverse effects and that learning from past events cannot be underestimated. In many cases disasters are closely related to the lack of risk awareness from political decision makers, administrators, private companies and the public. A lack of risk awareness leads to a minimum level of preparation and prevention capacities, resulting in a lower level of resilience (Source: REX-Workshop).

Learning from disastrous events is an issue which applies to all affected parties including the general public, public committees, governmental and non-governmental institutions advocating for or implementing disaster risk reduction, all legislative bodies, the stakeholders at policy level and the administration. To be more effective at conceptualizing and implementing collated knowledge, everybody affected needs to be involved in a continuous and contextualized way, in order to acquire relevant interests and feasibility, understand boundary conditions and options, establish links and networks, and to provide an interdisciplinary and intersectoral perspective. Generally, the participation of the population and local governments in DRR is vital to improve preparedness and reduce adverse disaster effects. Models for participatory approaches may be taken from the recently-introduced French inspection system, the Vigilance system, and local activities like those presented by the city of Dresden.

The position of disaster reduction on the political agenda is partly dependent on the public awareness of DRR and the public's interest in the topic of DRR. The political landscape regarding the implementation of DRR may also be actively formed by the public (e.g. public committees) (Source: REX-INTEGRATED PREVENTION Workshop). Governmental or non-governmental bodies advocating DRR at all levels can contribute to a general increase of risk-awareness among the public, authorities and decision makers.

Within the investigated case studies different approaches were presented to raise the risk awareness of communities. Among others these included media reports, school competitions and the construction of memorial places. While comprehensive plans were presented and implemented for structural improvements and the improvement of warning capabilities in different regions, sustained risk-awareness strategies were presented to a much lesser extent.

Supporting the preparation of independent experts' risk-management evaluation systems with inter-ministerial reports based on field studies can substantially improve the knowledge-collecting process. These are provided by independent structures consisting of highly-qualified and experienced civil servants with broad investigative

powers. Public access to these reports is an added value to this solution. In this way it is much easier to take into account the views of affected people and heighten the awareness of inter-institutional cooperation aspects. These experts can be permanently authorised, as in the French approach of independent inspectors mandated by the President, or occasionally, like Michael Pitt's directive commissioned by the British government after the 2007 summer floods ("The Pitt Review. Learning lessons from the 2007 flood").

Participatory approaches such as those introduced in Dresden by organizing public events to involve the populace and its views on flood prevention and preparation are important ways of raising awareness and initiating societal discourse on DRR, in addition to finding a publicly-accepted agreement on desired protection levels.

Further development and testing of practical systems such as Flash Flood Guidance in the Czech Republic should be practiced in all countries. Whilst being a challenging task, it simultaneously promises to improve capabilities in managing flash flood hazards in the future.

4.4 Planning / Legal

Spatial planning is an integral part of disaster prevention and each involved party has to develop strong arguments to be able to compete with opposing spatial interests. Appropriate ways need to be found to present such arguments to decision makers and assure that this information is used as collated knowledge to avoid future disastrous events (Source: REX-INTEGRATED PREVENTION Workshop). These arguments can be elaborated on the basis of cost-benefit analyses, risk assessments and collection, and archiving and validating accurate information and data on disaster losses and their sources. Data and information are two of the preconditions and important bases for improving the decision-making and learning processes.

In order to gather required information effectively, clear administrative structures and an agreement on a unified methodology were identified as crucial (Source: REX-INTEGRATE PREVENTION Workshop). Efforts and resources supporting and intensifying the activities displayed above must be put in place to assure better protection levels of the population, assets, structures, networks and (critical) infrastructures.

Important modes of action regarding floods have been comprehensively elaborated within the *OderRegio* program and are briefly introduced in this report.

4.5 Disaster Response / Management

In the case of DRR it has been identified to be of the utmost importance that all formally involved institutions and persons should cooperate and coordinate all action taken. Deficits in cooperation and coordination occur because of the transverse character of DRR, addressing several partly-competing skills and calling for further integrated, inter-administrative and interdisciplinary approaches (Source: REX-INTEGRATE PREVENTION Workshop).
A closer cooperation between the authorities involved in disaster response, forecasting and disaster prevention can induce synergies in the context of overall disaster management. These synergies can appear while establishing better communication, unified training, improved understanding of forecast and warning information and limits, understanding of disaster response requirements for certain products, and the exchange and merging of relevant information. Furthermore, cooperation between the competent bodies in neighbouring countries within international river basins is crucial for effective flood response measures.

4.6 Hazard and Loss Data

To find the reasons for the failures observed and to establish a basis for improvement, more and better data and information are required. This applies to both the data on the event itself and the resulting damage. Problems of data availability become especially evident where one is unable to attribute observed damages to the major characteristics of an event and vice versa. The project activities revealed that the acquisition of information and data about the event, and the design criteria and damage losses particularly at local levels can be a challenging task. In some cases, detecting relevant information was not possible or only achievable via intricate investigations, reflecting drawbacks in:

a. systematic data acquisition,
b. spatial resolution of available data (e.g. data not available for the point of interest),
c. accessibility of data (data not directly accessible, e.g. maintained by private sector),
d. transparency (data is not centrally stored, different bodies collecting different data – low transparency and homogeneity).

As displayed above the reasons are manifold and need to be tackled in a comprehensive way in the future. However, activities to improve the databases are undergoing, yet need to be intensified.

The expansion of monitoring systems for small river catchment areas such as the Wielopolka River basin in Poland, or improvements in hydrological monitoring

networks in the Czech Republic, alleviate effective automated data collection on flood and flash flood events. Dresden, severely affected by the river Elbe flooding in 2002, today investigates and assesses flood hazards in order to improve information bases for better preparation and prevention at district levels. Previous archived information and data on hazardous events also allows a better response to danger. The French electricity suppliers RTE and ERDF stored data and thus were aware of the system's weaknesses. This information improved response capabilities in the course of the Cyclone Klaus in 2009 by targeted actions. As such, knowledge derived from data is a key factor in developing appropriate, targeted and comprehensive DRR strategies and action.

Centralized national databases for historical data, such as those in France, including event and loss information from departmental archives are important to:1) allow easy and extended access to homogenous historical disaster data, 2) systemize historical and new information with regard to contents and formats, 3) improve possibilities of conducting different analysis, creating better opportunities for scientists, planners and others concerned, 4) allow improved risk and cost-benefit analyses for designing protective measures.

The data and information base and its use, e.g. for risk awareness, desperately needs improvement. A better information and database can be achieved by: 1) clear structures, orders and unified methodologies for an interoperable event, and impact documentation and allocation of corresponding resources for data acquisition and updates, 2) continuously updating and archiving information, 3) raising awareness at different levels that event and impact information is a precondition for learning from errors and decision-making processes, 4) making data about the events freely accessible.

4.7 Redefine the Concept of Lessons Learned

The concept of earning lessons from past disasters must be redefined and extended, from learning from a single disaster, to a continuous, active and sustainable process, evaluating changes in framework conditions such as uncertainties, vulnerability, structures and policies. It needs to provide control and survey mechanisms for structural and analysis of, and recommendations for, non-structural systems cross-checked by all the relevant people. This then ensures a systematic learning process and not only one from events triggered by a flash of public opinion. A continuous updating of hazards, exposure, vulnerability, risk perception, and the protective design criteria is required.