



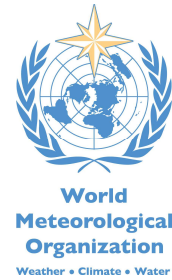
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WORKSHOP ON TRANSBOUNDARY FLOOD RISK MANAGEMENT Geneva, 22-23 April 2009

Discussion paper: Flood risk management in a transboundary river basin context¹

This discussion paper was submitted by the delegation of Germany and prepared by consultants. It is intended to support and facilitate the discussions during the workshop, with a particular focus on the case studies.

1. Setting the scene

1.1 Urgency of a new approach to floods

1. In the last decades, Europe suffered a number of major floods, causing fatalities, displacement of people, great economic loss and large impact on nature. Since floods are natural climate driven processes, they have always existed and will always exist. However, apart from their possible negative impact, the beneficial effects of floods for society should also be remembered and appropriate flood risk management can reduce the risks and damages resulting from flooding. They are an inseparable part of the water cycle and they supply floodplains with sediment and nutrients, which was the main reason for early settlement in and development of floodplains. Both natural characteristics and human interventions and activities in river basins influence the amplitude, frequency, duration and impact of floods. In many regions, climate change seems to increase the probability of flooding, while human behaviour often reduces the resilience of the land and water resources in the system.

2. Floodplains are attractive for human settlements in highly populated areas because of their economic potential. The floodplains are often fertile agricultural areas and the rivers provide excellent transport routes. But the ongoing occupation of the flood plains has increased the flood risk. In addition, the increasing investments in traditional flood management options like storing runoff, increasing the river's capacity and separating river and population by dikes, have affected the hydrological, ecological, economic and social functioning in the river basin. Because traditional flood control is essentially problem driven, the effect of interventions on other areas in the river basin (upstream or downstream) or on other components of the water system (land use, drinking water services, ecological services) have largely been neglected. In addition, the construction of "visible" structural flood protection measures has reduced the public awareness of flood risks.

3. Considering the benefits of human settlement near rivers and the threats and costs of floods, an approach is needed that supports maximizing these benefits and minimizes loss of life and capital. The approach therefore needs to integrate land and water resources and reduce the vulnerability to floods, recognizing the dynamics of the system as a whole. This of course implies a

¹ This document has not been formally edited.

river basin approach that recognizes the natural geographical and hydrological boundaries of the system instead of administrative and political boundaries.

1.2 Integrated flood risk management

4. Policy making, planning and management might be considered as a series of sequential steps in basin management. The following steps can be distinguished [INBO, GWP, 2009]:

- Drawing up broad policy goals (where we want to get to).
- Specifying water management problems to be solved (identify issues).
- Listing and evaluating potential strategies and selecting a (mix) of strategies (how we are going to get there).
- Strategy implementation.
- Evaluation of the outcomes, learn from these outcomes.
- Revising the plan to improve it for the future.

5. This sequence offers the opportunity to incorporate lessons learned in the process of planning and managing water and take into account new information as it comes to hand. This means that water management can adapt to changing circumstances, for example political changes, natural catastrophes and changes in demography.

6. Integrated Flood Risk Management requires adopting a river basin approach to planning through multidisciplinary inputs in order to reduce flood vulnerability and risks and preserve ecosystems. It also strengthens the adaptive capacity to climate variability and change. As has been stated above, the integrated flood management approach aims to maximize the net benefits from floodplains and at the same time reduce loss of life as a result of flooding, flood vulnerability and risks, and preserve ecosystems and their associated biodiversity within the overall framework of Integrated Water Resources Management. The concept recognizes the benefits of the smaller and more frequent floods, the importance of flood plains and the increasing development demands they face, while at the same time recognizing the disruptive nature of floods. It addresses the following elements [WMO, GWP, 2008]:

- Manage the water cycle as a whole.
- Integrate land and water management.
- Adopt a best mix of strategies, both structural and non-structural.
- Ensure a participatory approach.
- Adopt integrated hazard management approaches.

7. Rivers are dynamic systems and society is changing all the time, therefore integrated flood risk management is a cyclic management process. Reducing the vulnerability to floods is for instance well described in the flood risk management cycle in the European Flood Risk Management Directive [EU, 2006/EU, 2007] as well as in the draft UNECE Guidance on Water and Climate Adaptation. In this cyclic process, the following elements are distinguished: (i) flood prevention, (ii) flood protection, (iii) flood preparedness, (iv) emergency response and (v) flood damage recovery. For effective integrated flood risk management, all these steps are relevant, although specific local or regional circumstances may require more emphasis on one step than on the other. In the following chapters these elements and their role in reducing vulnerability towards floods and strengthening the functioning of the land and water system as a whole will be subject of discussion.

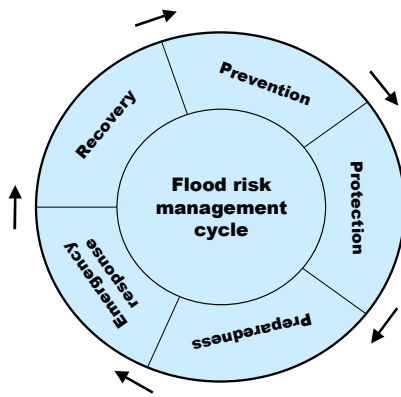


Figure 1 Flood Risk Management Cycle

1.3 The European Flood Directive

8. The European water policy and legislation like the Water Framework Directive and the Flood Risk Management Directive (Flood Directive) [EU, 2007] as well as the UNECE Water Convention embrace the approach of sustainable integrated water resources management. Guiding principles in the European water policy are the following:

- (a) *River basin management*: water management should be based on boundaries of the river basin, not on administrative areas or country borders, thus taking into account river systems as a whole, from source to mouth.
- (b) *Principle of solidarity*: the river basin approach implies that problems may not be shifted towards neighboring countries or regions. Negative effects between upstream and downstream areas should be prevented and positive effects need to be stimulated.
- (c) *Sustainability principle*: integrated water resources management aims at a combination of economic development, ecological protection and development as well as improvement of social welfare and justice. River basin management should start from a cohesive approach in which a broad spectrum of interests, disciplines and policy fields are involved. Issues like water quality, water quantity, ground water, space, economy, ecology and environment need to be balanced.
- (d) *Public participation*: active public involvement in development and implementation of water management strategies and plans.

9. Regarding integrated flood risk management, of course, the European Flood Directive is relevant. Its aim is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Flood Directive has the following three main pillars: assessment of flood risks, development of flood hazard (risk) maps and the development of an integrated flood management plan. The principles of river basin management and solidarity are addressed in the Flood Directive by obliging Member States to coordinate their flood risk management practices in shared river basins, including with third countries. They shall in solidarity not undertake measures that would increase the flood risk in neighboring countries.

1.4 The transboundary characteristics of integrated flood risk management

10. As floods are river basin wide phenomena, they do not respect borders, neither national nor regional and not even institutional. Therefore, floods often create common problems with locally varying intensity. The great advantage of transboundary cooperation is to widen the knowledge/information base, to enlarge the set of available strategies and to find better and more cost effective solutions. It is widely recognized that better knowledge on the flood formation processes will lead to better solutions. In addition, enlarging the planning space enables measures to

be located where they create the optimum effect. Finally, disaster management is highly dependent on early information and needs forecasts and data from the river basin as a whole. The necessity and urgency of transboundary has been acknowledged not only by the European Flood Directive (see above) but also by UNECE that formulated model provisions on transboundary flood management [UNECE, 2006, see chapter 1.6]. The model provisions provide a basis for bi- or multilateral cooperation addressing transboundary flood prevention, protection and mitigation and preparedness.

11. In some European rivers transboundary water resources management has a long history (e.g. Rhine, Danube, Iberian river basins). However, transboundary cooperation is not always obvious and requires specific efforts from both sides of the border. Successful transboundary cooperation depends above all on understanding and respecting the problems and needs of transboundary partners and the causes of these problems with respect to natural and social processes. For progress, common goals, agreed strategies and compensation mechanisms to balance advantages and burdens will be needed. This can be only reached if the partners know each other by working frequently together and have mutual access to all relevant information, thus creating the necessary level of trust.

Questions for Discussion 1:

1. At which level of cooperation would you classify the current contacts with your counterparts across the borders (Figure 2)?
2. Which level of cooperation is desirable for your problems?

The Flood Management Cooperation Continuum ¹

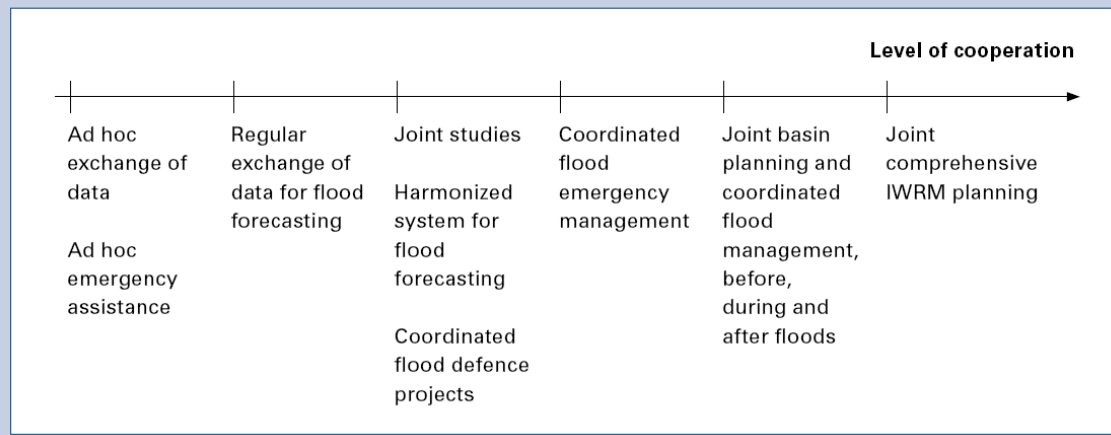


Figure 2 The flood management cooperation continuum [WMO/GWP, 2006]

1.5 European knowledge circles: EXCIMAP and EXCIFF

12. The core of any flood management is the knowledge on the hazards and risks, in particular the spatial distribution. Effective flood risk management planning depends on this knowledge (see also chapter 2). In this chapter two, European initiatives are highlighted that focus on knowledge and information concerning flood risks: EXCIMAP and EXCIFF.

European exchange circle on flood mapping (EXCIMAP)

13. An important pillar of the EU Flood Directive is the development of hazard and risk maps. Hazards and their underlying processes are manifold and vulnerability and the associated risks even more. The corresponding maps are an information tool on the spatial distribution of the driving factors creating the damage or the risk. As all information tools, the information must be prepared in a way that it is understood by the different stakeholders and leads them to take the right action.

This means that there are no unique maps; the content must be adapted to both the message that one wants to transfer and the receiver.

14. In the exchange circle EXCIMAP a variety of different hazard and risk maps was collected and compared. EXCIMAP forms therefore a knowledge base and not a guideline. The examples fulfil the requirements of the EU directive, but it is left open to the user which form of presentation is the best for his problems. Different map content is needed for flood management, for land use planning, for emergency management, for insurances and for raising public awareness. EXCIMAP distinguishes between flood hazard maps showing different parameters as flooding depth, flow velocity, flood wave propagation with their probability and extend, either by individual maps or as lumped parameter maps with hazard zones. While the flood maps including different parameters provide basic information, hazard zone maps are already more directly oriented to application. They can be the basis for land use planning or insurance. Vulnerability maps, often also called risk maps, show the assets at risk. The content can vary even more than in hazard maps. It can show the persons exposed to different degrees of risk, pure monetary damage, sensible spots and environmental hazards and may include social vulnerability of the society concerned. Vulnerability maps and hazard maps lead to emergency and flood defence planning which again can be presented in separate maps. The different elements can be combined in interactive maps.

European exchange circle on flood forecasting (EXCIFF)

15. The objectives of EXCIFF are to facilitate the exchange of knowledge and experiences in the field of flood forecasting. In the exchange circle EXCIFF the following themes have been distinguished concerning flood forecasting:

- Flood monitoring and detection practices.
- Flood forecasting procedures and organization.
- Information for triggering flood warnings.

16. For the various themes a review of current flood forecasting practices in Europe has been carried out. Next, the main information needs for the different themes have been assessed, resulting in an overview of data- and information requirements for various types and aspects of forecasting. The assessment resulted in a number of priority actions like training of experts, production of a good practice guide on delivering information to the general public [EXCIFF, 2007] and exchange of experience on flood forecasting organization.

17. Chapter 2 of this paper will elaborate on the themes knowledge and information.

Questions for Discussion 2:

The value of EXCIMAP and EXCIFF is the collection of the experience of more than 20 countries; the question is if these knowledge bases should be developed further in the direction of recommendations or even guidelines?

1.6 UNECE Water Convention and transboundary flood management

18. The 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) [UNECE, 1992], in force since 1997, aims to prevent, control and reduce transboundary impacts – meaning any significant adverse effect on human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors as well as effects on the cultural heritage or socio-economic conditions. The Convention requires that transboundary waters are used in a reasonable and equitable way. It also fosters an ecologically sound and rational water management,

conservation of water resources and environmental protection as well as conservation and, where necessary, restoration of ecosystems.

19. Although it does not cover in detail flood management, the Convention contains many provisions relevant for the management of transboundary floods. The Convention obliges Parties to prevent, control and reduce transboundary impacts, also those resulting from floods or from unilaterally decided flood protection measures such as dams.

20. Parties shall cooperate in research and development and exchange information on water quantity and quality. The Convention explicitly requires Parties to establish joint monitoring programmes for monitoring the condition of transboundary waters, including floods, as well as to establish warning and alarm procedures. Parties shall also cooperate on the basis of equality and reciprocity by concluding bilateral and multilateral agreements. They shall establish joint bodies which should provide the forum for discussing planned flood prevention measures and for agreeing on possible joint measures. Finally, Parties should assist each other for example in case of floods.

21. It should be noted that health aspects of floods are part of the Protocol on Water and Health to the 1992 Water Convention. The Protocol foresees measures to prevent, control and reduce significant adverse effects on human health, caused directly or indirectly by the condition, or changes in the quantity or quality, of any waters.

22. Since the entry into force of the Convention these basic obligations have soon been elaborated in more detail and expanded in a number of guidelines, combined with capacity building activities. In 2000, the Guidelines on Sustainable Flood Prevention² were elaborated by a Task Force on Flood Prevention and Protection, with Germany as lead country, and adopted at the second meeting of the Parties in The Hague. The guidelines cover basic principles, policies and strategies, joint bodies, provision of information, mutual assistance and public awareness as well as education and training. They recommend that joint bodies should develop a long-term flood prevention and protection strategy as well as an action plan, draw up an inventory of structural and non-structural measures and help countries cooperate in establishing the water balance for the entire catchment area. The guidelines also include several good practices such as for example retention of water in the soil, proper land-use, zoning and risk assessment, early-warning and forecast systems, and awareness-raising and planning. Finally, the guidelines also mention health impacts of floods.

23. These guidelines on sustainable flood prevention influenced the EU Best Practices Document on Flood Prevention, Protection and Mitigation published in 2003 (this document explicitly states to be an update of the preceding UNECE guidelines) and the Directive 2007/60/EC on the assessment and management of flood risks which entered into force in November 2007.

24. In 2006, the Guidelines on Sustainable Flood Prevention were complemented by Model Provisions on Transboundary Flood Management³ which have been drafted jointly by the Convention's Flood Task Force and the Legal Board with the aim of strengthening the legal framework for cooperation on transboundary flood management. The Model Provisions are meant to be used as part of either a general bilateral or multilateral normative instrument on transboundary water issues or a flood-specific one among riparian States, in order to address transboundary flood prevention, protection and mitigation and enhance preparedness thereto.

25. The Model Provisions are accompanied by a commentary to each provision. The provisions oblige Parties to take all appropriate measures to prevent, mitigate and protect against flood risks in

² MP.WAT/2000/7, available at <http://www.unece.org/env/water/publications/documents/guidelinesfloode.pdf>.

³ ECE/MP.WAT/2006/4, available at <http://www.unece.org/env/documents/2006/wat/ece.mp.wat.2006.4.e.pdf>

transboundary river basins and to refrain from taking measures which may result in a transfer of flood risks to another riparian country. They provide for exchange of information between Riparian Parties, and the set up and operation of coordinated or joint communication, warning and alarm systems with the aim of obtaining and transmitting information. In accordance with the Model Provisions, Riparian Parties shall develop a long-term flood management strategy and measures covering the transboundary river basin, including:

- a) Exchange of hydrological and meteorological data, monitoring/data, collection, and development of a forecasting model covering the whole river basin or of a linkage between the Parties' respective forecasting models.
- b) Preparation of surveys, studies (including cost-benefit or cost-effectiveness analysis), flood plain maps, flood risk assessments and flood risk maps, taking due account of local knowledge, and exchange of relevant national data and documentation.
- c) Development of a comprehensive flood action plan addressing prevention, protection, preparedness and response and providing for common objectives, joint action, contingency plans, information policy, flood plain management and, where appropriate, flood control works and financing mechanisms.
- d) Raising awareness and providing access to information, public participation and access to justice.

26. The Model Provisions also recommend to Parties to incorporate environmental requirements into their flood protection strategy and to restore the natural function of the watercourse. Finally, Parties shall consult each other if they want to undertake a project likely to significantly alter the water flow.

27. In order to support implementation of these guidelines, the UNECE has also put in place several capacity-building activities, for example, the Seminar on flood prevention, protection and mitigation (Berlin, Germany, 21 -22 June 2004).⁴

28. Currently, the National Policy Dialogue (NPD) implemented in the framework of the EU Water Initiative includes flood management as one of the topics related to adaptation to climate change in water management in Ukraine. The objective is to assist Ukraine to specify policy measures as well as institutional and managerial tasks on flood issues.

2. Joint flood forecasting and warning/ exchange of data

2.1 The need for information in integrated flood risk management

29. For an effective and efficient flood risk management it is essential to have an in-depth knowledge of the functioning of the water system, the prevailing hazards and risks. Thorough knowledge forms the core of the flood risk management cycle. For every element, from prevention to recovery, reliable information is needed in order to develop the best mix of strategies. The role of information in flood risk management is illustrated in Figure 3.

⁴ See <http://www.unece.org/env/water/meetings/flood/seminar.htm>.

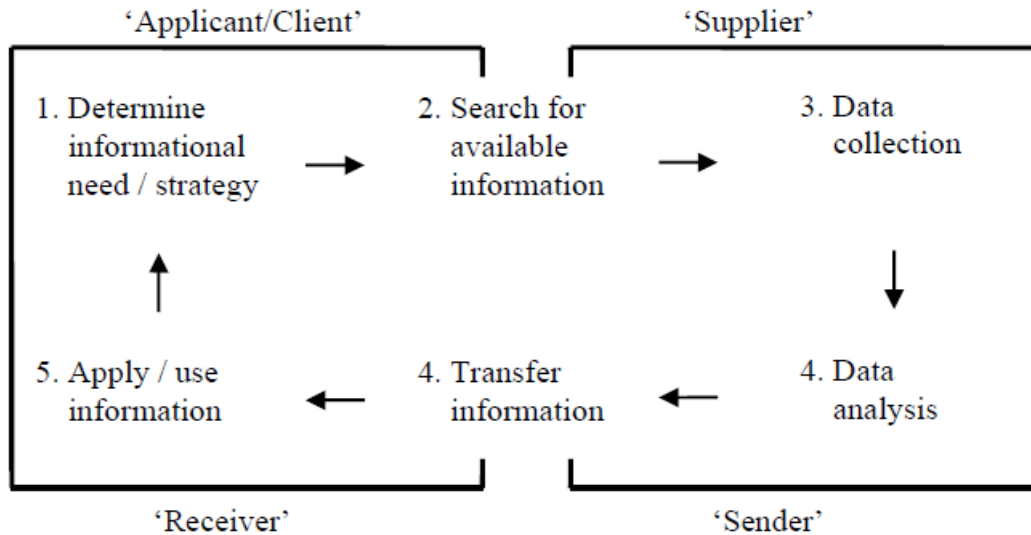


Figure 3 Information cycle and information transfer [Source: NeWater, 2005]

30. For integrated flood risk management knowledge of the behaviour of the water system, it is required to include all important parameters, such as type of flooding (static, dynamic) as probability, intensity (flooding depth, flow velocity) and extent of impact. Understanding of the river basin and floods can be obtained by analyzing and assessing the hydrological aspects of the basin and of past events.

2.2 The value of information exchange for integrated flood risk management

31. As explained above, accurate information and knowledge is the core of the flood risk management cycle. Decision-making in integrated flood risk management requires up-to-date, reliable and complete information on hydrological aspects, flood characteristics and impact assessment of the whole river basin.

32. A generally well known application of information is the development of early warning systems and flood forecasting systems. As the case descriptions of the Meriç and Transcarpathian river basin illustrate, often the emphasis of data collection and information transfer is on early warning. However, information exchange is also essential for flood prevention strategies in the sphere of integrated land and water management by e.g. creating space for the river, adapting land use (planning) and setting standards. The same applies for the planning of protection measures like the realisation (or removal) of dams, weirs or bypass channels.

33. Another important element of reducing the vulnerability to floods in flood-prone areas is creating public awareness and preparedness for flood events. It is essential that people recognise flooding as part of their environment. Communities must be aware of being at risk, which means that they know about it and take it into account appropriately when acting. High quality information is the basis for preparation issues like the design of flood proofing, contingency planning etc. No matter how good and reliable the information on floods is, without a proper communication to the general public, the objective of reducing the vulnerability will not be achieved.

2.3 Flood forecasting and information transfer

34. Timely and reliable flood warning, flood forecasting and information are prerequisites for successful mitigation of flood damage. Risks originating from floods, dam failures and ice hazards, may be reduced by:

- Free and unrestricted provision and transfer of meteorological and hydrological data and products.
- Informing without delay downstream areas likely to be affected by floods, critical water levels or ice drifts.
- Providing forecasts of water levels, run off and ice hazards.

35. The diverse applications for information each require their own type of data and information. As integrated flood risk management aims at a mix of strategies, from options for prevention to recovery, a large variety of information may be needed. Therefore the first step to define the type, frequencies, parameters etc. for data collection is to draw up management objectives and list potential strategies for the complete river basin. Because the river and flood characteristics may differ from location to location, transboundary cooperation is necessary to take this first step and realize monitoring and information systems that are useful throughout the entire river basin.

Questions for Discussion 3:

1. Flood forecasting and data exchange are input for determining flood risk management strategies. In present flood risk management the main focus appears to be data collection and information transfer itself. Its application and potential value for flood prevention, flood protection and preparedness, are underestimated in today's practice.
2. What are the main hindrances and opportunities for countries to strengthen the transboundary linkages in flood forecasting and related information transfer?
3. Which success stories can be used in elaborating the full application potential of flood forecasting services across borders?

2.4 Case descriptions: observations regarding joint flood forecasting and warning/ exchange of data

36. In the workshop session about Joint flood forecasting and warning/ exchange of data, the following cases are subject of discussion:

- Ukraine, rivers in Transcarpathia.
- Turkey, river Meriç.
- Central Asia.⁵

37. In short the following observations can be made for these case descriptions⁶:

Observations for the presentation: rivers in Transcarpathia

38. The Transcarpathian region has a dense network of water courses. The main rivers are Tisza, Borzhava, Latoritsa and Uzh, of which the Tisza basin is the largest. The Tisza river basin is shared

⁵ Due to lack of information this case is not presented in the present paper.

⁶ For this and all following cases the analysis and observations have been made based on the templates and additional material submitted by the presenters in advance, combined with some additional research and sometimes direct communication with the presenter

between Ukraine, Romania and Hungary. Transcarpathia is predominantly mountainous. As a consequence the area of productive land is relatively small and settlements, economic development and (communication) infrastructure are concentrated in the river valleys. The vulnerability to flooding is large in these areas.

39. The following observations can be made based on the case description:

- (a) Flood problems in the Transcarpathian region are a consequence of the following:
 - a. Climate change.
 - b. Deforestation and land use changes.
 - c. Intensive economic land use and settlements in the floodplain.
- (b) No or only limited space for flood prevention or reduction options.
- (c) Maintenance of structural prevention measures is difficult, expensive and sometimes poor.
- (d) Storage reservoirs are a possible option for reducing floods. Maintaining and operating them requires high quality and frequent information on flood waves and morphology.
- (e) For emergency response in vulnerable areas more accurate information on arrival and location of floods is required too.
- (f) Management of emergency response needs to be improved.
- (g) Ukraine, Romania, Hungary and Slovakia signed agreements on cooperation in transboundary waters. These focus on notification of planned interventions, prevention from adverse effects and sharing of information.
- (h) In the Tisza basin a transboundary online forecasting system was installed. The Ukraine system was realized with financial support from Hungary. The system is still being improved.

Questions for Discussion 4:

1. Are these observations correct?
2. Are data and information shared in sufficient accuracy, format and timeliness?
3. Key problems in the Transcarpathian case are:
 - a. Intensification of land use in floodplains.
 - b. Need for adaptive design of domestic and economic areas.
 - c. Inappropriate emergency response management.
4. The focus on early warning is helpful, but too little attention seems to be paid to these essential elements of integrated flood risk management . Are national flood management policies formally in place to support such integrated approach?
5. If so, are initiatives such as pilot projects considered adequate instruments to advocate for a shift in policies?
6. What role and potential do basin wide policies, protocols or recommendations have in bringing about required change?

Observations on the case river Meriç

40. The River Meriç (Maritsa/Evros) is flowing through Bulgaria, Turkey and Greece. It is the second river basin of the Balkan with a total length of 550 km and a catchment area of 39,000 km². The river originates in Bulgaria, flows through Turkey where it forms the boundary with Greece for 203 km. In Greece the river flows to the Aegean Sea.

41. The following observations can be made based on the case description:

- (a) Because large vulnerable Turkish settlements are located near the Bulgarian border, Turkey is dependent on Bulgaria for accurate and timely information on flooding danger.

- (b) Until 2003 there was no transboundary contact on water management at all. Now, Turkey and Bulgaria started transboundary cooperation on data and information transfer and flood forecasting and early warning. The main aim is to enlarge the available response time in Turkey.
- (c) In the Bulgarian part of the river basin there seems to be a high potential of improving (structural) prevention measures, with downstream effects in Turkey. The cooperation is not based on a formal agreement.
- (d) The lower Turkish part of the river basin is densely populated and at the same time lacks space for prevention measures.
- (e) The transboundary forecasting and early warning system will be used as input for local and regional preparedness and emergency response plans.

Questions for Discussion 5:

1. Are data and information shared in sufficient accuracy, format and timeliness?
2. In the case description, land use aspects (densely populated areas) are acknowledged as part of the problem. How could the available information be applied to integrated land and water planning?
3. Between the countries there is no formal agreement. Still transboundary cooperation is achieved. What are the preconditions for cooperating without formal agreements?
4. The downstream region of the river basin (Greece) is known to have suffered from floods in the past. For an integrated flood risk management approach it would be desirable to involve Greece in the transboundary information transfer system. Why is this not the case?

2.5 Key problems/Challenges for joint flood forecasting and warning/ exchange of data

42. Analyzing the cases and literature, different key problems or challenges for achieving joint flood forecasting and warning/data exchange can be distinguished. In the following they are described in short.

Joint information transfer as a first step to transboundary management

43. Experience shows that the development of (small) joint flood risk management projects, like the installation of monitoring and forecasting systems can be a successful first step in transboundary management. It provides the opportunity of finding agreement on an operational level, without the need for complex arrangements and agreements on a (national) political level. Integrated water resources management though, needs in most cases a legal basis, since it concerns often withdrawals and minimum flows that must be guaranteed downstream.

Questions for discussion 6:

1. Information (exchange) is the core of the flood management cycle and integrated flood risk management. What are the essential requirements to achieve (international) information exchange (institutional and/or technical)?
2. What could be convincing arguments for data “owners” or the decision makers in the administrations controlling them, to act more in favour of data sharing?
3. How can legitimate concerns about cost recovery, or the strategic value of hydrological data be addressed in the context of transboundary flood forecasting systems?

Define the field of application of information

44. Applying a mix of flood risk management strategies requires data and information with different characteristics. In present flood risk management the main focus appears to be data collection and information transfer itself, without exploring the final objectives of information use.

In the river basin the information need may vary between regions, depending on various characteristics. Before setting up forecasting and warning systems, a river basin wide analysis of objectives should be made.

Necessity for joint knowledge development

45. Different levels of data availability in a river basin will result in a lack of necessary meteorological, hydrological and geomorphological data for the whole river system. This will be an obstacle for integrated flood risk management. Therefore joint knowledge development and capacity building in the river basin is required.

Compatibility of systems

46. In Europe a large variety of flood information systems is used, by various governmental organizations. Despite the need for transferring data and information, informing all stakeholders in the river basin and sharing knowledge, information systems often operate in isolation, producing information for their internal users [FLAPP, 2007]. Transboundary agreement on model compatibility and data transfer will form a common basis for assessing the flood risk situation in the river basin. The challenge of data exchange and information systems is to achieve an undisrupted data and information flow on flood risks in river basins. In addition compatibility of calculation models guarantees that potential strategies and options can be discussed for their merits, without disagreement about their potential effects due to diverging models used.

From warning to awareness

47. Flood warnings, information and forecasts should also be made available to the public through the media, the Internet or other appropriate means. This should include information about what the public should do. This way information transfer will contribute to flood risk awareness and thus to reduction of vulnerability. In practice the information transfer is mainly an issue for people who are technically involved.

Questions for Discussion 7:

1. Information exchange is mainly focussed on forecasting and early warning. Which steps need to be taken to extend the use of information to the public and joint flood management?
2. Is this merely an issue for local authorities or can transboundary solidarity help to face extreme events? What should be the role of transboundary institutions?

3. Joint flood risk management planning and implementation

3.1 Elements of flood risk management planning

48. The starting point for flood risk management planning is the assessment of flood risks, based on the information about the river basin and floods (see chapter 2). In return, the scope of flood risk management planning defines the information need (see figure 2). In this chapter the elements that might be subject in flood risk management planning are described in short.

49. Flood risk management planning – as for example prescribed in the European Flood Directive – focuses on the reduction of potential adverse consequences of flooding for human health, the environment, cultural heritage and economic activity, on non-structural initiatives and on the reduction of the likelihood of flooding. In short, flood risk management planning addresses every element of the concept of integrated flood risk management (see chapter 1). Flood risk

management plans thus need to be developed to identify means of reducing the impacts of flooding, aiming at maximizing the benefits of living in floodplains, while minimizing the potential burden. They particularly focus on aspects of prevention, protection and preparedness.

50. Flood risk management plans need to consider the complete water cycle. They should be intertwined with for example drought management, the management of flood dependent areas like wetlands and water quality. Furthermore, flood risk management plans need to cover all floods. As the Morava case for example shows, a large variety of flood types can occur within the same river basin, varying from flash floods to more regular floods due to snow melting to ice hazards. Flood risk management plans have to take all these flood types into account and not merely focus on some design standard for protection.

51. While differentiated flood protection targets will continue to play an important role in flood risk management strategies, also across national and regional boundaries, they must be embedded into wider considerations on how to deal with residual risks once design flood levels are exceeded. In that case flood adapted land uses, emergency planning and finally risk sharing (insurance, cat-bonds, etc) should be part of the strategy. In addition to the various aspects of the functioning of the water system, flood risk management plans offer the opportunity to optimize or maximize the benefits of the various uses of the water. It is often obvious to take users like agriculture, ecology and drinking water supply into account in a flood risk management plan because they are closely linked to the settlements in flood prone areas. River basins like the Meriç, Vuoski and the Sava show that it is essential to take generating hydropower into account in the planning and that multiple benefits can be achieved (Vuoski). The same counts for the transport and touristic functions of rivers. For example in the river Waal (The Netherlands) a planning program has been started to manage flood risks, while at the same time preconditions for intensive navigation are respected, floodplains are renaturalized and opportunities for tourism and water recreation are being developed.

52. Two types of measures are particular critical in transboundary flood management: construction of reservoirs and protection dikes. Both measures change the characteristics of the natural flood, the first one retains, the second accelerates the flow. Downstream effects can be neutral, positive or negative, depending on the situation and the flood. Both types of measures are necessary within the integrated water resources and flood management and an integration of water and land management is necessary. This is difficult to achieve and is limited in many cases to the water management, but by the increasing pressure on land the integration becomes a necessity. It is the main aim of the EU flood directive to stipulate this transboundary planning. The resulting action plans, which have been established for several rivers in Europe such as Rhine, Elbe, Mosel or others try to achieve an overall optimum or at least the common minimum of measures, which can be realized. In the scope of this workshop the Vuoski river is a typical example.

53. Flood damage can be reduced by avoiding new construction of houses and industries in present and future flood-prone areas or by adapting future developments to the risk of flooding. On the other hand the river and its floodplains are very attractive for housing programmes. An integrated management approach may provide opportunities for innovative and beneficial combinations of housing and flood risk management. The same applies for example for the combination of creating space for the river and restoring the ecological functioning of floodplains or wetlands .

54. Taking into account multiple interests and different aspects of the water cycle may imply however that conflicts of interest appear. To deal with possible conflicts it is required that they are addressed transparently in flood risk management plans and that plans are flexible.

Questions for discussion 8:

1. Looking at flood risk management planning, often the focus lies on conflict of interests within the water cycle and between functions. A focus on synergies, multiple benefits and levelling of benefits is obstructed by a too large emphasis on local interests. Are successful examples available where synergies, opportunities and benefits of cooperation are the drivers of flood risk management planning, instead of (local) problems?
2. What analysis is desirable and feasible to strengthen the case for closer collaboration in flood management planning, e.g. in planning and operating larger scale flood defence works or retention areas?
3. What concrete added value can be presented to upstream decision makers to consider flood risks in downstream countries or jurisdictions and vice versa?
4. What successful examples can be cited to address fears of being on the “looser” side of changes in the planning process, e.g. to be on the receiving end of flood risk sharing?

55. Flood risk management plan play also an important role in the preparedness of flood prone areas. Based on risk assessments and the various management strategies that will be applied, they need to formulate instructions to the public and involved organizations on what to do to reduce the vulnerability to flooding and on what to do in the event of flooding.

3.2 Flood risk management strategies

56. A flood risk management plan aims at increasing the resilience to floods. Because river systems and socio-economic systems are dynamic, as is the climate, a flood risk management plan requires a certain degree of flexibility. Optimizing interventions requires adapting to changing conditions. This means that flood risk management planning needs an orientation on a mix of strategies and options. Table 1 gives an overview of strategies and options for flood risk management.

Strategy	Option
Reducing flooding	Space for the river Dams and reservoirs Dikes, levees and flood embankments High flow diversion Catchment management Channel improvement
Reducing susceptibility to damage	Flood plain regulation Development and redevelopment policies Design and location of facilities Housing and building codes Flood-proofing Flood forecasting and warning
Mitigating the impacts of flooding	Information and education Disaster preparedness Post flood recovery Flood insurance
Preserving the natural resources of flood plains	Flood plain zoning and regulation Cyclic floodplain rejuvenation

Table 1 Strategies and options for flood risk management [sources: APFM, 2004; Kater et al., 2005]

3.3 Case descriptions: observations regarding joint flood risk management

57. In the workshop session about Joint flood risk management planning and implementation, the following cases are subject of discussion:

- Azerbaijan, river Kura.
- Serbia, river Sava.
- Czech Republic, river Morava.
- Finland, river Vuoksi.

58. In short, the following observations can be made for the various case descriptions.

Observations on the case River Kura

59. The Kura river basin is shared by Azerbaijan, Georgia and Turkey. It originates in Turkey and flows through Georgia and Azerbaijan to the Caspian Sea. In Azerbaijan the river Kura is joined by the river Araz, which originates in Turkey and flows through Armenia, Iran and Azerbaijan to river Kura. Observations in the case description are the following:

- (a) Water resources management and flood risk management in Azerbaijan has a strong sectoral focus. This is the case for the legal setting, policies as well as the organizational structure in the country.
- (b) The economy of Azerbaijan is highly dependent on the water sector. The main objectives of (national) water management are environmental protection and rational use of natural resources.
- (c) A large variety of projects on water management are carried out in Azerbaijan, concerning for example water supply, waste water handling and flood protection. Due to the fact that different donors are involved in the projects, coordination and integration of the various aspects of the water cycle are lacking.
- (d) In the Kura basin there is a strong need for a shared knowledge base about the river system and for applicable information about and experiences with integrated water resources management and integrated flood risk management.
- (e) Transboundary cooperation concerning the Kura river basin is absent.

Questions for discussion 9:

1. Are these observations concerning the case correct?
2. (Joint) flood risk management planning requires a transparent and integrated institutional structure for water issues
3. What are the first steps in the direction of joint flood risk management planning?
4. What level of informal collaboration is in place right now in different aspects of transboundary flood management?
5. Can flood management collaboration be shielded against the dynamics of wider international politics?

Observations on the case river Sava

60. The Sava river basin crosses four countries. It originates in the Republic of Slovenia and flows via the Republic of Croatia, Bosnia & Herzegovina and the Republic of Serbia, where it mounds in the Danube.

61. The following observations can be made based on the case description:

(a) The riparian countries of the river Sava cooperate in the International Sava River Basin Commission (ISRBC). It was established by the Framework Agreement on the Sava River Basin (2004).

(b) The Agreement Parties (riparian countries) will prepare joint plans for the water resources management upon proposal of the International Sava River Basin Commission.

(c) ISRBC is preparing a Protocol on flood protection following an integrated planning approach.

(d) An information and forecasting system is available in the Sava river basin, but it needs to be updated and extended.

(e) Lack of financial resources is an obstacle to implementation of the joint flood management planning.

(f) The river Sava serves multiple functions. Floodplains are used as agricultural land, for urbanization and heavy industries. In addition the river is an important transport route. In the Slovenian part hydropower plants are present [Swanenvleugel, 2007].

Questions for Discussion 10:

1. Are these observations regarding the case correct?
2. Are data and information shared in sufficient accuracy, format and timeliness?
3. Which lessons can be learned concerning the national application and implementation of joint planning approaches that are constituted on an international level?

Observations on the case river Morava

62. The Morava river basin is shared by the Czech Republic, Austria and the Slovak Republic. The source and the largest stretch of the river is on Czech territory. It forms a (small) part of the Czech-Slovak border and of the Slovak – Austrian border. On the latter, the Morava joins the Danube. The main tributary to the Morava is the river Dyje.

63. The following observations can be made based on the case description:

(a) The riparian countries of river Morava all have bilateral agreements on water management issues.

(b) Bilateral agreements concerning forecasting, reporting and warning provide a basis for information transfer on floods between the riparian countries.

(c) Following the European Flood Directive, the riparian countries and Hungary will start a project aimed at joint flood risk assessment and management.

(d) The practical implementation of information transfer contributed to an improved transboundary cooperation.

(e) Transboundary cooperation in the Morava river basin now mainly focuses on information transfer, forecasting and early warning. It doesn't become clear from the case description how the information is being/will be applied for flood risk management planning.

Questions for Discussion 11:

1. Are these observations regarding the case correct?
2. Are data and information shared in sufficient accuracy, format and timeliness?
3. An institutional basis for cooperation is a precondition for joint planning; an agreement can strengthen the cooperation.
4. Does experience in cooperating on a technical level encourage joint planning?
5. When exchanging data what must be known on both sides on their application?.

Observations for the case river Vuoksi

64. The Vuoksi is a transboundary river that flows between Lake Saimaa in south-eastern Finland to Lake Ladoga in north-western Russia. The upper part of the Vuoksi River (13 km) belongs to Finland and the lower part to Russia. The Saimaa lake system is one of the largest in Europe. Lake level and outflow rise slowly, resulting in long lead times which is the opposite of for example the Carpathian rivers mentioned above.

65. The following observations can be made based on the case description:

(a) Finland and Russia agreed on a bilateral agreement on transboundary waters. Based on this legal framework a Joint Finnish-Russian Commission on the Utilization of Frontier Waters was established.

(b) In a bilateral agreed discharge rule both floods and droughts are addressed.

(c) Important functions of the river Vuoksi are hydropower and navigation.

(d) The bilateral cooperation includes provisions and compensation rules on energy supply. Since there are direct hydroelectric benefits by lowering Saimaa lake levels, the case can be regarded as an example of joint integrated water resources management.

(e) Monitoring and forecasting information is transferred between the two countries and to the public.

(f) There is less communication on flood assessment and land use planning between the two countries. As a result the transboundary consequences of interventions in one country are not clear and joint flood risk management planning is hampered.

Questions for discussion 12:

1. Are these observations regarding the case correct?
2. Are data and information shared in sufficient accuracy, format and timeliness?
3. Cooperation on flood control is a basis for extending cooperation to other elements integrated water resources management.
4. Levelling costs and benefits between countries facilitates and creates opportunities to strengthen transboundary cooperation.

3.4 Key problems/Challenges for joint flood risk management planning

66. Flood risk management planning in transboundary river basins requires a joint approach in order to improve the knowledge base, broaden the space for solutions, integrate strategies and find synergies between functions. Transboundary cooperation has numerous potential benefits, as was described in chapter 1.3. despite the advantages however, joint flood risk management planning is not everyday practice. As was stated in chapter 2 and is illustrated by the various cases, a first step in joint integrated flood risk management is the realization of a system of information exchange, joint flood forecasting and early warning systems. In many river basins this first step has been taken. With the step to joint flood risk management planning however, the complexity of cooperation increases.

67. Analyzing the cases and literature, different key problems or challenges for achieving joint flood risk management planning can be distinguished. In the following they are described in short.

Transparency of the institutional structure

68. As the Kura case shows, a precondition for integrated water resource management in general is that a transparent and integrated institutional structure for water issues is established. Transboundary cooperation on flood risk management planning requires an unambiguous

institutional framework on water issues, a clear water policy and a transparent administrative organization in all the countries involved.

Harmonizing the institutional basis

69. Neighboring countries – or even regions and provinces within a country - often lack harmonized policies, legislation or agreements on water resources and/or flood risk management. As the cases of the rivers Sava, Vuoksi and Morava show, transboundary agreements form a good starting point for joint planning.

Understanding of mutual benefits and threats, common goals and shared interests

70. The land use, development perspectives and other issues in a river basin may vary from location to location. An open discussion about and respect for each other's objectives as well as identifying each others benefits provides a basis for joint planning. As the Vuoksi case illustrates knowledge and understanding of the situation in the neighbouring country is essential for a joint flood risk management plan. And, without common goals, there is no cooperation.

Options for cost recovery and redistribution of benefits and costs

71. Joint flood risk management plans need to include multiple interests, on both sides of the borders. Some interests can easily be expressed in economic values (e.g. energy, transport) while others can't (such as nature). In addition, interventions in one location may have (positive or negative) consequences on other locations. Therefore, analyzing options for cost recovery of flood risk management services or redistribution of benefits and costs will strengthen the integrated approach of flood risk management. This is for example illustrated by the Vuoksi case.

A participatory approach

72. Consultation with local and regional stakeholders in order to identify their needs, problems and priorities will contribute to effective flood risk management planning. For a transboundary approach it is important to involve the (local) public in the entire river basin. In the cases that are presented, this aspect is not addressed.

Questions for discussion 13:

1. Do the participants agree with the key problems/challenges mentioned above?
2. What should be the recommended strategies or approaches to address them?

4. Institutional and legal arrangements for cooperation

4.1 The institutional setting of (transboundary) cooperation

73. Being an interdisciplinary challenge, flood management calls for interaction between various disciplines, governmental organizations and various sectors of society. There is a need for a change in the sectoral outlook of development so that the synergies between the actions of various stakeholders are maximized for the most effective implementation of an approach [APFM, 2006/2]. Institutional and legal arrangements are necessary elements of a successful integrated flood risk management.

74. In the institutional setting of a policy field, in this case Integrated Flood Risk Management in river basins, various factors can be distinguished. National laws, regulations, directives and international agreements and treaties altogether form the legal framework. A second factor is

formed by the policies, policy intentions and plans that influence flood (and water) management on various governmental levels. The third factor, the organizational setting, concerns the organizations that are involved in integrated flood risk management (on various governmental levels) as well as their mutual relations and alliances.

75. An important objective of integrated flood risk management in river basins is to cooperate on a transboundary level. The institutional setting is a crucial element in achieving a transboundary approach. However, it is necessary to realize that the three different factors cannot be influenced in the same degree. Figure 4 indicates the degree of impressionability of the various factors. In this chapter the various factors of the institutional setting and their relevance are further explained.

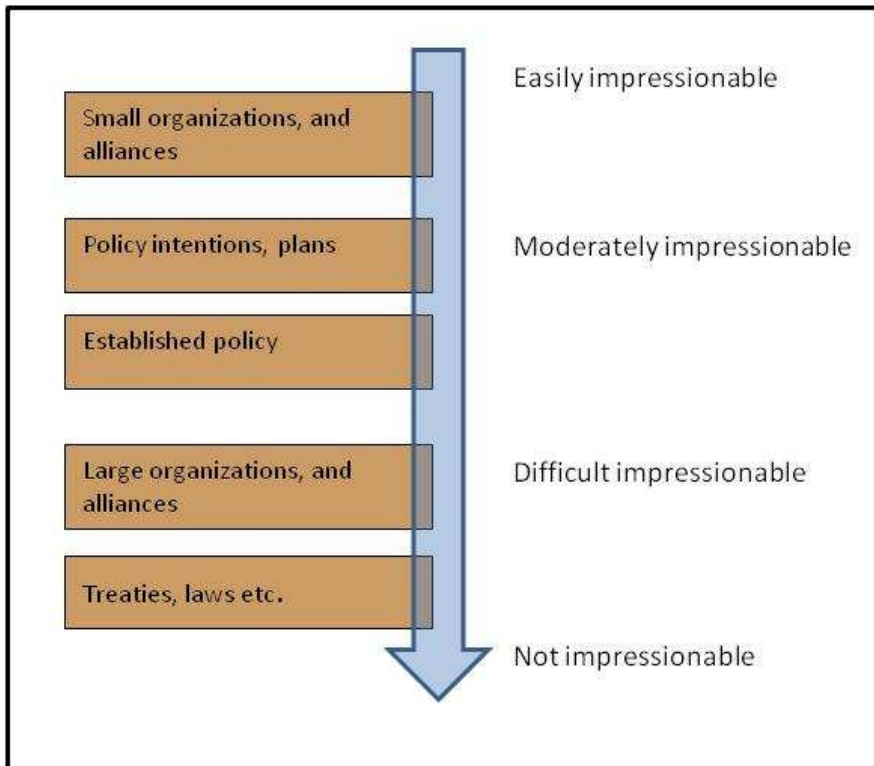


Figure 4 Institutional setting and impressionability

Organizational setting

76. As has been stated above, the achievement of integrated flood risk management in river basins is highly depend of the organizational setting, within country boundaries as well as crossing boundaries. From a national perspective, integrated flood risk management requires that various roles are played by a complex set of actors to ensure cooperation and coordination across institutional and disciplinary boundaries. At various governmental levels (national, regional and local) decision making requires coordination such that decisions take account of any impacts on flood management. In chapter 3, the Kura case illustrated the necessity of a transparent and coordinated organizational setting for integrated flood risk management. Organizations that are involved in water management on the national, regional and local level therefore need a clear allocation of responsibilities and mandates. From an international (river basin) perspective joint commissions may play a role in sharing knowledge and information and coordinating flood risk management planning. In order to achieve transboundary coordination and cooperation, it is essential that within a river basin an unambiguous overview is created of who is involved in water management on the various levels and how.

Policy arrangements

77. Integrated flood risk management requires both a horizontal and vertical integration of plans, programmes and policies. Horizontal integration refers to the multidisciplinary nature of the approach and the involvement of various water users. Vertical integration means that national and regional plans, programmes and policies are considered and implemented in regional and local policies, and vice versa. The starting point for all policy arrangements needs to be the setting of explicit and common goals. This will provide a basis for integration with other policy fields, identifying incompatible interests and exploring synergies, eventually resulting in cost recovery. For transboundary flood risk management common goals are a precondition too; without common goals there will not be cooperation. An example of an arrangement between countries can be found in Spain and Portugal, where the “convenio Albufeira” agreement applies serves for all Spanish/Portuguese common river basins.

Legal setting

78. Law is considered to play a vital role in the effective implementation of integrated flood risk management [APFM, 2006/2]. On a national level, standards of performance and a clear delineation of duties, rights and powers of the various organizations involved should be set out in law. Similarly, procedures and requirements regarding monitoring of compliance and mechanisms for enforcements must be established. The law needs to provide appropriate mechanisms for the settlement of disputes. WMO and GWP developed the Rapid Legal Assessment Tool to identify legal instruments that might be needed for a consistent and effective integrated flood risk management. Figure 5 illustrates the roles that a legal framework plays in the implementation process of flood management policies.

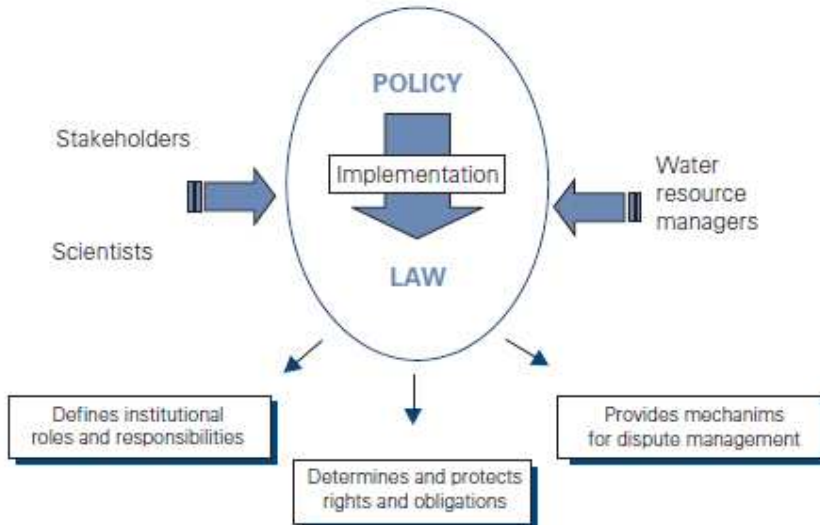


Figure 5 Roles of law [Source: APFM, 2006/2]

At the international level, integrated flood risk management should be integrated into wider frameworks of integrated water resources management. The rule of equitable and reasonable use should for example be implemented. At the international level, integrated flood risk management should be integrated into wider frameworks of integrated water resources management. The rule of equitable and reasonable use should for example be implemented. Legally binding commitments might be of help for a transboundary approach, but are not absolutely necessary; voluntary agreements can also be effective if the concerned Parties are committed to implementation. For example in the Rhine river basin, the Rhine commission works on an

institutional base. The responsible officials meet, set targets and elaborate an action plan. The governments of the participating countries are informed and at a next meeting the ministers of the countries accept the agreed action plans which are often non-binding, but are still effectively implemented by the riparian countries.

4.2 Cases

79. In the workshop session about Institutional and legal arrangements for cooperation, the following cases are subject of discussion:

- Moldova, river Dniester.
- Czech Republic, river Elbe.

In short the following observations can be made for the various case descriptions.

Observations for the case river Dniester

80. The Dniester rises in Ukraine and flows to the Black Sea. Before entering Moldova it marks the boundary between Ukraine and Moldova. The river flows through Moldova for 398 kilometers; it is the largest river in Moldova. In the downstream part it forms an additional part of the Moldova-Ukraine boundary, before flowing back to Ukraine and to the Black Sea.

81. The following observations can be made based on the case description:

- (a) Despite the presence of structural measures like reservoirs and information exchange with Ukraine, extreme events (rare floods) can cause large damage in Moldova.
- (b) Within the Dniester river basin there seems to be a strong need for transboundary early warning and contingency planning.
- (c) A legal framework for transboundary cooperation regarding flood management is absent.

Questions for discussion 14:

1. Are these observations regarding the case correct?
2. Are data and information shared in sufficient accuracy, format and timeliness?
3. Does cooperation need a legal framework per se and how may this be realized?

Observations for the case river Elbe

82. The Elbe river basin is shared by four countries: Germany (65.5%), Czech Republic (33.7%), Austria (0.6%) and Poland (0.2%). The upper Elbe river basin in the Czech Republic consists mostly of highlands and lower mountains. The middle part is lowland area in central and northern Germany. The lower part of the river runs through the German lowland to the North Sea and is affected by the tidal regime of the North Sea.

83. The following observations can be made based on the case description:

- (a) Due to the different characteristics in the different parts of the river basin, in the Elbe basin various flood types occur.
- (b) The transboundary institutional setting is well developed with the International Commission for the Elbe Protection and the Czech-German Commission for boundary waters. Both institutions focus on various aspects of water resources management, including floods.
- (c) An important basis for the management of the Elbe is the joint knowledge base that has been developed (in both German and Czech language), including a joint action plan for flood protection.

(d) The first step in the cooperation was the development of forecasting capabilities and the set up of an early warning system for the whole river basin.

(e) Lessons learned are that personal involvement of people plays an important role for effective flood management and that language may be an obstacle in communication.

(f) The practice of joint forecasting needs to be established in a transboundary institution for further development of integrated flood management.

Questions for Discussion 15:

1. Are these observations regarding the case correct?
2. One of the objectives of cooperation in the Elbe river basin is raising public awareness. How is this realized?

4.3 Key problems/Challenges for transboundary institutional arrangements

84. Laws and policies can establish the framework for water management in a river basin context. They clearly identify the functions, structure and funding of basin organisations and basin management. Roles and mandates are specified and fairness and accountability in decision making is ensured. With a transparent institutional structure fragmentation and overlap of responsibilities can be avoided and multiple interests can be addressed. Institutional development in a transboundary context however is a complex issue.

85. Analyzing the cases and literature, the following key problems or challenges for institutional development in integrated flood risk management can be distinguished:

Stepwise approach

86. As Figure 4 showed, the influence of involved stakeholders on laws is small. The influence on policies may be larger, but still complex. In practice discussing transboundary flood risk management between organizations and experts appears to result in less obstacles to cooperation than on a policy level. Therefore, developing joint flood risk management on a project basis could be an effective first step to successful cooperation. Exchange of information for example does not require any formal treaties. Next steps might be the development of transboundary plans, implementation etc. The advantage of a stepwise approach will be that participants in the process are able to familiarize themselves with (possible) differences in procedures, structures and culture. It will contribute to the development of mutual trust. A further benefit of a step-by-step process is that will allow the pros and cons, success factors and obstacles to be evaluated at each step.

87. Of course every step has to be assessed considering the overall policy objectives. These common objectives have to be addressed on the policy level and may even be fixed in legal arrangements. Adopting strategies and policy options is most effective on a local or technical level.

Questions for Discussion 16:

1. Agreements should fix the goals and leave the means to local and/or technical stakeholders. Is this right?
2. What aspects of timing and place in the political process should be considered when initiating legal reform?
3. What are the experiences in legal practice of embedding flood risk management into wider transboundary agreements on water resources management or water use? Or in other words can flood management be used as a “starter for cooperation” to build trust? What are the requirements for this assumption to succeed in practice?

Participatory approach

88. The aim of integrated flood risk management is to maximize the net benefits that may be derived from flood plains while minimizing the loss of life and property. IWRM and thus integrated flood risk management implies that those who are interested in, or who will be affected by decisions on water resources, will be involved in basin management and that information will be exchanged freely. Freedom of information is crucial in finding good solutions. Where there is no transparency or accountability, where those affected are excluded it is difficult to put the IWRM approach into practice [INBO/GWP, 2009]. Therefore it is imperative that all stakeholders are involved from the start in the decision-making processes that affect flood management. The level of participation of the different interested groups may vary both in terms of degree and in the level at which it occurs, whether national or local. Greater participation of all stakeholders in flood policy development is considered vital since it enables inhabitants of flood-prone regions to choose the level of risks they are ready to take.

89. A shared consensus has emerged in the past decade on the importance of participatory planning in disaster management. Individual and community ownership, commitment and concerted actions in disaster mitigation produce a wide range of appropriate, innovative and feasible mitigation solutions, which are cost-effective and sustainable [APFM, 2006/3]. In addition public participation adds to reducing fears and resistance of stakeholders and increases democracy in planning processes [Swanenvleugel, 2008]. From a transboundary perspective it is important to increase (public) awareness on the fact that people share the same water resource and depend on each other for its management.

Statements for discussion 17

1. At the moment the focus in integrated flood risk management lies primarily on the level of governments and experts. For a successful implementation however, a participatory approach needs to be established as soon as possible.
2. Joint programmes for informing public stakeholders, involving them in decision making processes and creating awareness can be a good starting point for transboundary cooperation.

Durable institutional arrangements

90. As was stated above, emergency cases are an important driver of present flood management. Of course transboundary cooperation during calamities is important, but it will not be enough for a real integrated approach. Because water resources management implies long term management, institutional arrangements aiming at transboundary cooperation need to have a long duration. They require the flexibility to adapt to changing circumstances (climate, society etc.) but should not be subject to (changes in) political ideology or whatsoever.

Questions for discussion 18:

1. How can it be guaranteed that institutional cooperation arrangements are continuous and not only aimed at emergency cases?
2. Is there a chance that flood management issues can be uncoupled from the wider political dynamics of international cooperation within a basin (trade, security, territorial issues, water sharing etc)?

5. Conclusion

91. Problems in flood management are expected to increase. On the one hand because of increasing hazards caused by climate change and on the other hand due to increasing vulnerability due to economic and social development. There is a general consensus that upcoming problems can

be minimized only by an integrated approach in a river basin. This means that all boundaries whether national, regional, local or institutional must be overcome. This is however hampered by human nature, which often prefers the individual maximum to the overall optimum. Therefore, solutions which are concentrated on proposing only the best technical means will fail. All stakeholders must be convinced that the overall optimum is also the long term individual optimum. Convincing is difficult, but it can be achieved by cooperation. Starting point is the exchange of data, then the exchange of know-how. As a next step, joint projects may lead to a level of trust which should lead to a common integrated planning where the goals are no longer the individual maxima but the common optimum.

92. The necessary level of trust can be achieved only by a stepwise approach. Cooperation can start with any element of integrated flood management. Often it is the forecast, but this might not be sufficient. The next step is the exchange of know-how and experience. Each partner must feel that he can gain when cooperating with partners. Amplifying the space for actions is one of the most important chances in transboundary cooperation. But actions are only realized, when the responsible agencies are convinced that the action will be successful. And this can only be achieved by the exchange of knowhow and experience. Therefore, it must be repeated, exchange of information and the resulting trust on all levels are the prerequisite for any cooperation. Therefore joint studies and projects are necessary to gain experience together.

93. In the chapters 1 to 4 various elements of integrated flood risk management have been described. The various aspects of these elements, like integrated approaches, different flood risk management strategies and options and institutional arrangements have been addressed in numerous studies and practical implementations. Many of these studies and (pilot) projects are financed by the EU or other international institutions (as the Kura case for example shows).

94. The large investments in the development of an integrated flood risk management approach have insufficiently resulted in an improved common knowledge so far. Experience shows that many valuable projects and studies contribute to the capacities of the actors that are involved directly, but are not disseminated effectively to other obvious beneficiaries.

Final questions for discussion

1. Is it possible to improve exchange of know how, without flooding the partners with Paper?
2. What are the means to avoid that valuable study results disappear in drawers?
3. Is a help desk (like APFM) a solution and what must be done to improve it?
4. How can the sharing of experiences in the UNECE region be continued?

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