CEFRAME - FLOOD RISK ASSESSMENT AND MANAGEMENT ON BORDER-CROSSING RIVERS IN CENTRAL EUROPE

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Abstract

The project "Central European Flood Risk Assessment and Management in Centrope" (CEframe) assesses flood risk and its management on reaches of border-crossing rivers in central Europe. Pilot areas are the rivers Danube, March, Thaya, and Leitha. For the first time, the relevant institutions from the four countries: Austria, Czech Republic, Slovak Republic, and Hungary are working together on managing floods in this area. The aim of the project is the development of strategies and recommendations for reliable and sustainable transboundary flood management on these rivers in compliance with the EU Flood Directive (2007). Further the long-term implementation of these results on the national and transnational level is an ambitious goal.

Flood hazard maps and flood risk maps have been compiled, harmonized, and if necessary elaborated by a joint method for analysis of the current situation. National rules and methods in the implementation of the EU Flood Directive partially differ from country to country. The challenge is to elaborate a suitable common database for comparison of the national data as simple as possible.

One important goal of the project is to prepare Charter of Flood Protection for the project area. This action plan constitutes the strategies as well as structural and non-structural measures in general. The implementation of the results into the daily administrative work will be obtained by integration of the relevant administrative institutions (first of all the Bilateral Water Commissions) and other relevant stakeholders into the process.

Introduction

The implementation of the EU Flood Directive is on the agenda of Europe´s water management authorities. The 9 project partners from Austria (AT), Czech Republic (CZ), Slovak Republic (SK), and Hungary (HU) initiated the Central European Flood Risk Assessment and Management in Centrope (CEframe) project, implemented through the Central Europe Programme as a pilot for joint flood risk management plans on border crossing rivers in central Europe. The CEframe project started in April 2010 and will finish in March 2013. For more information on the project contact the homepage www.ceframe.eu.

This paper is an intermediate report on the CEframe project after 2/3 of the project runtime. Transnational hazard maps and risk maps are explained and an outlook is given to the procedure to reach common flood risk management strategies. The last point reports on the experiences in the transnational work.

The pilot rivers

Four pilot rivers were selected for the CEframe Project: Thaya/Dyje (CZ/AT), March/Morava (CZ/SK/AT), Danube (AT), and Leitha/Lajta (AT/HU) (see Figure 1). Until 1989 the "iron curtain" was situated along these rivers, so during the last 20 years transnational collaboration and regional development intensified.

The aim of a mutual flood risk management plan is that no country should suffer from disadvantages caused by flood management measures of another country. The pilot rivers are relevant examples due to the various countries situated upstream and downstream (Thaya, Danube, Leitha), as well as different countries on the left and the right banks (March).

Bilateral Water Commissions have been institutionalised for decades on all the pilot rivers. The Commissions deal with problems and solutions in all fields of water management and exchange information about measures in

the border regions; floods and flood management are one subject among others. Therefore the coordination of flood protection strategies and measures only took place at the very border region. The project is a starting point to seek further transnational understanding and propose solutions.

In Austria, Czech Republic, and Hungary, the administration units which send delegates to the Bilateral Water Commissions are the CEframe project partners, whereas in the Slovak Republic other governmental institutions are represented like the Slovak Water Management Enterprise, the state-owned organization for administration, operation and maintenance of water courses in all Slovakia.

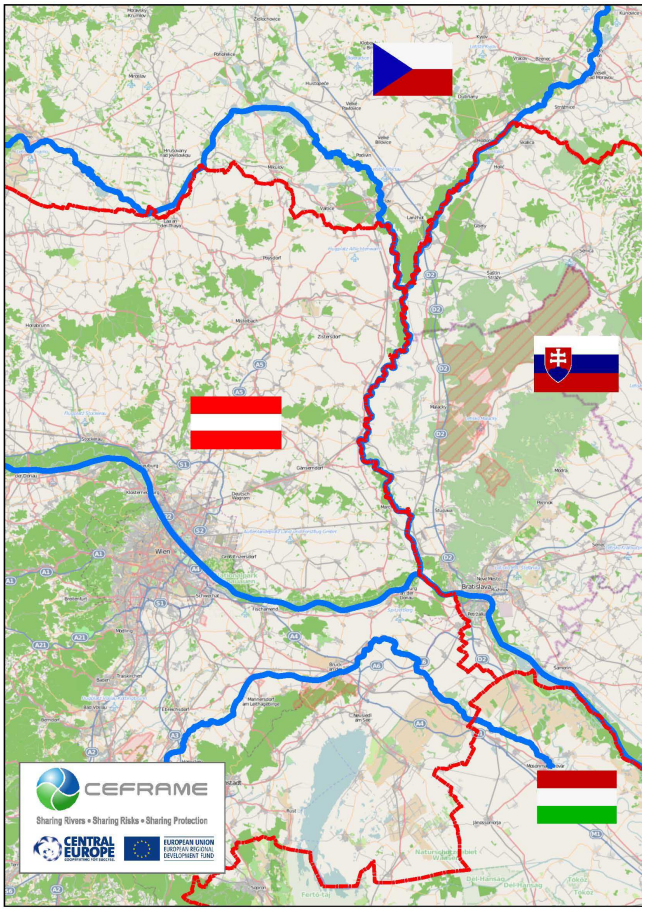

Figure 1: Sketch of the region and the pilot rivers (blue lines) March and Thaya in the North, Danube in the center and Leitha in the South

CEframe Working Packages

The substantial working packages in CEframe are

- documentation of current flood protection
- potential damages and risk
- flood management strategies.

These steps coincide with the steps according to the EU Flood Directive, but the details and methods in the national implementation of the directive are significantly different. As far as possible, all the information necessary to reach the project goals has been collected and analysis has been coordinated with the means of standardised reports and maps.

Current flood protection

Three scenarios are evaluated to assess flood hazard according to the EU Flood Directive. In the four countries only for the medium probability the same return period of 100 years is used. The return period for the high probability scenario reaches from 20 – 50 years, for the low probability scenario from 300 – 500 years. Therefore the joint hazard maps show 3 scenarios with slightly different probabilities of occurrence.

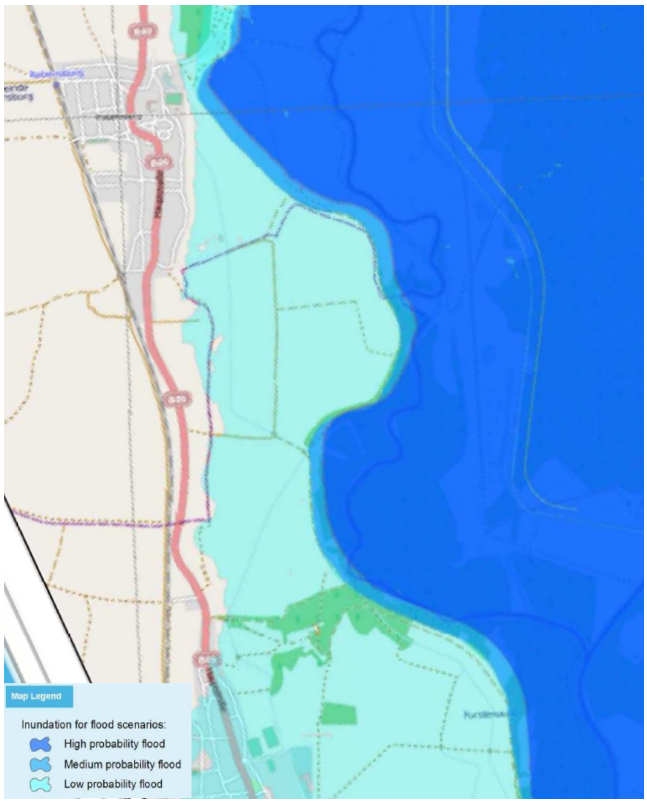

Figure 2: Section of the flood hazard map of river March in Austria (left) and Czech Republic (right)

The demand for coordination starts with the transnational agreement on statistical discharge values at least on the common river reaches. On the rivers March and Thaya wide agreement on discharge values could be found although details still are under discussion. On the river

Leitha, the discharge values were confirmed by combining statistical methods and unsteady hydrodynamic simulation.

High relevance of retention

On the river Thaya/Dyje, large regulated retention ponds are available in the Czech Republic for flood attenuation. These structures and their regulation have significant effects on the downstream sections of the river and on the river March/Morava, hence on the inundations in the Slovak Republic and in Austria. Significant flood hazard was identified in all three countries.

In the river Leitha flood attenuation is significant (see figure 3). The maximum of the 100 year flood wave for example is reduced from 350 m³/s to appr. 100 m³/s by the extensive inundations along the 100 km Austrian river reach. Although most of the flooded area is covered by fields and forests, there is a severe need for flood protection of several residential and commercial areas. One of the results of the CEframe projcet was that there is no flood hazard outside of the dams in Hungary due to retention in Austria during the 100-years flood.

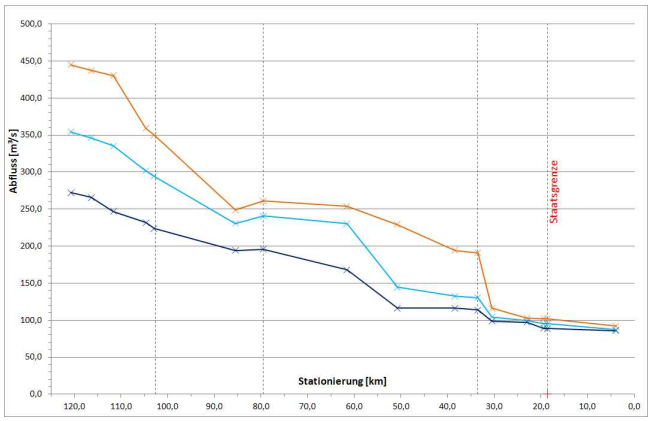

Figure 3: Hydrological longitudinal section (HQ_{30}, HQ_{100}, HQ_{300}) of river Leitha in Austria and Hungary (flow is from left to right)

The high relevance of the retention on the pilot rivers emphasise the importance of transnational flood risk management. Coordinated simulation was carried out in Thaya by steady hydrodynamic modelling for river sections between the retention ponds, and in Leitha by continuous unsteady modelling of flood propagation.

Flood Risk

The national methods of flood risk assessment are very different in the four countries. In Austria for example, the hazard maps are superimposed by the categories of land use and sensitive objects. Additionally the number of affected people is indicated.

The national method of risk calculation in Hungary (AKK-method) is much more detailed: Flood risk is evaluated by statistical methods for 50 m x 50 m grid cells. In each cell flood risk is calculated from the occurrence probability of inundation (by flood, flash flood, groundwater flood, flood due to dambreak) and water depth. Flood risk is calculated by integration over the whole range of probabilities.

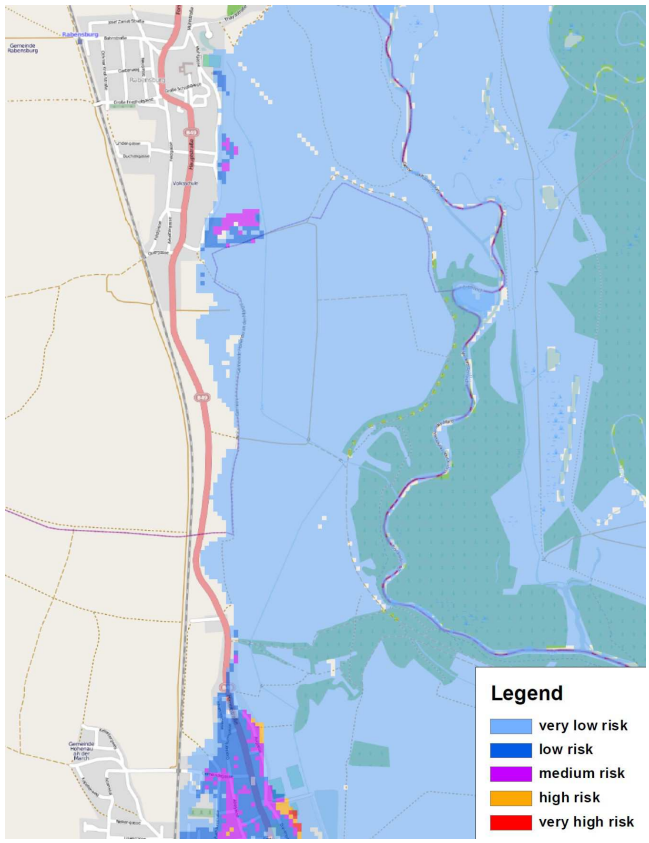

Figure 4: Section of the flood risk map of river March in Austria (left) and Czech Republic (right)

In the CEframe project for all countries a semi-quantitative method for 25 m x 25 m grid cells is used to get comparable flood risk values and flood risk maps. The quantitative part of risk assessment includes calculation of mean annual loss based on water depth at the three inundation probability scenarios. Uniform damage functions and asset values per land use category (Corine landcover 2006) according to the Rhine-Atlas (ICPR, 2001) are used for all countries. The asset values are adjusted in time by using the current price index, and adjusted to the average purchasing power parity of the four countries. Mean annual loss is calculated in Euro but is displayed in classes in the transnational maps (see figure 4). The display

of differences in money value is avoided by this method. National losses can be calculated by adjusting the mean losses to the national purchasing power parity.

Loss owing to dam overspill is considered in the mean annual loss up to the low probability scenario. Areas with additional residual risk owing to dambreak or human failure are indicated on the risk map but loss is not quantified.

The CEframe - risk maps created by this method can be compared to the national maps. This allows the discussion of the strengths and weaknesses of the different methods.

Flood Management Strategies

The main objective of the CEframe project is the mutual development of joint strategies and measures for flood risk management. The project will result in recommendations, and ultimately aims to reach binding agreements between the countries and the different institutions involved. These agreements will include the long-term implementation of the strategies and measures as well as the organizational safeguarding of the transnational cooperation. The results are currently under discussion, but the roadmap to achieve them is already agreed upon.

The development of mutual strategies is difficult because of differences in the organizational and legislative framework of the four countries. For example, in Austria the focus of flood protection up to the HQ100 is on settlement areas. In Hungary inundation with the probability 0.01 has to be restricted within the dams. Therefore, along the Leitha, Hungarian law does not allow inflow into the agricultural area behind the dams from Austria. Conflicting legislation like this calls for a just and rational solution.

Figure 5: Confluence of Thaya/Dyje (right) and March/Morava (left) during the flood in March 2006 (in the foreground Czech, left banks Slovak, right banks Austrian territory).

On the river March, with a Slovak left bank and an Austrian right bank, it is an important goal of the preventional measures to minimise damages during low probability extreme floods. Inundation has to take place initially in areas with low damage potential. Therefore, internationally concerted spillways will be discussed. Additionally, national preparation for disaster operations with transnational coordination will have to take place.

The solutions to be negotiated will contain a set of measures that cover the needs and the legal boundary conditions in every country along a specific river.

Charter of Flood Protection

The core output of the CEframe project is the Charter of Flood Protection, which is an agreed flood action plan for the project areas. This action plan constitutes the strategies as well as the effective structural and non-structural measures for flood protection based on an integrated approach covering water management, land use, spatial development, and nature protection.

The strategies are developed in three stages for each pilot river:

- First, discussions take place on the national level, involving the project partners and the most important administrative decision makers.
- Second, national concepts are discussed by transnational experts. They formulate a paper to the Bilateral Water Commissions by categorizing the results to “mutual” and “under discussion”.
- Third, the Bilateral Water Commissions discuss the strategies and find mutual general concepts. Afterwards details have to be elaborated in the project on the national and transnational level.

The signing ceremony of the Charter of Flood Protection will take place during the Best Practice Workshop at the end of 2012. The national first delegates to the Bilateral Water Commissions are expected to sign the Charter.

Communication after project closure

The CEframe project and the CEframe working groups only exist for a limited period of time. For dissemination and valorisation of the project results it is necessary to hand over the responsibility for the transnational aspects of flood risk management to a well-established transnational organisational unit. Further, transnational information and coordination should be intensified but restricted to the aspects where they can improve significantly the common

goal of sustainable flood risk management (Gierk et al., 2011).

The CEframe working group agrees on the following recommendations for communication after project closure:

- Transnational communication is carried out by the Bilateral Water Commissions: The Bilateral Water Commissions are legally institutionalised and well established organisational units. The implementation of the EU Flood Directive causes the focus on transnational flood risk management to gain importance. The subsequent recommendations should support the commissions in performing this task.
- An online platform is installed and updated: Through this platform information is available to the target institutions of all countries on a river. The important information is hydrological observations, forecasts, communication lists, other documents.
- An annual bilateral meeting of experts in flood risk management is proposed: The annual expert meeting dedicated to the subject of flood risk management gives the opportunity for face-to-face information, coordination, discussion of updates and improvements concerning planning of measures, observations, forecasts, and the exchange of experiences. The CEframe Best Practice Workshop is a starting point for this future institutionalised forum.

Information-dissemination

All stakeholders and the public will be informed about the contents of the Charter during CEframe Info-Dissemination Days. These events will take place in each of the four countries before the signing of the Charter. For the time after project closure it is recommended to update this information to the same group of people every 3 to 5 years.

Follow-up activities

The Charter of Flood Protection will serve as a guideline for the future work on the pilot rivers. The national, regional, and local implementation is conceived by a joint concept concerning follow-up activities and emergency situations.

As a basis for future communication a Thesaurus of technical terms is available in 5 languages (English, German, Czech, Slovak, Hungarian) on the CEframe homepage.

Experiences with transnational work

The experience after nearly two years of discussions on flood risk assessment and management on the four border-crossing rivers gives the following conclusions:

The transnational exchange of data, maps, and reports is very intensive in terms of time and resources. Therefore transnational information and coordination has to be restricted to the features which are important for reaching a common goal. Excessive harmonization has to be avoided. Interfaces and standards have to be defined early and in detail.

Although a lot of data are available in each country, the joint transnational work reveals data gaps and new unexpected insights. The goal to reach transnational commitment raises the consistency and integrity of the analysis and decisions.

In the CEframe-project we try to discuss different national views in detail. We discuss in English which is a foreign language to all of us. This gives equal opportunity of speech to all participants but the meaning of words has to be verified not to get “lost in translation”. But this problem arises also if you communicate via a professional interpreter who is not familiar with all the technical terms.

Conclusions

The goal of the CEframe project is the transnational agreement on flood risk management plans for the pilot rivers. Central Europe has many joint rivers, so taking a joint approach is essential to ensure effective management of flood risk.

Due to the different organisational and legislative background data of the same type are diverse in the four countries but have to be used and analysed. It turned out that in the analysis of the current state only a few data (first of all discharge values) and methods (e.g. risk calculation) have to be harmonized. Otherwise comparable data seem to be sufficient as a basis for strategic decisions.

To ensure long-term project effectiveness, the results have to be implemented by a well-established transnational institutional unit, which in our pilot rivers are the Bilateral Water Commissions. Based on this structure, the whole project region will benefit from jointly accepted und reliable strategies for flood protection.

Acknowledgements

The authors thank Karoly Gombas, Franz-Walter Froschauer, and Raimund Heidrich for their contributions.

The project CEframe is implemented through the Central Europe Programme cofinanced by the ERDF.

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