CABRI-Volga

Report

Deliverable D3

CABRI - Cooperation along a Big River:
Institutional coordination among stakeholders for environmental risk management in the Volga Basin

Environmental Risk Management in Large River Basins:
Overview of current practices in the EU and Russia

Co-authors of the CABRI-Volga D3 Report

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1. INTRODUCTION

CABRI-Volga D3 Report overviews current water related environmental risk management practices in large river basins. The focus of this Report is on the basins in Europe, notably the Volga Basin in European Russia. The treatment of specific questions concerning domestic and international practices, major approaches and tools used in different cases is presented within thematic areas covering multiple issues in environmental risks and their management. Such thematic areas as water quality amelioration, river environmental rehabilitation, use of water resources, floods risk reduction, transport mobility are focus of attention of CABRI-Volga. All of these are structural components of integrated water management.

A particular accent of the D3 Report is on overview and analysis of prevailing practices and perceptions as well as the related problems in institutional capacity building and coordination between stakeholders. In this context, coordination and stakeholders partnerships are seen as essential and innovative tools of good water governance. The D3 Report assembles a variety of examples of actual practices, i.e. *how environmental risk management questions are being treated.* Such examples cover a broad range of issues such as R&D, modeling experiences, technical options, vulnerability assessments, decision-making frameworks, action plans and programmes, economic tools and incentives, legal, administrative and other institutional and policy responses. The Report provides an analysis of both 'good' and 'bad' practices and solutions adopted to overcome problems that have been experienced. An interchange of lessons learned through past success and failure in promoting coordination and cooperation in large European river basins is a core question addressed in the D3 Report.

The D3 Report gives continuity to the CABRI-Volga D2 Report. Both are part of the project phase "State-of-the-Art and Good Practices" in environmental risk management and coordination between stakeholders. For reference purpose, main objectives of this phase are:

- To overview the state in environmental risk management in large river basins, including evidence from relevant projects and research results
- To explore the status of coordination between institutions and other multiple stakeholders, including civil society, business, decision-makers and scientists
- To identify good and bad practices in coordination and cooperation between stakeholders in large river basins
- To explore major lessons learned from practices and case-studies within major thematic areas of CABRI-Volga

The specific target of the D3 Report is the Volga Basin – the largest fluvial system in Europe. In similarity with cases of other large river basins worldwide, the core question nowadays is how to increase effectiveness of water governance to overcome growing problems. The search for innovative tools and approaches aiming at the increase of human and environmental security in harmony with the sustainable development of the basin areas is the red thread of current joint actions of stakeholders, including the civil society, representatives of different sectors of economic activities, NGOs, government agencies and the scientific community. There is growing evidence that new tools and approaches are being used in practice in various river basins with reported success.

Although the D3 Report gives special attention to the Volga, it exercises a broader approach. It combines overviews of practices not only from the Volga area, but also from various countries in Europe. It allows comparing their experiences in solving similar problems that are faced today.

This process gives evidence to learning from the past experience in the search for constructive and practical ways forward which is an important concern of CABRI-Volga.

The D3 Report includes two basic components. *First*, it contains the results of CABRI-Volga expert discussion during the First Expert Group Meeting in Nizhny Novgorod, Russia (September 2005). The work process used to develop the reported findings represents a unique example of interesting practices in domestic and international coordination and cooperation by itself. Besides building an interactive European network of stakeholders interested in working together for rehabilitation of river basins, the CABRI-Volga generates the valuable results of joint assessments by about sixty experts from Europe. *Second*, the D3 Report includes a selection of essays presenting the cases prepared by seventeen CABRI-Volga project partners from Russia and the EU countries. They illustrate particular examples of recent practices in environmental risk management and coordination in large river basins. The choice of examples was defined by the scope of interests and expertise of the project partners.

The D3 Report starts with the Executive Summary (Chapter 2) presenting a synthesis of major findings of the analysis reported in Chapter 3 which is organised under the headings:

- Integrated Water Management (section 3.1)
- Floods Risk Reduction (section 3.2)
- Institutional coordination and cooperation between stakeholders (section 3.3)

The first section **Integrated Water Management** presents an overview of current practices and related problems in integrated water management in the Volga Basin and in other river basins in the EU countries. Within a broad variety of issues concerning integrated water management, the focus of CABRI-Volga expert discussions (3.1.1) is on current practices in water quality improvement, basin management approaches, monitoring and data sharing, multi-stakeholder partnerships in river rehabilitation and inland waterway transport. Existing practices in the Volga Basin are compared with experiences in the EU countries. The chapter overviews a number of case-studies as examples of 'good' practices in integrated water management and in coordination between stakeholders in selected river basins. The Volga-Rhine bilateral German-Russian research project (3.1.2.1) is an attempt in applying an integrated water management approach at basin scale to the Volga River. Focus is on both, water quality and water quantity. A description of current practices in water management administration of Baden-Wurttemberg (Germany) in the application of integration and coordination concepts is presented for the case of the Neckar River catchement area (chapter 3.1.2.2). Overview of the recent results in building the decision-support system for the Elbe River basin in Germany illustrates (3.1.2.3) practical outcomes in the user friendly communication of scientific knowledge and data to decision-makers and water managers. This system helps to enhance water management integration, including a combined controls of water quality, flood risks, floodplain ecology and river navigability. The final section (3.1.2.4) presents new experiences in application of integrated water management and land-use zoning approaches to water protection and conservation in riverside areas of the Volga Basin.

The second section **Flood Risk Reduction** in the EU and in the Volga Basin describes recent experiences and related problems in mitigation and protection against destructive river floods that are increasingly been seen as components of integrated water management in river basins. A brief overview presenting results of CABRI-Volga expert discussion, including basic perceptions and definitions and a combination of technical, strategic, institutional and socio-economic issues related to flood management is provided (3.2.1). Examples of good practices describe the pilot European Flood Forecasting System (EFFS) and give emphasis to the urgent need for reliable flood forecasting as an important element of flood risk reduction practices (3.2.2.1). Another presented example is the multi-objective planning methodology for decision-making in protection of small towns in Greece against catastrophic floods, drawing attention to the fact that major cities worldwide are better protected against floods than smaller settlements

(3.2.2.2). Presentation and comparison of recent experiences in design and application of indicators to assess human vulnerability to floods, including the Disaster Risk Index, GTZ indicators applied at a local level, and the "BBC-framework" for measuring vulnerabilities and coping capacities of societies to floods is provided (3.2.2.3). At last, illustration of current activities and policies of Baden-Wurttemberg (Germany) in flood protection and mitigation follows (chapter 3.2.2.4). This presentation gives evidence to the fact that flood risk reduction is a structural component of integrated water basin management and that tight institutional coordination and stakeholders cooperation are essential.

The third section **Institutional Coordination and Cooperation between Stakeholders** presents the results of CABRI-Volga expert discussion with attention on current practices and problems encountered in the application of coordination mechanisms in the Volga. It also includes assessments of recent experiences in resource allocation and programming, in building interactions within the triangle 'government-business-civil society' and in the development of environmental cooperation between the EU and Russia (3.3.1). A number of case studies from EU countries and Russia illustrate good practices. Interesting evidence and results from the European domestic practices in coordination and stakeholder participation are illustrated by activities of the Po Basin Water Board, Italy (3.3.2.1) that is significantly concerned with the development of a dialogue and consensus between various stakeholders in the basin. Innovative approaches introduced recently in Russia by the new RF Water Code envisage establishing the system of the River Basin Councils. In similarity with the case above it aims at stakeholder coordination and especially at identifying tools for local public involvement in decision-making and practical action for river rehabilitation (3.3.2.2). The case of the Scheldt illustrates how institutions in the estuary region managed to find means to shift from a long-standing bilateral water-related conflict between Belgium and the Netherlands to actual cooperation and common policy-making. Currently they are involved in development of a long-term vision for the Scheldt estuary, including flood protection, optimal transport accessibility and preservation of a healthy natural environment.

We are grateful for contributions of the project partners and experts from Russia and the EU who shared their assessments of the present practices, related problems and identified possible problem solving options. Results of discussion at the CABRI-Volga First Expert Group Meeting in Nizhny Novgorod, Russia (September 2005) are used in this Report. The D3 Report is prepared jointly by the CABRI-Volga partners. The Nizhny Novgorod State University of Architecture and Civil Engineering (NNSUACE), Russia and the International Ocean Institute, Malta are responsible for compilation of this document. The Report editing and its Executive Summary was done by EcoPolicy, Russia. We acknowledge the valuable advice of Prof. Bela Petry, the member of the CABRI-Volga Policy Advisory Board.

2. EXECUTIVE SUMMARY

The Executive Summary of the CABRI-Volga D3 Report "Environmental risk management in large river basins: Overview of current practices in the EU and Russia" presents the synthesis and major findings from analytical part of the document.

It summarizes findings from present practices, problems and examples of problem-solving within water-related environmental risk management in large river basins of Europe with a major focus on the Volga Basin in the European Russia. Its focus is on registry of existing practices in institutional capacity building and coordination between stakeholders towards environmental risk reduction in large river basins. Coordination and stakeholders partnerships are regarded among innovative tools in good water governance.

The Executive Summary contains both the results of CABRI-Volga expert assessments and insights from particular cases of current practices in the EU and Russia compiled by the project partners. It assembles examples from a variety of existing practices in river basins, e.g. how things are done in environmental risk management – within research projects, R&D and modeling experiments, technical solutions, vulnerability assessments, decision-making frameworks, programming and actions plans, economic tools and incentives, legislative, administrative and other institutional and policy options.

The Executive Summary follows the structure of the D3 Report, and it consists of three sections:

I. Integrated Water Management

II. Flood Risk Reduction

III. Institutional Coordination and Cooperation between Stakeholders

I. INTEGRATED WATER MANGEMENT

1. Integrated water management is a conceptual approach to water problems, planning and practice...

Integrated water management (IWM) is a conceptual approach to water problems, planning and practice in water resources use and water resources protection/conservation. Today there is a variety of perceptions and notions related to IVM. Typically this approach stresses three main interrelated components: 1) combination of economic, social and ecological uses of water, 2) cross sectoral water management, and 3) institutions at various levels (Conca 2006). Institutional coordination and stakeholder partnerships being a tool in good water governance have a direct link and are heavily rooted into IWM.

From a very broad and complicated theme of integrated water management several topics had been in the core of CABRI-Volga discussion at the 1st Expert Group Meeting in Nizhny Novgorod[1]. They include: 1) water quality regulation; 2) river basin management, 3) monitoring and data dissemination to stakeholders, 4) multi-stakeholder partnerships for rivers rehabilitation; 5) transport mobility and clean river navigation. All of them comprise structural elements of integrated water management approach in large river basins.

Current practices and problems encountered in application of integrated water management approach were discussed between the experts from the EU countries and Russia. The

[1] This chapter synthesises discussion held in three CABRI expert groups (EG): EG1: "River environmental rehabilitation"; EG3: "Sustainable use of water resources"; EG4: "Connecting goods and people".

emphasis has been on experiences in integrated water management within large river basins in the European countries with a special focus on the Volga Basin. Comparisons of practices and lessons from domestic practices in these countries and in cooperation between them indicate at interesting results and allow learning from each other.

2. Water quality standards in Russia are very strict and, thus, sometimes difficult to comply with…

Regulation of water quality in the rivers, water quality standards and mechanisms used for their enforcement is a key element in integrated water management. Today, water quality standards in Russia are very high. As a result, they are difficult to comply with and often are ignored[2]. In contrast, the EU and Brazilian standard setting focuses on 1) designing a system of standards which 'fits into particular purpose', 2) differentiating standards according to functional use of a water body, 3) ensuring coherence between standards applied to different water segments, and 4) having a vision of a long-term target, but setting realistic and attainable intermediate goals ('build upon success as success motivates'). It is important to move step-by-step from non-strict standards to more stringent ones.

Although, some institutional uncertainties remain in Russia regarding division of competences between various government bodies to set standards and to control their enforcement, the coordinating system is quite similar to the practices in the EU. In Russia, Gosstandart is responsible for setting water quality standards, while control organs of Sanedidemnadzor and the Ministry for Natural Resources and their territorial branches are responsible for their enforcement. In most EU countries, one organization has the task to develop and set standards, while water management authorities are responsible for control over meeting the targets set up by a standard. Russian system for standards setting is presently being further reformed, and it is necessary to ensure more effective control over the compliance with norms and standards, and also to define mechanisms to properly motivate the users to meet the standards.

3. Regulation and control over waste water discharges is an essential part in integrated water management…

Regulation of waste water discharges is among priority issues for many river basins, and it is particularly important for improving, or safeguarding water quality. Polluter pay principle (PPP) is one of the economic mechanisms applied today by many countries. In Russia, the system of payments by polluters for their sewage discharges (within and above the allowable limits) is fixed in the existing national environmental legislation. Recently, there have been some changes in this system – with a shift from previous special environmental funds accumulating the pollution charges, to direct transfer of generated finance into territorial and federal state budgets. Currently, 19 percent of collected payments go to the federal budget, while 81 percent is accumulated in the territorial consolidated budgets of the federation subjects (with about a half of this amount transferred to the local budgets). However, the PPP implementation in practice is not effective enough to provide incentives for polluters to change their behaviour, to make investments to modernise their technologies and to reduce the pollution level.

To compare: licenses are given for sewage discharge in the Netherlands. Fees are paid depending on pollution level; a fine has to be paid when limits are exceeded, and in severe cases court action is taken, and an industry might be closed down. The taxes go into a fund which is used a) to give subsidies to enterprises to develop/implement improved technologies and b) to fund enforcement and monitoring. In the Netherlands a long-term perspective is taken: polluters know in advance that taxes will be increased in a period of, for example, 10 years. Responsibilities for enforcement are clearly allocated. The Ministry has an Inspection body, which assesses the agencies responsible for enforcement. The Dutch system has a stepwise approach with incentives to invest in technologies for pollution reduction

[2] Although according to some parameters the water quality in the Volga is improving and in general it is better than in some rivers in the EU (see, CABRI D2 Report), the drinking water quality is still poor.

4. Basin management approaches are becoming a common practice in the EU and in Russia…

It is becoming a common practice in the EU countries and in Russia that good water governance is based upon basin management approaches. They are started to be more actively applied in practice. In the EU the WFD prescribes the basin management approach for all countries and stakeholder groups, and also that their actions within a river basin district are coordinated. River basin district is regarded as a main unit for management of the river basins. Similar approach is consolidated in Russia by the new Water Code (for details, see CABRI D2 Report). In Russia, since recently basin management approach has been the basis for water-related programming activities. For example, it was applied by the Volga Revival Programme and the GEF Dnieper Project. These programmes were grounded upon a strong scientific basis; however, the implementation of these initiatives in practice was rather weak. One of the problems today is that despite some efforts to integrate the specific economic and social factors inherent to particular basin areas into the basin management, they are not sufficiently taken into account in water practices.

Improving the institutional context of the water management in the Volga Basin is essential. According to experts, an organization, i.e. a special basin agency, or a basin council with clear responsibilities in water management and clear mandate in coordination between various stakeholders and different administrative levels is needed. Lessons from current practices indicate that cross-scale administrative coordination is equally important for the Volga rehabilitation, and especially, involvement of the local level and municipalities is crucial. Currently, the national institutional framework is enacted to provide new broader competences to the Volga municipalities. Their taking part in basin partnerships would allow using similar models as in many other countries of Europe, as for example, in Germany where much greater responsibilities are given to municipalities: while the central government support exists, the municipalities have a chance to represent public opinion and address their concerns.

5. Regular basin-wide monitoring and data sharing are among preconditions for integrated water management …

In the past, hydro-meteorological and environmental monitoring in Russia was well organized and coordinated ensuring high comparability of data. Unfortunately, this strong network has been dismantled during the nineties in a course of the transition period. It is necessary to restore and maintain multi-level monitoring infrastructure in the Volga Basin. Nowadays some companies (for example, LukOil, RAO UES) conduct their own environmental monitoring in the Volga Basin: they often possess updated environmental information, which is not made widely available to the general public and experts; also there are some doubts concerning its quality and reliability. State bodies are usually not too open to share the data. In many cases information exchange between various organisations in Russia is hampered by a variety of reasons, including charges for data by its producers. Not everyone can afford to buy data. Although Hydromet is a leading agency responsible for hydrological data compilation, only a fraction of all data collected in the Volga Basin reaches the Hydromet Data Centres. As a result, the information from different regions of the Volga is fragmented, and it is difficult to get a complete inventory. Integrated water management in the basin can be effective only if it is based on profound information, while water managers have to have unrestricted access to data. In addition, provisions have to be made to ensure an easy data exchange among all actors involved. Tighter links and coordination should be established between monitoring and application of its results in decision-making in the Volga.

In the Netherlands, a gap exists between policy/decision makers and scientists who design and implement monitoring programmes. Monitoring is essential, but often it is considered to be too expensive. Usually, it deals with different elements (water quality, ecology, chemistry), and different bodies are responsible for it. Almost each decision-maker considers that an amount of information supplied to him is excessive compared to what he needs. As a result, the impression is created that considerable resources are wasted (so-called, “data rich-information

poor" syndrome). Thus, it is essential that 1) decision-makers are involved in defining what particular data sets are required, and 2) compilation of data is to be user-friendly and presented to policy-makers in a clear and synthesised manner.

6. These days communication to the public is becoming a 'must' in integrated water management…

Communication of information to the public is essential for proper water management. Water related data and information about practices and problems should be clear and understandable for a layman, but this goal is very difficult to attain. A Dutch study where the public and experts were brought together is an example thereof. Both parties were asked to explain how they view water quality. The public and experts had a completely different perception of water quality terminology and therefore it was very difficult for them to understand each other.

Sharing and circulation of information is critical to mobilising public support for actions towards rivers rehabilitation. There is a lack of public awareness in the Volga Basin related to water quality, water related risks and management problems. This is also a result of a limited number of mechanisms applied in practice to promoting wide access to the required information. Information is often biased reflecting approaches of a particular interest group. Few people are interested in ecological information, although in general the public is not satisfied with the state of the environment. People are still rather inert and heavily rely on government action and protectionism. It is necessary to establish close links with mass media and make all water quality information easily accessible, understandable and transparent. Local NGOs can be a powerful driver towards problem-solving.

7. River transport is among key water users and ensuring that rivers are navigable and facilitate mobility is among prior concerns within integrated water management in river basins….

The river transport is among key water users. Integrated water management in river basins presupposes cross-sectoral coordination of transport with other water users, promoting navigation and transport mobility for people and goods, ensuring that rivers are navigable and ecological considerations are met. The results of CABRI expert discussion on practices and problems in transport mobility in the Volga Basin present the following ranking of current needs: 1) improve the urban mobility situation, 2) develop a unified Volga Mobility Master Plan "2010", 3) establish a coordination mechanism for passenger and freight transport, and 4) reduce water pollution. For example, according to expert opinion, among priority problems related to ecological impacts of river transport in the Volga Basin is control over pollution from vessels, including oil spills, improvements in hazardous goods transport over the waterways, stimulation of programmes for fleet modernisation, and control over pollution from small boats.

The Volga and other rivers in the Volga Basin are natural barriers to urban mobility, but also have the potential for being integrated as transport ways in the public transport system of a city. The water-taxi scheme currently implemented within the EU CIVITAS Initiative in Rotterdam serves as an innovative example. However, it needs to be considered that the rivers in the Volga Basin are frozen for about half of the year. The level of present coordination of transport mobility within the basin is low. There is neither any integrated mobility plan, nor the body that would be able to develop integrated Mobility Master Plan for the entire basin area. At the same time the coordination between water policy fields and territorial units is needed. Additional measures to facilitate its development include: overcoming segmentation of authority, setting clear targets, lobbying at the national level; "Matryoshka" master plans and increasing political weight. Coordination mechanism for passenger and freight transport is also necessary. Combined transport or more generally intermodal transport has enormous potential to extend the range of freight transport possibilities and to avoid congestion. There are numerous innovative projects of this kind in Europe. For example, the EU research project ALSO Danube aims at promoting the use of inland waterway as a key mode of intermodal door-to-door transport chain.

8. The Volga Revival federal programme has been a unique example of coordinating multiple efforts towards environmental amelioration in the basin...

The Volga Revival Programme, 1998-2004 has been among the most important national programmes aimed at environmental amelioration and sustainable development in the Volga Basin. It has been a success in practical action towards coordination and cooperation among stakeholders, especially in developing interaction between science and decision-making, and in joint action of the federation subjects located in the Volga Basin. Among its participants had been administrations of the 39 federation subjects, about 11 ministries and agencies and over 60 research institutes and organisation. Corresponding regional programmes had been introduced in the Volga regions. Its design was based on the use of integrated water management approaches, on cross-sectoral and multi-scale coordination within the entire basin area. It included ten major directions of practical activities organized into its sub-programmes, as well as a set of future quantitative targets for ecological amelioration in the Volga Basin. Despite early termination of the programme (against 2010 as initially planned), a number of its sub-programmes demonstrated good results in certain improvements of ecological situation and in environmental problem solving. For example, during 1995-2002 waste water discharges in the Volga Basin were reduced by 15 percent partly due to programme measures (about 54 water treatment plants were put into operation), but partly due to decline in industrial production as a result of economic crisis. This programme is assessed by the experts as a unique example of institutional coordination activity with a strong scientific basis, but facing a number of implementation problems caused by a mixture of financial and institutional reasons. Although its effectiveness is a combination of success and failures, at the same time it is regarded as a truly important lesson for future planning and coordination for ecological amelioration within the basin and for enhancing bottom-up initiatives in the field. Indeed, Volga Revival has contributed to creating common perceptions of existing problems and to finding means to solve them.

9. Eight years of interdisciplinary research within bilateral Volga-Rhine project generated important results for integrated water management in the Volga…

The Volga-Rhine project, 1998-2006 is a German-Russian cooperative research supported by the German Federal Ministry of Education and Research and the Ministry of Industry, Science and Technologies of the Russian Federation. Massive anthropogenic interference makes the Volga system extremely complex and vulnerable, and conflicts between stakeholders, utilization, ecology and economy are unavoidable. The project focuses on the water quality and water quantity in the Volga Basin. Concepts for an integrated river basin management and a sustainable use of the natural resources of the Volga catchment are to be an important outcome, as well as technology transfer and capacity building. To check if the concept is suitable for different rivers, there are parallel studies conducted on the river Rhine. The project is divided into seven subprojects: 1) Impacts of congested areas and dams on water quality and drinking water supply in Nizhny Novgorod region, 2) Sediments quality and origins of pollutants accumulated in the sediments, 3) Quantification of erosive discharge of nutrients and development of land-use concepts, 4) GIS-supported hydrodynamic-numerical modeling for flow simulation of the Volga River, 5) Hydrological modeling of the catchment for the forecast of the flow and pollutant transport in the river channel, 6) Exploitation of Volga cascade: energy production and ecology, and 7) Development of concepts of hydraulic structures for the improvement of the operational safety. Exchange and use of experiences and results of the above mentioned IKoNE and Elbe DSS is an integral part of this joint initiative.

10. Practices in Europe indicate that cross-sectoral coordination and stakeholders cooperation is essential for integrated water management…

In practice, application of such tools as coordination and partnerships is expanding at various administrative levels. For example, in Germany, the federal state governments and local authorities (cities, districts and municipalities) are responsible for enforcement of water

regulations. The Water Resource Administration of the federal state Baden-Wurttemberg[3] implements in practice integrated approach to water management. IKoNE project "Integrating Conception of the Catchment Area of the Neckar River" adopted in 1999 is an example of current practices of this administration in integration and coordination between various directions of water management within a single river basin. IKoNE project coordinates the river-related measures, including: (1) quality of the waterway, (2) structure of the waterway, (3) flood protection, with other local development plans and integrates other sectors planning. It is performed in the Neckar River Basin – the biggest river[4] of this state with about half of its population residing in its catchement area.

Its approach is based on promoting cooperation between various stakeholders of the basin and creating partnerships. It also suggests a river-basin action framework for water resources management within the entire catchment area of the Neckar River. The objective is to preserve and improve the rivers as living spaces and lifelines of the landscape as well as important natural factors for business locations. IKoNE addresses citizens, industry and business, associations and authorities. It defines and bundles the multiple tasks of river management into action programs. This includes measure-related action programs and action plans which are set up in order to compile basic data. Communication is of special importance within IkoNE and it aims at presenting the water resources management in a convincing way; creating confidence, influencing behavior and winning cooperation partners.

11. Among pressing current endeavors is how to communicate scientific knowledge to decision-makers in a user-friendly manner...

*The Elbe DSS: Development of a **D**ecision **S**upport **S**ystem for the Elbe River Basin* initiative has exactly the above goals. Since the methodology and the instruments for integrated river basin management are quite scarce, the German Federal Institute of Hydrology (BfG) has initiated the project "Towards a Generic Tool for River Basin Management". The goal is to develop a prototype decision-support system which helps the water managers to formulate an effective strategy for sustainable management of the Elbe Basin. It is to help to provide knowledge to administrators and decision-makers on interactions of natural and anthropogenic factors within a river basin. A key aspect of the design is the combination of process models and data from different scientific disciplines in an integrated systems network. Water management within a river basin is a complex task and it requires integration of a number of topics; the DSS format includes: 1) water quality and reducing pollutant loads, 2) flood control and flood risks, 3) ecological state of floodplains, 4) navigability. It also takes into account external scenarios such as climate change, agricultural policy and demographic developments. A pilot version of the DSS was completed in 2005 and its results were presented to the authorities. It is a useful tool for decision-making that allows the user to assess the impact of selected measures and alternative solutions. The system is user-friendly and practice-oriented because the development of DSS was based on a participative approach – the requirements of possible users such as local authorities, nature conservation organizations and others had been taken into account. The DSS has a modular structure so that individual elements can easily be exchanged or added. The format of this project is applied to the Volga Basin, and the Oka River DSS has been already developed.

12. Special water protection regimes in riverside areas are a part of integrated water basin management...

[3] The state of Baden-Württemberg in Germany is one of its 16 federal states. It is subdivided into 4 Regional districts, each of them having a Regional District Authority. The city of Stuttgart is the legal seat of the State Government, the State Departments and one of the Regional District Authorities.

[4] The Neckar is the biggest river flowing from its source to its mouth within the state of Baden-Württemberg, its catchment area of about 14,000 km^2

In Russia, new water management practices suggest special regimes for the riverside areas that are especially attractive for residence, leisure and for economic development. Such practices promote water protection and water conservation in a river basin. The tools applied include, for example, the legal zoning of riverside areas, special water protection regulations and norms, including limitations and banns on certain types of activities, setting up strict territorial limits for water protection zones along the banks of water bodies, as well as land-use planning and flood protection. Special regimes for the riverside areas are established by the Water Code, by the Land Code and by the City Planning Code. A number of the cities in Russia, including those in the Volga Basin, e.g. Nizhny Novgorod, Kazan, Samara, Perm gained interesting experiences in development of building regulations, in re-profiling the land-use and in establishing special regimes for riversides within urbanized territories. Integrated water management approaches are applied for the riverside areas rehabilitation and development.

II. FLOOD RISK REDUCTION

13. CABRI-Volga favors the proactive approach with combination of flood prevention, emergency response and rehabilitation practices...

Floods are natural hazards that become disasters when they interact with human society. Natural factors are the main cause of catastrophic floods. However, anthropogenic interventions have modified the natural characteristics of extreme floods. Recent catastrophic floods in Europe and in the USA have shown that human activities and traditional river engineering works may result in an increase in the frequency of extreme floods and have negative economic consequences. Human activities, especially changes in land-use patterns and engineering works, are a key factor affecting the impact and magnitude of medium and small-scale flood events. Two different attitudes to flood management prevail. The first is to consider the flood as a random natural disaster and to only respond on an ad hoc basis through emergency programmes. The alternative, favoured within the CABRI-Volga project, is to recognize that floods are recurring phenomena and to adopt a proactive and strategic approach including combination of mitigation measures with emergency response and rehabilitation. Equally important is incorporation of disaster risk reduction into sustainable development strategies. Technical solutions alone, such as dams and dykes are not adequate to ensure human security in a long term. Structural and non-structural measures should be integrated and considered at the same time, instead of one after the other. Coordination, integration and packaging of a variety of response policies, measures and tools are essential for living with floods.

14. Local population needs to be prepared, but not scared of a coming flood…

There is a growing understanding today that it is important to raise awareness, particularly among people leaving in flood prone areas. Local population needs to be prepared how to act during disastrous events and how to prepare for them. It is to be an active force involved in real actions at all stages of flood mitigation. Practice shows that information exchange at all levels, cooperation between local authorities and the public in development strategies for integrated flood management is essential. Public participation is especially well developed in the Netherlands, where the way of life and the perception of risk have been addressed within integrated flood risk reduction approaches. In contrast, in Russia, although traditional knowledge of local population is very rich, the interactions in practice between the government authorities and the local public are at initial stage of their formation. Prevention of flood damages requires an organized, well-aimed and integrated cooperation of many different partners of administration and society. Besides early warning of population and raising its awareness about floods, the regular maintenance of infrastructure is a key element in enhancing security in local livelihoods against floods.

15. Usually major cities are better protected from floods than small towns…

Current practice worldwide shows that major cities are often better protected against floods than small settlements, and special focus should be made on problems the rural communities and small towns are facing. The case study from Greece on flood protection of small towns illustrates methodology for flood management based on multi-objective planning under risk Coordination of a variety of possible decision-making options is becoming of a particular importance. Alternative remedial structural and non-structural solutions are analysed to protect the inhabited area and important public buildings from possible extreme floods in a small town of Heraklion, Crete Island where a devastating flood occurred in 1994. After this extreme event the Organization for Eastern Crete Development (OANAK) financed a research project carried out by the Aristotle University of Thessaloniki. The use of engineering risk analysis and multi-objective decision-making under risk are considered as tools for (1) protection from extreme floods at small scale, and (2) floodplain management at the catchments scale. Distinction is made between the local scale of protection from floods and the catchments scale planning. On the local scale, protection measures are based on traditional techniques involving hydrological and hydraulic modelling of two-dimensional unsteady flows. On the catchments scale, a multi-criteria trade-off approach is used for choosing between different alternatives. By combining three structural solutions, five major alternatives are investigated. The main objectives for ranking these alternatives are a) costs and benefits, b) risk of failure, c) environmental impact and d) social effects. Alternative with 'regulation of the downstream part of the river + storm detention basin tributes network of T=30yr floods' appeared to be the most appropriate for satisfying the multiple objectives. The methodology can be applied to different water basins.

16. Reliable flood forecasting systems is an important component in flood risk reduction practices…

Recent large floods in Europe have emphasized the need for reliable flood forecasting systems. They are an integral element of flood risk reduction and they are extremely important for enhancing human security in the areas prone to floods. The example of the European Flood Forecasting System (EFFS) is presented. It is aimed at improving capacities of national water services with 4-10 day flood forecast, whereas warning time is generally between 0 and 3 days. Thus, it allows preventive measures to be undertaken, exposed population to be informed, water retention reservoirs to be emptied and additional emergency services to be prepared. The output of EFFS is a probabilistic assessment of the n-day ahead risk of river discharge accidence (n<10) for the whole of Europe at 5 km resolution. This output may be updated as the forecast lead-time is reduced. EFAS is a research project led by the EC's Joint Research Centre ISPRA, Italy and it is in a prototype phase of development. The model was applied to the 1995 Meuse River flood; the simulation of the event was developed in two steps. Cumulative distribution of the ensemble forecasts allows obtaining a good degree of precision for a lead time of up to 5 days, and then gives an idea of the probability of occurrence of an extreme event. The system is modular and allows adaptation in different river catchments. Other hydrological models describing the local hydrological conditions may be integrated into this system.

17. Indicators for assessment of global and local vulnerability and coping capacity of societies to floods are necessary for effective flood risk reduction…

Development, testing and application of indicators that assess vulnerability and coping capacity of societies to floods are important for effective disaster risk reduction measures. Some insights into theoretical fundamentals of vulnerability indicators are presented and they are combined with illustration of recent applications and results. Vulnerability indicator can be defined as an operational representation of a characteristic or quality of a system able to provide information regarding the susceptibility, coping capacity and resilience of an element at risk to an impact of an albeit ill defined event (flood) linked with hazard of natural origin. The usefulness of indicators in practice is determined by their success in identification, understanding the vulnerabilities to flood risks and their underlining factors. They are needed by decision-makers to enhance "knowledge for action". Practice shows that one of the most difficult issues relating to measuring vulnerability is collection of appropriate data. Development of vulnerability

indicators is a long process composed of several phases - from defining its goals, scope, selection criteria, set of necessary indicators to analysis of indicator results and performance.

In the last 5 years important initiatives and research projects were initiated to assess risk and vulnerability at global, national, sub-national and local levels. Two approaches are discussed to provide an overview of the current concepts: the first is the Disaster Risk Index (DRI) developed by UNDP for the global scale. In contrast, the second approach targets vulnerability and risk identification at the local scale adopted by the German Technical Cooperation (GTZ). DRI is based on a quantitative approach that allows comparisons between countries by building an index based on mortality; it has global coverage and a national scale of resolution. DRI is applied to cases of flooding, earthquakes and cyclones. GTZ shows a local disaster risk index approach using various variables. The Community-Based Risk Index developed by GTZ aims at identifying the vulnerability and the capacities of households and local communities to manage and overcome disasters, including floods. The BBC-framework ((Bogardi\Birkman\Cardona) addresses various vulnerabilities in the social, economic and environmental sphere. It is at the initial stage of application in Europe and Russia, including the Volga Basin rural households.

18. Flood protection and flood damage control requires high coordination and it is an essential part of integrated water management...

Present practices in flood protection and flood mitigation of Water Resources Administration of the Baden-Wurttemberg, Germany are discussed. This case illustrates the need for (1) tight institutional coordination and stakeholder cooperation in floods risk reduction, and (2) dealing with floods as a component of integrated water basin management. Approach and strategies of this German regional water management administration are based on the lessons learned from recent disastrous floods. They suggest that the priority objective is to reduce the damaging effects of floods, but not influencing the natural disaster. The former is far more complicated than tasks of hydraulic engineering, which are to provide technical flood protection. Prevention of flood damages requires an organized, well-aimed and integrated cooperation of many different partners at administration and society. Three coordinated sub-strategies are applied: 1) management of flood prone areas (land-use control and water retention), 2) technical flood protection (dams, dykes, river flood proofing, etc) 3) flood damage prevention (adaptation of constructions and buildings, flood preparedness and risk prevention through insurance).

In 2000, the German Ministry for the Environment and Transport formed a interdisciplinary working group (representatives of disaster control, municipalities, spatial planning associations, chambers of industry, water management authorities, insurance industry), which activities were very successful in Baden-Wurttemberg. It was quickly determined that flood hazard maps for all relevant areas were urgently needed. They serve as a basis to draw up precautionary and flood damage mitigation regional and municipal plans for the protection of humans and property, public and industrial facilities located in flood prone areas. Data is to be presented in an easy-to-understand form by the general public. This group also elaborated the “11-Point programme for flood damage mitigation” and “Guidelines for flood hazards and strategies for damage mitigation”. In 2003, the Water Management Association of Baden-Wurttemberg together with the federal authorities started the Flood Partnerships in order to establish an exchange of experiences on “Preventive Flood Damage Protection” between cities, municipalities and water associations with a focus on developing flood danger awareness among decision-makers and public. The Action Plans on Flood Defense are to be prepared jointly by municipalities and civil defense authorities in order to coordinate actions of all stakeholders in flood protection and prevention within a catchment area.

III. INSTITUTIONAL COORDINATION AND COOPERATION BETWEEN STAKEHOLDERS

19. In practice, the river basin management in the Volga is a ‘multilayered institutional pie’ compounding water governance…

So far, basin management approaches are not effectively applied in the Volga. *Technical and scientific* questions within river basin management (RBM) are mingled with *governance* issues. Moreover, the RBM application needs to be coordinated within broader socio-economic context in the Volga regions. Existing 'situational' economic, political and social factors significantly affect RBM performance turning it into a complex multidisciplinary problem. It is also a difficult *multilayered institutional* problem which is deeply embedded into national institutional context.

The existing structure of government authority and dissemination/coordination of functions vertically and horizontally between bodies involved in environmental risk reduction in the Volga Basin overlaps with RBM application. Current system of four basin management administrations 'overlaps' with existing administrative system, and particularly with the system of environmental bodies in federal districts (Volga, Central, South, North-West). It also overlaps with another 'layer' of administration, i.e. within the 39 federation subjects in the Volga Basin with respective environmental and disaster risk reduction authorities responsible for certain segments of the River. The lack of effective vertical coordination between local-regional-federal levels negatively affects integrated water management. Existing uncertainties in division of responsibilities between authorities of various scales are perfect means to avoid responsibilities in practice. The approach "one river basin – one governing body – one programme" is indicated as important for effective water management. New expectations for problem solving are connected with the new Water Code entry into force in 2007. However, the newly introduced system of basin councils is combined with the existing system of government basin authorities. The shortcoming is that within this new institutional design the *basin management* still overlaps with *administrative management* approaches within the same basin.

20. Many environmental programmes with good design and 'progressive' goals had been suspended during the 1990s in Russia because their performance had been poor…

Not only the Volga Revival (closed in 2004), but many other important federal environmental programs have been recently suspended in Russia. Most of them had progressive goals, but they were facing implementation failures. The core reason for shortcomings is usually not in the programmes' design, but is rooted within implementation stage. It is associated with programme management and coordination mechanisms applied in practice. Although the design of the Volga Revival programme was based on an integrated river basin management principle it did not produce the expected results. Practice showed that various coordination problems emerged. Vertical coordination between levels indicated at significant problems. Loopholes in mechanisms for coordination of resource allocations are considerable, while insufficient funding for programmes implementation has been in the core. Corruption and misuse of funds had been a significant barrier towards the success; in that context control of resource flows is crucial as well as transparency and accountability in every-day life. Mobilisation of regional and local capacities and resources is equally important; broad perspectives are opened with development and testing the new schemes and mechanisms of vertical coordination within the so-called 'priority national projects'. At the same time financing and resource allocation problems are common to many countries in Europe, and quite often they appear to be not just a technical problem, but a political one. Weaknesses of environmental programmes in Russia resulted from serious economic and social problems of the transition period in the nineties. Combination of recent results of national socio-economic reforms with innovations in legal framework in environmental management are expected to help significantly to solving implementation and coordination problems in the Volga Basin.

21. Building effective interactions within the triangle "government–business–civil society" is a challenge for effective water use and water protection in Russia…

The domain of establishing effective interaction between the authorities, business and civil society is still a *terra incognita* for Russia, and a lot should be urgently accomplished as existing coordination mechanisms are really weak. It relates to developing institutional settings, including legislation, incentive mechanisms, coordination of resource allocations, tools and methods for support of partnerships between stakeholders, etc. Nowadays, the RF government makes a

special focus on constructing new framework for interaction with the business community. Consolidating environmental responsibilities of business is of a particular importance for the Volga Basin. Among the important goals is the modification of existing environmental mechanisms in order to overcome the problem that only modern and rapidly developing enterprises are interested in compliance with existing environmental regulations and in adherence to the "polluter-pays" principle (PPP), installation of new environment friendly technologies, in their products' standardization, in building the 'green image'. At the same time many problems are associated today with small firms-polluters, municipal facilities and water services providers. The problem is how to encourage and integrate small and medium size enterprises into water conservation and water protection. In Russia, unfortunately, businesses do not get yet many incentives from the government either for environmental activities or for developing interaction with the environmental NGOs. As a result, the aggressive image of business is a benchmark of nowadays, and this situation will prevail until new institutional frameworks are introduced by the state.

22. Importance of business-public partnerships in the Volga is growing…

Today, growing attention is paid to establishing partnerships between civil society and business. Some, especially large companies in the Volga Basin perform the function of 'social responsibilities' that are coupled with 'ecological responsibilities'. They are involved in partial coverage of costs for dwellings for their staff, healthcare, education; Ammophos, for example, besides other social responsibilities supports the non-governmental centre "Drozd: Russian children are healthy". Such practice of social support is widely spread in the West. Unfortunately, 'charity' funds recently established in Russia by some large companies tend not to include 'environment' in their agenda (exception – Fund of Vernadsky supported by Gazprom) and some of them are directly involved in political issues. Building regular and stable partnerships between civil society groups with business is a promising avenue for the Volga Basin. Some environmental NGOs that are active in the Volga area (for example, "Dront" from N.Novgorod) are seeking their niches to establish cooperation and identify common interests with the business community in the Basin. Such approaches are based on the perception that "business is able to improve the environment" and develop its environmentally responsible image, while environmental NGOs can help businesses to change their behaviour to become environment friendly.

23. Local public awareness and action really matters for the Volga revival…

Although higher public awareness has been among the priority directions of environmental reforms initiated in Russia during the nineties, the public participation is still weak, and ecology has been receding to the bottom of priorities of the local public agenda. Although some environmental NGOs are active in the Volga regions, they are much less developed than in the EU. Under these conditions, mobilization of the public and problem pressure groups for water protection and conservation is a promising tool for the nearest future. New patterns of interactions between environmental NGOs and authorities are being gradually developed. For example, although Dront is sometimes regarded as oppositional to the government, it develops cooperation with authorities, and particularly with the regional environmental agency. Particularly important is establishing the dialogue between the public and authorities in the Volga regions and locales as there are many examples from current practices that public participation is very far from desired (see, CABRI-Volga D2 Report). Among the burning problems is establishing the accountability and transparency of local authorities before the local public in environmental problem solving. Building institutional capacities for regular interaction of authorities with the public, finding means for expanding public involvement in decision-making and in environmental action are the avenues for urgent actions of government officials.

24. Road Maps in the EU-Russia cooperation envisage twinning partnerships and learning from each other…

The EU is regarded among important stakeholders that can have an impact on the decision-making process in environmental risk reduction in the Volga Basin. Cooperation of the Volga regions with their counterparts in Europe and twinning partnerships are of a growing importance as proved, for example, by the Volga Vision and the Volga-Rhine project. The latter contributed to particular aspects of problem solving during the freshet floods on the Volga and its tributaries, to Volga hydraulic modelling, and assessing bottom sediments. Starting from spring 2005, the Road Maps in cooperation between EU and Russia were initiated. There is an opinion that common environmental space should be in the focus of a special Road Map. It should not be diffused within common economic space, although there are close and integral links between them within sustainable development pathways. Specific project proposals for building common environmental space and development of international twinning might be a backbone for common environmental space formation. Good practices and tools for coordination between stakeholders in environmental risk management in river basins can be exchanged and transferred between Russia and the EU countries. However, national conditions, cultural, economic, social, political peculiarities are to be carefully taken into account. There is also an opinion that 'packaging and transfer' of practices across river basins, or across national borders might be misleading. In that respect, the alternative possible option might be learning from each other in creating capacities and building preconditions that promote equal access, effectiveness, transparency, openness in water protection and conservation within river basins.

25. Water management authority in the Po River Basin, Italy is among the most concerned about involvement of stakeholders and local public in a dialogue, consultations and consensus-building...

Interesting evidence from domestic practices in Europe in coordination and stakeholder participation in river basin management is presented by activities of the Po Basin Water Board (PBWB), Italy. Among existing river basin authorities in Italy it is probably the most concerned about involving the stakeholders and the public residing in the river basin in consultations, dialogue, defining plans and selection of programming instruments for the river basin governance. It was established in 1990 and since then it has performed several initiatives to involve into decision-making both local public and private entities from the basin area that are characterized, of course, by a variety of interests relating to the river. In order to improve the quality and effectiveness of management plans for the basin it seeks to: a) coordinate and make optimal use of knowledge, experience and initiative of different actors; b) obtain public support, consensus and mandate for decision-making; c) reduce conflict and misunderstanding of interests; d) provide transparency of PBWB decisions; e) promote constructive dialogue between all stakeholders. Its membership includes representatives of local authority associations, agricultural and industrial producers' groups, trade unions, conservation organizations and natural parks, cooperatives, etc. The scope of its competence relating to environmental risk reduction in the basin includes a combination of regulatory and management activities to maintain the hydrographic network on the river, to protect water quality and rationalize water use, to reduce risk of floods and to regulate land use practices. Its experiences and lessons learned from practical actions can be taken into account Europe-wide and in the Volga Basin while developing the coordination mechanisms towards good water governance.

26. River Basin Councils – is an innovative tool for coordination and partnerships between stakeholders which has been introduced in Russia in 2006 by the new national Water Code...

Among the possible tools for the coordination of interest of multiple stakeholders, for the establishment of a dialogue between them, for the enhancement of their cooperation and for the solution of possible conflicts between water users, the *river basin authorities* such as *committees* or *councils* have gained an increased and worldwide recognition. River Basin Council type organizations are today common to different parts of the world following different institutional models. The above example of good practices in coordination between

stakeholders from Italy is "twinned" with an example from Russia. The system of River Basin Councils (RBC) recently introduced by the new RF Water Code is an institutional innovation for this country. RBC has similar goals, i.e. to promote coordination of interests, consensus and dialogue between stakeholders, and to involve them into decision-making related to water protection and conservation within a river basin. It also has a broad representation from various water-users, local NGOs, indigenous people and government of various levels. In contrast to a variety of regulatory functions of PBWB in Italy it has a consultative status within existing national administrative system of river basin management. Among important items on RBC agenda is how to promote in practice the local public participation in a dialogue and decision-making, which is still a weak segment in environmental institutional framework throughout the country. Among the problems related to formation of RBC in Russia is that there is no culture when the public or water users have influence on how water is managed. The RBC could be the first step in developing such attitude to water management. They are to provide an opportunity to overcome one of the biggest barriers in the country: by establishing a dialogue between local public and government officials. How the RBC system will actually be implemented in practice according to a framework established by the RF Water Code is still a considerable challenge to river basin management in the country, in general, and in the Volga Basin, in particular.

27. Coordination institutions in the Scheldt Estuary managed to promote a shift from a long standing bilateral water-related conflict between Belgium and the Netehrlands to cooperation and joint policy-making...

Interesting bilateral coordination water-related practices between the Netehrlands and Belgiium are illustrated by the 'Scheldt Estuary[5] case: from conflict to cooperation'. This region is a dynamic agricultural and industrial area, while estuary itself is important for navigation, fisheries and recreation activities. The Scheldt estuary has long been a source of conflict between the southern Netherlands and Flanders, Belgium as various conflicting interests of various actors in these countries relating to water-use and water protection exist. During several centuries a number of agreements had been signed between Belgium and the Netherlands and joint organs had been established to regulate and coordinate problem-solving. Among them has been the joint Technical Scheldt Committee (TSC) set up in 1948 to provide recommendations on water management and infrastructure and it is regarded as a turning point from bilateral conflict to cooperation and joint policy-making. Since 2001 the Netherlands and Flanders has been developing a joint long-term vision for the Scheldt estuary. They established the ProSes, the operational body for its implementation which successfully acts in coordination with TSC and the 'multi-stakeholder platform' (Consultative Committee of Advisory Parties). Among its initial tasks has been the elaboration of the development programme for the Scheldt estuary up to 2010 with wide participation of interested parties and local public. This development outline has three major foci: 1) flood protection, 2) optimum transport accessibility to the Scheldt harbors, 3) healthy natural environment. It does not address all water related problems: water quality issues are covered by the Internaitonal Commission for the Protection of the Scheldt (The Netherlands, France, Belgium).

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[5] The Scheldt Estuary is the downstream part of the Scheldt River Basin and it is situated in the northwest Flanders(Belgium) and the southwest of the Netherlands. The total area of the Scheldt Basin accounting for 21.8 thousand sq.km is divided between France, Belgium and the Netherlands; the length of the Scheldt river with its mouth in the North Sea is 355 km.

3. OVERVIEW OF CURRENT PRACTICES

3.1. Integrated Water Management

3.1.1. RESULTS OF CABRI EXPERT DISCUSSION

Introduction

This chapter of D3 Report is based on the CABRI-Volga expert discussion during the CABRI-Volga Expert Group Meeting in Nizhny Novgorod, 2005. Its emphasis is on existing practices in integrated water management within large river basins in the EU with a special focus on the Volga Basin. It synthesises the results of discussion underway within three CARBI expert groups: 1) river environmental rehabilitation, 2) sustainable use of water resources, and 3) river for connecting goods and people.

Integrated water management is a conceptual approach to water problems, planning and practice in water resources use and water resources protection and conservation. Typically this approach stresses three interrelated themes. They include: a combination of social, economic and ecological uses of water; cross-sectoral water management; and water management and institutions at various levels. From a very broad and complicated issue of integrated water management several topics had been in the focus of discussion during the CABRI first expert group meeting. All of them comprise structural elements of this comprehensive approach, and are reflected in this chapter.

The major accent of this chapter is on the following structural elements of integrated water management:

- Water quality regulation
- Mechanisms applied in river basin management
- Monitoring and data dissemination to stakeholders
- Multi-stakeholders partnerships for rivers rehabilitation
- Transport mobility and clean river transport

Current practices and problems encountered in application of integrated water management approach were discussed between the experts from the EU and Russia. They were evaluating both „good“ and „bad“ practices in the field, as well as possible solutions on how to make implementation process effective. Comparisons of experiences and lessons learned from domestic practices in these countries indicated useful and interesting results. Suggestions for enhancing coordination in river environmental rehabilitation, in basin management approaches, in transport mobility are based on experiences already gained from good practices and approaches applied by these countries.

WATER QUALITY

Standards (quality objectives) for water quality

Regulation of water quality in river basins and reducing possibilities of risks to human health and environment linked to water quality deterioration is a key element in integrated water management. Water quality standards, mechanisms used at various scales to provide meeting these standards and enforcement of their compliance in practice by all stakeholder groups is among primary concerns in good water governance.

Currently, the water quality standards in Russia are very high. As a result, they are difficult to comply with. Experts indicate that standards which are too demanding might appear ineffective in practice as they may be ignored because of being unrealistic. The practices and experiences in the EU and in Brazil in coordination of standard setting were summarized as: 1) design a

system of standards which 'fit into particular purpose'; 2) differentiate standards according to functional use of a water body (for example, for recreation or fisheries, etc.) 3) ensure coherence between standards applied to different water segments (e.g. surface water, or waste water) and 4) have a vision of a target to be reached in the future, but set realistic and attainable intermediate goals: build upon success as success motivates! It is important to move step-by-step from non-strict standards to more stringent ones. Furthermore, it is essential to design a system of standards according to functional purposes of water use (drinking water supply, fishing, recreation, etc).

Still, there is a number of institutional uncertainties in Russia regarding division of responsibilities and competences between various government bodies to set standards and to control their enforcement.[6] In most EU countries, one organization has the task to develop and set standards, while water management organs are responsible for meeting and compliance with targets set by a standard. Lessons from recent practices indicate that standards, legislation and enforcement are to be treated in an integral manner.

The Russian system for standards is presently being reformed along the lines similar to those outlined above. The question is how to ensure compliance with legislation and standards in a more effective way? What tools and mechanisms should be used? How to motivate users to meet the standards?

Though approved standards and norms of water quality exist in Russia, different methods are applied for measuring water quality in water industry and among other water users, which leads to incompatible results. Hence, it is essential to set up a unified set of water quality standards. They might vary across water basins and water-users, but meet the requirements of generic water quality standards. Organisations in charge of water supply to the population and other water-users are to be responsible for meeting the water quality norms.

Waste water discharges

Effective regulation and management of waste water discharges is among priority issues for many river basins. It is a crucial precondition for rivers environmental rehabilitation and for improvement or safeguarding water quality. Interesting comparisons can be made between existing practices in Russia and the Netherlands.

In Russia, the system of payments for sewage discharge (within and above the set limits) by particular polluters is fixed by the existing environmental legislation. However, implementation of this system is not efficient enough to provide incentives for polluters to make investments to modernize their technologies and reduce the pollution level.

In the Netherlands, licenses are given for sewage discharge. Fees are paid depending on pollution level; a fine has to be paid when limits are exceeded, and in severe cases court action is taken. In the latter case, it is possible that an industry has to close down. The taxes go into a fund which is used a) to give subsidies to enterprises to develop/implement improved technologies resulting in lower pollution levels and b) to fund enforcement and monitoring. In the Netherlands a long term perspective is taken: polluters know in advance that taxes will be increased in a period of for example 10 years. This means that actors can calculate whether investments in clean technology will pay off. Responsibilities for enforcement are clearly allocated. The Ministry has an Inspection body which assesses the functioning of the agencies responsible for enforcement. The Dutch system has thus a stepwise approach with incentives to invest in technologies for pollution reduction. Experts believe that some elements of the Dutch system are important to consider in the context of the Volga: the principles on which the system taxes are based, the combination of a long term perspective with the stepwise approach, the formation of a fund, the incentives to reduce pollution and improved institutional aspects.

[6] In Russia, there is an organ responsible for setting standards, i.e. Gosstandart. Bodies of Sanepidnadzor and the Ministry for Natural Resources (MNR) are responsible for controlling standards implementation.

RIVER BASIN MANAGEMENT

Basin management mechanisms in Russia

It is becoming a common practice in the EU and Russia that good water governance is based on basins management approaches. Basin management principles are Two Russian projects based on the principles of integrated basin management were presented and discussed: the Volga Revival Programme and the GEF Dneper Project. It was concluded that their approaches were grounded upon a strong scientific basis and some of their experiences can be regarded as interesting lessons for the Western Europe. However, it was indicated that the implementation phase of these initiatives had been rather weak. This was caused by a mixture of financial and institutional problems.

Improvement of water management in the Volga basin is essential. An organization, i.e. a special agency, or basin council with a clear mandate and responsibilities in water regulation of water use and water protection based on integrated river basin management principles is needed. It is to have an authority to provide coordination between various stakeholders and different administrative levels. Such an organ might bring together representatives from government authorities from various levels, including existing basin management administrations, from local communities and various water users. It might be also responsible for coordination and development of water quality standards based on a basin approach.

Within river basin management it is important to coordinate efforts across scales. Lessons learned from existing practices in Russia show that broader participation of the local level is of crucial importance. There is a need to increase involvement of municipalities in environmental management in general, and in water management in particular. Currently, the national institutional framework is enacted to provide broader competences to the local legvel of governance. It is important to develop regulatory mechanisms and incentives for coordination and partnerships between municipal and regional authorities in water basin management and to avoid possible conflicts between them. The situation relating to existing hierarchical levels in Russia is much the same as, for example, in the Rhine region. But in the EU countries, a greater responsibility is given to the municipalities than in Russia. A central government support exists and municipalities have a chance to represent public opinion and to address their concerns.

Some participants expressed their concern about suspension of the federal Volga Revival Programme despite interesting results from a number of its sub-programmes that had been coordinating practical actions within the basin area. It was suggested that the programme should be revived. It had been a big success in developing interaction and establishing links between the scientific community and industrial groups in the basin; it had contributed to creating common perceptions of existing problems and to finding ways to solve them.

Existing institutions and problems in the EU

In Europe, important new approaches to river basin management are outlined by the EU Water Framework Directive (WFD). The WFD is the legal framework to achieve the environmental objectives in all river systems in Europe. It prescribes a river basin approach and giving a comprehensive approach to protect all water in Europe on a common level. The first step is a large part of legislation that must be realised right down at the local level on the territory of the EU. The key features include good surface water and ground water, transitional water and coastal water and the reduction of selected chemical substances. These water bodies are required not only to minimize chemical pollution but must also achieve and maintain a “good ecological standard” (for surface water bodies) and a “good quantitative standard” (for groundwater). All states are responsible for protecting, enhancing and restoring their water bodies in accordance with these principles. There are also quality criteria and a time goal - 2015 is to be observed. Water protection should occur at a public level. Only one report and one management plan should be compiled per river basin. There is a clear timetable for action and implementation. In the EU countries non-compliance results in entailing legal action, and offending states are to be fined.

Some current implementation problems result from the following management problems:

- At present, ecological problems have lower priority compared to economic issues. There are limited financial resources which entails a 'suffering' environment. If ecological issues are not discussed in the media people lose interest, and politicans prioritize other issues. Therefore all stakeholders should be involved in ensuring that the environment is on the political agenda.

- Many stakeholders have to be involved in decision-making and actions, each of them with its own specific interests and objectives – public and private stakeholders, NGOs, private companies, municipalities, administrative departments. Many of them are not used to working together, or even worse, they don't know that they have to work together and don't know how to cooperate. This turns to be a really complicated system of cooperation partners and many problems accompany its realisation in practice. It is obvious that a situation where a wide range of government bodies and departments have to cooperate is not a simple one. They are used to have their specific priorities and financial resources. Very often they aren't willing to share power and funds. So it is really difficult to coordinate all actions which are necessary to achieve the objectives. Furthermore there is a lack of financial and personal resources for environmental protection in administration and in the communities.

MONITORING AND DATA EXCHANGE

Monitoring programmes

Current practice shows that within integrated water management the regular monitoring, data processing and effective dissemination of data is a key element in integrated water management.

Monitoring programs in the Volga basin were briefly discussed. In the past, monitoring had been well organized and coordinated. For example, all laboratories and monitoring sites applied uniform procedures, protocols and reporting standards that were established and coordinated by a central body. As a result, high comparability of data was achieved. This strong institutional framework, unfortunately, has been dismantled during the last decade.

Experts consider it to be very important to revitalize the monitoring infrastructure in the Volga Basin and adjust it to contemporary monitoring requirements. It is important to develop multi-level monitoring system (state, regional, industrial, etc.). Nowadays many private enterprises conduct their own environmental monitoring: often they are turning to be the main owners of updated environmental information, which is not made widely available to the general public and to experts; there are also doubts concerning its quality and reliability.

Producers of monitoring results are sometimes charging for access to data because of limited funding they have from the government. Introduction of special fees for monitoring, as it is done, for example, in Canada can contribute to problem solving: the fees are collected by the environmental agency and funds are used for support of monitoring activities. A similar scheme is applied by the Dutch system. Tighter links and coordination should be established between monitoring and decision-making, and monitoring data should be broadly used within decision-making processes in Russia in general, and in the Volga Basin, in particular.

In the Netherlands, a gap and disconnection exist between policy/decision makers and scientists who design and implement monitoring programmes. Monitoring programs are essential, but often they are considered as too expensive. Usually, they deal with different elements (water quality, ecology, chemistry), and different bodies are responsible for them. Most each decision-maker considers that an amount of information generated and supplied to him is too excessive compared to what he needs. As a result, the impression is created that considerable resources are wasted (so called, "data rich - information poor" syndrome). It is therefore essential that (representatives of) decision-making bodies are involved in defining what particular data sets are required. This problem seems to be less present in Russia.

Data sharing and dissemination

Problems of data exchange and cooperation received considerable attention in the discussion. Experts indicate that state bodies in Russia are often not too open to share information and data. In many cases data exchange between various bodies in Russia is hampered by a variety of problems, including the requirement to pay for data. It was agreed that integrated water management can be effective only if it is based on profound information, while bodies involved

in water management have to have unrestricted access to data. In addition, provisions have to be made to ensure an easy data exchange among all actors involved (e.g. glossaries with definition of terms applied in water management, data formats including names, abbreviations, units for reporting, etc.). The infrastructure required for reliable data processing seems to have been weakened over the past years, and renovation of data centers and laboratories in a modern setting is recommended.

Though Federal Service for Hydrometeorology and Environmental Monitoring (Hydromet) is identified as a leading agency responsible for hydrological data compilation, only a fraction of all data collected in the Volga Basin reach the Hydromet Data Centers. One of the reasons is introduction of data charges for its consumers, while the data sources prefer to deal directly with consumers. As a result, the information from different regions of the Volga basin is fragmented and it is difficult to get a complete picture. In contrast in Germany, the current practice is that it is essential to rely on time-series and spatial (every 100 m along a river) hydrometeorological, hydrogeological and morphological data for the effective management of rivers.

The situation may not improve as long as the system of data charges exists. This is the problem not only in Russia, but in many other countries as well. It is being discussed at the international level but without much success. The data is available and ready to be shared but not everyone can afford buying data. The quality of data collected by various enterprises and agencies is low as the methods of data collection and formats of their presentation differ and give incompatible results.

PUBLIC INVOLVEMENT

Data communication to the public

Communication to the public and broad dissemination of information that is presented in user-friendly manner is essential for proper water management. Many countries (excluding Russia) have ratified the UNECE Aarhus Convention and that means all public bodies have the right to access and publish environmental information. Circulating information is critical to mobilising public support in environmental problem-solving.

Very interesting examples from both Russia and Western Europe were given. All emphasized that there is a need to communicate in a way which laymen can understand.[7] In practice, this is very difficult. A Dutch study was presented as an example. In this study, public and experts were brought together. Both parties were asked to explain how they view water quality. It appeared that public and experts had a completely different perception of water quality terminology (public: focus on visual aspects as e.g. plastic bags floating in the water; experts: emphasize non-visible issues such as chemicals) and therefore did not understand each other. The debate was lively and interesting; both parties strived to communicate with each other.

How to share information with the public was discussed on the basis of the example of Astrakhan, which is located at the Volga Delta at the Caspian Sea. Local TV programmes are used to disseminate information on water resources related activities and other environmental issues among the public. Flood prevention is ensured by liaison with weather forecasters and the prognoses are shared with local media. Astrakhan has been successfully managing floods for a long time. Lessons learned are also shared with the public.

In general there is lack of awareness of the public in the Volga basin related to water quality and management problems. This is a result of a limited number of available mechanisms promoting access to the required information. Information presented is often biased reflecting only approaches of a particular interest group. According to a survey executed by NGOs in the Volga basin, only a minor portion of society has an interest in getting ecological information, although in general the public is not satisfied with the environmental situation. People are still rather inert and heavily rely on government action and protectionism.

The need was stressed to establish close links with mass media and make all water quality information easily accessible. This information should be presented in a form easily understood

[7] NGOs could play an important role in the interpretation of technical indicators and experts' opinions in a way understandable for the general public.

by the general public. Provisions for special support by NGOs should be incorporated into domestic legislation.

How to achieve multi-stakeholder partnerships

Establishing multi-stakeholder partnerships with broad public involvement is an important tool in integrated water management, including amelioration of water quality in the river basins. The key component, which is still weak in many cases, is participation of the local population.

There is not enough of local public awareness and participation in environmental problem solving. In the opinion of the European experts, the normative and regulatory approaches don't seem to be very effective in building such partnerships. Current practice indicates that the importance of environmental education and encouraging the society to appreciate the value of good water management are crucial. For example, there should be programmes to raise environmental awareness amongst school children. There are several examples in Europe (summer schools, green pack for school teachers) and in Russia (competition related to water resources management and summer schools). There are needs to have a universal curriculum that underscores the professional development related to environmental sciences and water resources management.

Measures for strengthening the relevance of environmental issues among public and in institutions should be taken into consideration; this principle should be applied across various time scales of the impact horizon. It means that measures with long-term impacts which affect all stages of the education system have to be complemented by measures with middle- and short-term impacts like awareness raising campaigns and the publication of acute environmental threats (e.g. the occurrence of pollution incidents) by the media.

Finally, it is observed that the Volga Basin, the backbone of the Russian economy, represents the largest river basin in Western Europe. The Volga River has a significant impact on the overall national development comparable to the Rhine, the Po, the Seine or the Vistula rivers in Europe. All involved parties and stakeholders of the basin area are challenged by an enormous responsibility for its sustainable development. They are committed to maintain good practice in their specific fields of work and good standards of cooperation in order to achieve specific and community goals.

TRANSPORT MOBILITY

Approaches

The river transport is among key water users. Integrated water management in river basins presupposes its cross sectoral coordination with other water users, promoting navigation and transport mobility for people and goods, ensuring that rivers are navigable and meeting ecological standards.

This chapter presents the results of discussion within CABRI expert group "Connecting Goods and People" on existing practices in promoting transport mobility in the EU and in the Volga Basin. The general scope of CABRI quest within this thematic area is on the following topics: 1) Intermodal freight transport[8], 2) Intermodal public transport networks and services[9], 3) Leisure mobility[10], and 4) Clean water-and land-transport in the EU and Russia[11].

[8] Intermodal freight transport: Aiming at sustainable transport development, water-borne transport represents an important alternative mode. Its competitiveness depends to a large extent on the availability of appropriate interchange facilities at strategic locations. The planning, financing and operating of such facilities and the corresponding transport services need to be discussed in the light of (inter)regional and local logistic patterns.

[9] Intermodal public transport networks and services: Ferry services could establish missing links in public transport networks within cities (across the river) and between cities (along the river). To this end, they need to be fully integrated with the land public transport system (train, bus). This leads to coordination requirements regarding financing, modal combinations (carriage of vehicles or bicycles), interchange locations, scheduling, tariffs and ticketing, marketing as well as information services.

[10] Leisure mobility: The Volga basin (especially upper Volga to Volgograd) as a leisure and recreation area attracts growing numbers of tourists. Against the backdrop of the rapidly increasing motorisation and extending leisure-mobility patterns in Russia, the impacts of such a development need to be anticipated, and targeted measures for a sustainable management of leisure-related transport flows into the river basin have to be designed and implemented.

The focus of discussion about existing practices and priority problems in transport mobility in the Volga Basin has been identified by the experts, and it includes the following:

1) Improve the urban mobility situation
2) Develop a unified Volga Mobility Master Plan 2010
3) Establish a coordination mechanism for passenger and freight transport
4) Reduce water pollution

Improve urban mobility situation

The most apparent signs for an urban mobility situation in need of improvement include air pollution in city centres (due to low engine standards) and congested public transport of low quality. Nevertheless, Russian experts identified a low level of awareness of the problem among the citizens. Further identified problems concerning the urban mobility situation included the update of transport layout vs. mobility needs (separation of cars and heavy vehicles; parking spaces, etc.) and a low innovation level of the transport development.

The Volga and other rivers in the Volga Basin are natural barriers to urban mobility, but also have the potential for being integrated as transport ways in the Public Transport system of a city. The water-taxi scheme currently implemented within the EU's CIVITAS Initiative[12] in Rotterdam serves as an innovative example. However, it needs to be considered that the rivers in the Volga Basin are frozen and hardly usable for transportation during several months of the year.

Further measures suggested and discussed during the meeting were:

- Modernisation of PT vehicles
- Subsidising policy-compliant operators
- Integration of coordination and management of PT services
- Uniform tariff & ticketing system
- Reintroduction of hydrofoils (METEOR)
- Priority lanes for buses
- Real-time control of all transport arteries

Develop a unified Volga Mobility Master Plan 2010

Why there is no integrated Mobility Master Plan in place for the Volga Basin? According to the Russian experts, no single organisation exists which would be able to develop such a plan, since each ministry that could be responsible for the Master Plan development and each territorial unit (which also enjoys some degree of independence) has its own interests.

In order to develop a unified Mobility Master Plan, coordination between policy fields and between territorial units has to be achieved. First steps in this regard were successful, including the Volga Revival Programme and the establishment of a basin-wide industrial council. The establishment of one coordinating organisation was discussed as well while the question

[11] Clean water- and land-transport: Transport and traffic in the river basin strongly affect the quality of air, water and soil through infrastructure construction and the emission of pollutants and noise. To reduce transport-related environmental impacts, a broad package of policies and measures needs to be discussed, ensuring integrated infrastructure and land-use planning, promoting alternative fuels and propulsions, enhancing modal shift, fostering the use of filter and mitigation technologies, as well as access restrictions or speed limits and corresponding enforcement.

[12] The European Commission's CIVITAS Initiative helps cities to achieve a more sustainable, clean and energy efficient urban transport system by implementing and evaluating an ambitious, integrated set of technology and policy based measures. See www.civitas-initiative.org .

concerning the effective perimeter (operational area of the master plan) of such an organisation remained opened.

Additional measures to facilitate the development of a unified Volga Mobility Master Plan include:

Overcome segmentation of power (regional, national, sectorial)

- Set clear targets
- Lobby at the national level
- “Matryoshka“ master plans
- Increase political weight

Establish coordination mechanism for passenger & freight transport

Russian experts stated that according to existing practices there are several water basin administrations the Volga Basin, but that they do not cooperate with each other, thereby leading to a de facto weak basin management. Any kind of conflict resolution is therefore deemed to be ineffective. This needs to be supplemented by effective cross-sectorl coordination.

The participation of all stakeholders (public, private, business, industry, etc.) in order to improve the coordination of transport was highly encouraged by the experts.

It was suggested to establish a coordination mechanism for passenger and freight transport or to go even further by considering a coordination authority beyond transport, including for example flood control, water use, water quality control, etc.

Reduce Water Pollution

According to some experts opinion the water pollution from vessels, for example due to spillages or caused by transporting hazardous goods, is the main problem for the Volga and other rivers in the Volga Basin. The high priority of this problem – at least compared to the other high-priority issues/problems identified – was not shared by the experts from the EU.

Causes for water pollution include wastewater from streets (in particular in the spring) and reservoir snow melting, but also pollution from small boats (spillage and engine fuel) and other vessels due to, again, spillages and the transport of hazardous goods. As also identified during parallel expert groups meetings in Nizhny Novgorod for other economic sectors and life situations (industrial pollution, sewage system failures, etc.), non-compliance with existing strict rules and the lack of an efficient monitoring system were identified as problems.

The measures to solve the identified problems covered a broad range of issues, e.g. awareness raising and training (including the police, to enable a better enforcement of rules and regulations), improvement of hazardous goods transports on the waterway, stimulation programmes for fleet modernization. In this context, the importance of inland navigation on the river Volga was briefly discussed and considered as low by the Russian experts. Nevertheless, beside the interest in experience with hazardous goods transport and fleet modernization, further similarities with inland navigation problems and solutions between the rivers Volga and Danube are obvious.

3.1.2. EXAMPLES OF GOOD PRACTICES

Introduction

This section of CABRI D3 Report presents four examples of current practices from the EU and Russia in application of integrated water management approaches in river basins.

The first example (*chapter 3.1.2.1*) is the **Volga Revival** national programme, 1998-2004 which has been among the most prominent coordination efforts towards environmental amelioration and sustainable development in the entire basin.

The second chapter (*chapter 3.1.2.2*) describes the **Volga-Rhine** international research project. It is a German-Russian interdisciplinary cooperative initiative aimed at enhancing and application of integrated water management approached in the Volga Basin. It combines water quality and water quantity studies in the Volga catchment. It applies experiences tested and results achieved within parallel studies in the Rhine.

The following example illustrates the **IKoNE: Integrated Water Management in the Neckar River, Baden-Wurttemberg, Germany** (*chapter 3.1.2.3*). It presents recent practices of the water management administration of this federal state in Germany in application of integrated management approaches in the Neckar River catchment area. It includes a combination of policies and measures related to (a) quality of the waterway, (b) structure of the waterway, and (c) flood protection. Cross-sectoral coordination and partnerships between stakeholders is the key feature of this initiative.

The next chapter contains the case-study (*chapter 3.1.2.4*) the **Elb DSS: Development of a Decision Support System for the Elb River Basin.** It illustrates current practices and tools used in linking the available scientific knowledge about river basins with decision-making. It shows that Integration of various models and data from various scientific disciplines and user-friendly communication to managers and policy-makers is extremely important, especially when it relates to multiple water uses. This project concentrates on combining the following issues: (a) water quality, (b) flood control, (c) ecology of floodplains, and (d) navigability of a river.

The final chapter in this section (*chapter 3.1.2.5*) is the **Volga: Application of Integrated Water Management to Water Protection in Riverside Areas.** It highlights some features of special institutional regimes established in Russia for water protection and conservation in riverside areas. Such tools as legal zoning of riverside areas, special regulations and norms, bans and limitations on certain types of activities, land-use planning, building regulations and others are in a focus of its attention.

3.1.2.1 THE VOLGA REVIVAL PROGRAMME

Nizhny Novgorod State University of Architecture and Civil Engineering

Introduction

The Volga Revival Programme[13], 1998-2004 has been among the most prominent national programmes aimed at environmental amelioration in the Volga Basin. This programme is regarded as one of the initial attempts in application in Russia of sustainable development principles. In a course of implementation some of its sub-programmes demonstrated interesting results in improvement of ecological situation and in solving a number of environmental problems. It has been a success in practical action towards coordination and cooperation among stakeholders in environmental problem solving within large river basins, especially in developing interaction between the scientific community and decision-making and in joint efforts of all federation subjects located in the Volga Basin. It envisaged application of integrated water management approaches in the entire basin area. Its design was grounded on cross-sectoral and multi-scale coordination. As a result, this programme is assessed by the experts as a unique example of institutional coordination activity grounded on strong scientific basis, but facing a number of implementation problems caused by a mixture of financial and institutional reasons. Its execution illustrated the gap between progressive goals and the results achieved in

[13] The full title of the target federal environmental programme is “Rehabilitation of ecological situation in the Volga river and its tributaries, restoration and preventing degradation of natural complexes of the Volga basin for the period up to 2010”

practice, which is quite common today for programming activities worldwide. Although its effectiveness can be evaluated as a combination of success and failures, it is regarded as a truly important lesson for future planning and coordination for sustainable development within the entire basin and for enhancing bottom-up initiatives in the field. It has contributed to creating common perceptions of existing problems and to finding means to solve them.

Programme profile

The Volga Revival was approved in 1998 by the RF government[14], while its preparatory and pilot (1994-1996) phases with respective institutional arrangements[15] had been underway since the beginning of the nineties. It was suspended by the federal government earlier than planned, i.e. in 2004. However, many interesting lessons and results in environmental problem solving in the Volga had been demonstrated in practice by its sub-programmes. Some experts are concerned about its suspension, and suggest that the programme should be revived.

This national programme has been a quintessence of the preceding multiple efforts undertaken from the beginning of the nineties by various stakeholders at different levels towards environmental amelioration in the Volga Basin. A number of regional and local projects, programmes and actions plans such, as for example, “Oka – Clean River”, “Volga Delta”, “Socio-cultural development of the Tver oblast – the Great Watershed”, “Development of economic complexes of the Great Volga region” and others had been executed. Several civil society initiatives had been undertaken at that time as well. For example, the public committee ‘Save the Volga’ was involved in broad dissemination of information about the alarming ecological situation in the basin and in promotion of public awareness. The Ecological Parliament for the Volga Basin and the Northern Caspian established in 1990 committed itself to finding practical means to ecological problem solving and to support of the local public rights for good environment; it was closely involved in development of the Volga Revival Programme. In 1993, the project of Volga Basin Agreement was developed (Komarov, 1996).

Coordination

The Volga Revival was a unique example of coordination activity: it has been coordinating practical action within the entire Volga Basin. Among its participants had been administrations of the 39 federation subjects situated in the Volga Basin, about 11 ministries and agencies and over 60 research institutes and organisation. It was coordinated by the RF Ministry for Natural Resources; its scientific council has been headed by professor Valentin Naidenko, NNGASU. The Volga Revival Directorate has been located in Nizhny Novgorod.

The major feature of the Volga Revival design has been the application of diversified coordination tools, and it is regarded as a considerable success in programming. Its main environmental goals were to be achieved, *first,* through the use of integrated water management approaches and, *second,* through application of basin management principles to the entire Volga. *Third*, it attempted to combine environmental problem solving with socio-economic development within the basin. *Fourth*, vertical scaling and coordination of actions at federal, regional (republics, oblasts, kray), local and municipal levels was applied, and corresponding territorial programmes were developed in most federation subjects in the Volga Basin using the same conceptual basis. *Fifth,* cross-sectoral coordination was foreseen. *Seventh*, Volga Revival had a coordinating status towards other government science and technology prorgammes and action plans in effect within the basin area.

[14] RF government decree “On federal target programme ‘Rehabilitation of ecological situation in the Volga river and its tributaries, restoration and preventing degradation of natural complexes of the Volga basin for the period up to 2010’”, N 414, 24 April 1998

[15] RF government ordinance “On development in 1994 of the project for the Volga Revival federal target programme”, N 574-p, 23 April 1994; RF government decree “On priority measures towards rehabilitation of ecological situation in the Volga river and its tributaries, restoration and preventing degradation of natural complexes of the Volga basin for the period up to 2010”, N 95, 2 February 1996

Development of coordination mechanisms for resource allocation has been at that period a step forward in seeking the models of interactions between various levels of administration in resource mobilization. Lessons learned from their application by the Volga Revival contributed to new current designs of financial transfers across levels which were adopted recently by the 2006 Water Code (for details see, CABRI-Volga D2 Report). The Volga Revival was budgeted by objectives and by ministry or administration. The total budget was 140 billion 1998 rubles of which the federal budget was to cover 8 percent, the regional and local administration - 57 percent, and other sources - 35 percent. In practice, shortages in funding and failures in resource mobilisation had been among the reasons for abandon of the Volga Revival.

Goals

Volga Revival overarching goal has been in 'improvement of ecological situation and conservation of natural complexes of the Volga Basin for creating favorable conditions for its population' (Naidenko, 2003). The priority was given to the programme measures which provide improvement of human health, well-being and quality of life.

Volga Revival envisaged activities within the following 10 major directions and sub-programmes:

- protection and conservation of water bodies;
- enhancing fisheries productivity in reservoirs;
- development of basin wide environmental monitoring and GIS systems;
- improvement of human health, reduction of water quality depended deceases;
- environmentally benign industrial development;
- environmentally benign development of agriculture;
- municipal development, including municipal water, heating, sewage management;
- forest and biodiversity conservation and natural protected areas;
- continuous ecological education, awareness and information;
- legal, scientific and technological infrastructure.

The structure of its activities is presented in the figure below.

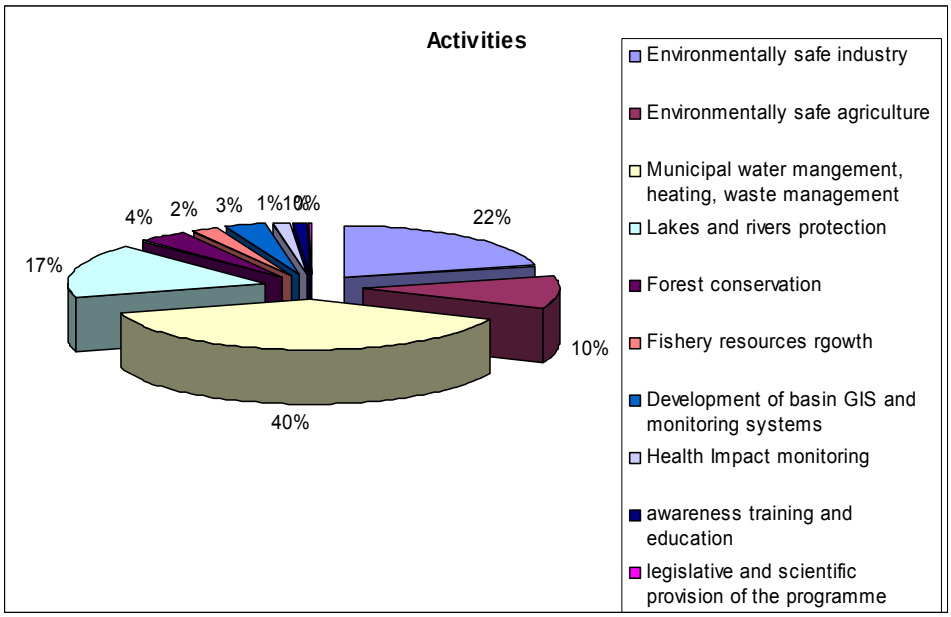


Fig. 1: Volga Revival: structure of activities

The originally foreseen final results and quantitative targets of the programme are summarized as follows:

- Termination of untreated wastewater discharge into natural water bodies;
- Reduction of sewage water discharges by 30 percent ;

- Providing safe drinking water supply;
- Reduction of specific drinking water consumption by 20 to 25 percent;
- Reduction of consumption of drinking water for industrial use by 35 to 40 percent;
- Increase productivity of fisheries in Volga-Kama reservoirs by 2;
- Extension of migrating and semi-migrating fish reproduction by 30 to 40 percent;
- Realisation of optimum operation regimes on the reservoirs of the Volga-Kama cascade;
- Forming a network of special nature protection areas in the Volga Basin up to 3 percent of its total area;
- Upgrading and construction of storm water collection systems in towns and big industrial sites;
- Reduction of air pollution from stationary sources by 1.9 times;
- Reduction of motor transport air pollution by 1.7 times.

Unfortunately, many of its targets could not be met, partly because of the Volga Revival early suspension, but partly due to high ambiguity of some of them. According to expert assessments the overall design of the programme and its targets were good as general objectives. There was certainly a kind of vision behind this initiative, but it was not clearly formulated and therefore it was not always clear what socio-economic purpose or result of the proposed measures was (Volga Vision, 2004).

Implementation results

Improvement in water quality has been among the priority objectives of the Volga Revival. A variety of practical action towards this goal has been undertaken. Comprehensive summary of measures undertaken within each of its subprogrammes is compiled in the monograph of Valentin Naidenko (Naidenko, 2003).

For example, in 1997-2003 fifty four water treatment plants (total daily capacity 646 thousand cubic m.), mostly the municipal ones, had been put into operation. A number of small towns had put an end to direct untreated waste water discharge into the Volga. During the existence of the Volga Revival the construction of about 80 municipal treatment facilities was commissioned in different cities, such as in Ufa, Kazan, Saratov, Perm, Togliatti, Vladimir, Yaroslavl and Kaluga. In 13 regional centers of the Nizhny Novgorod oblast new municipal treatment plant were put into operation or renovated. For example, new modern plants were built in Gorodets (17 thousand cubic m./day), in Pervomaisk (7 thousand cubic m./day), while in Arzamas the treatment facility had been modernized (150 thousand cubic m./day). In general, during this period the construction and upgrading of waste water treatment facilities in the basin contributed to daily waste water discharge reduction up to 3.52 million cubic m.

In a course of the Volga Revival the new programmes of water savings had been introduced at a number of industrial enterprises. Reduction of water consumption as a result of closed-cycle water supply systems installation led to decline of wastewater discharges into the Volga and to its water pollution reduction. For example, emission of untreated wastewaters into the Oka river by GAZ automobile plant, the largest polluter in Nizhny Novgorod, were considerably reduced. Before the programme the GAZ share in water pollution of the Oka and the Volga had been up to 50-90 percent, while after modernization it has declined lower than 50 percent. The renovation has been a part of the Volga Revival prgramme financed by GAZ.

During the existence of the Volga Revival programme the total wastewater discharges had been significantly reduced in the Volga Basin. According to official statistical data during the 1995-2005 period the wastewater discharges declined by 15 percent; their dynamics is presented by the figure below.

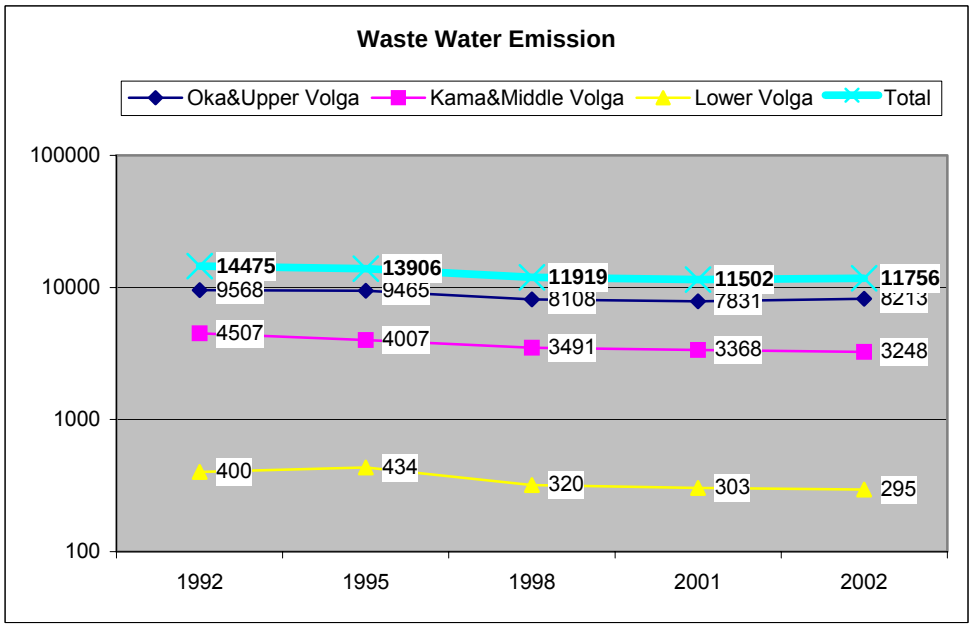


Fig. 2: Volga Basin: dynamics of wastewater discharges, 1992-2002

The wastewater discharge reductions during the Volga Revival programme were attributed partly to measures undertaken within the programme, but partly to decline in industrial production during the severe national economic crisis of the nineties. However, the rates of emission reduction had been more modest than decline in industrial production which has been up to two fold.

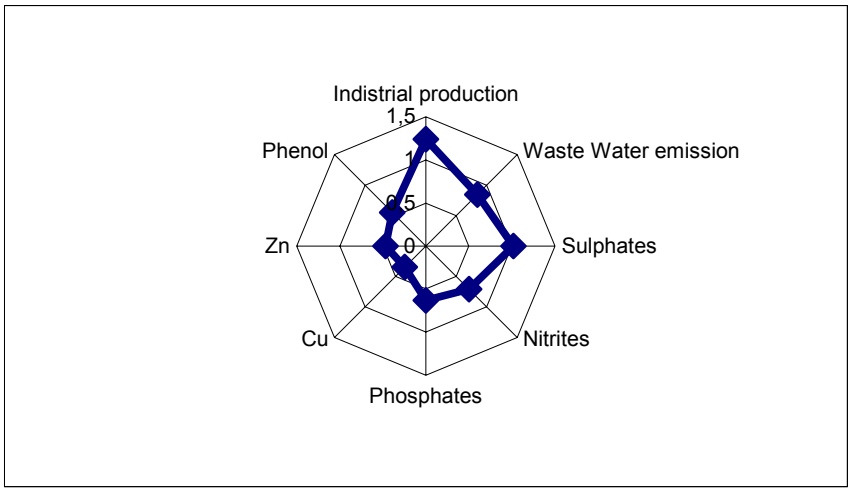


Fig. 3: Volga Basin: dynamics in industrial production and water discharges, 1995-2002

3.1.2.2. THE VOLGA-RHINE PROJECT

Karlsruhe University, Germany

Introduction

Anthropogenic pressures, conflicts of interests among various water-users, complex interactions between economy and ecology in the Volga Basin requires integrated water management within the entire basin. In its turn, there is a need in interdisciplinary research which is not limited only to natural processes. A variety of economic, historical, cultural, social factors are to be taken into account within an interdisciplinary study of such important ecological system as the Volga. The research results are to help formulation of concrete concepts for sustainable use of natural

resources of the Volga. The Volga-Rhine project is a German-Russian joint research project on the management of water quality and water quantity in the Volga River Basin. This bilateral cooperation project is based on the agreement on „cooperation in the field of water research and environmental technologies“ between the German Federal Ministry of Education and Research and the Ministry of Industry, Science and Technologies of the Russian Federation. The project is funded by these two bodies. The national Volga Revival Program which started in 1996 gave an impetus to the idea of the Volga-Rhine Project. The Volga – Rhine project aims at the improvement of the ecological situation of the Volga River and its tributaries. The experience gained in the Rhine Basin serves as a basis for the research exchanges and technology transfers. The project started with the pilot phase in May 1998, and its operational main phase was underway from November 2000. The project will be finished in December 2006.

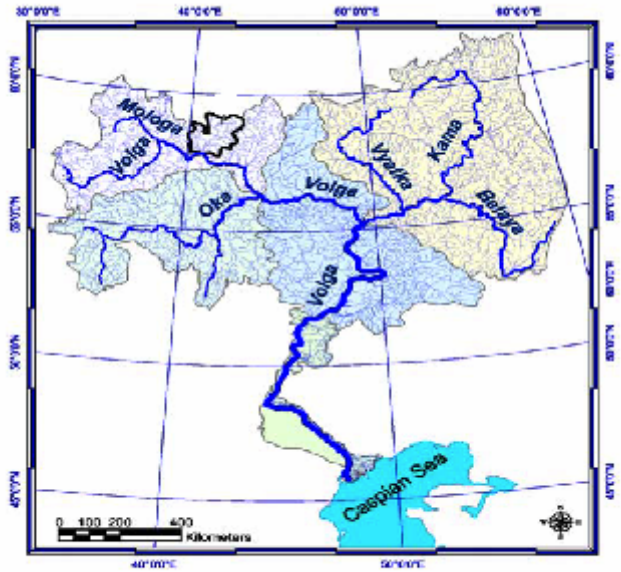


Fig 1.1. The Volga catchment

Fig. 4: The Volga River catchment area

Partners

The partners of the Volga-Rhine project are listed below. The first four partners are involved in project management and coordination.

- University of Karlsruhe, Germany
- State University of Architecture and Civil Engineering, Nizhny Novgorod
- State University of Life Sciences, Moscow
- Scientific Research Institute of Hydrotechnique and Melioration, Moscow
- University of Applied Sciences, Fulda
- „MC-Building Chemicals“ Germany
- “Voith Siemens“
- “RAO UES”
- “WBW”, Baden-Württenberg
- “Ingenieurgesellschaft Bauwerke GmbH“, Karlsruhe

Objectives

The thematic focus of this project is the water quality and water quantity in the Volga Basin. Concepts for an integrated river management and a sustainable use of the natural resources of the Volga catchment are expected to be an important outcome from this project. Capacity building and technology transfers are among its goals. The cooperation with the International

Commission for the protection of the Rhine, ICPR, (http://www.iksr.org/) and the IkoNE project (see, *chapter 3.1.2.1*) (http://www.ikone-online.de) are underway and they are very productive.

Project structure

The Volga-Rhine project is divided into seven subprojects. Within its subprojects I-III the research relating to the *water quality* is carried out. Part IV is divided into four subprojects and they deal with the management of *water quantity*.

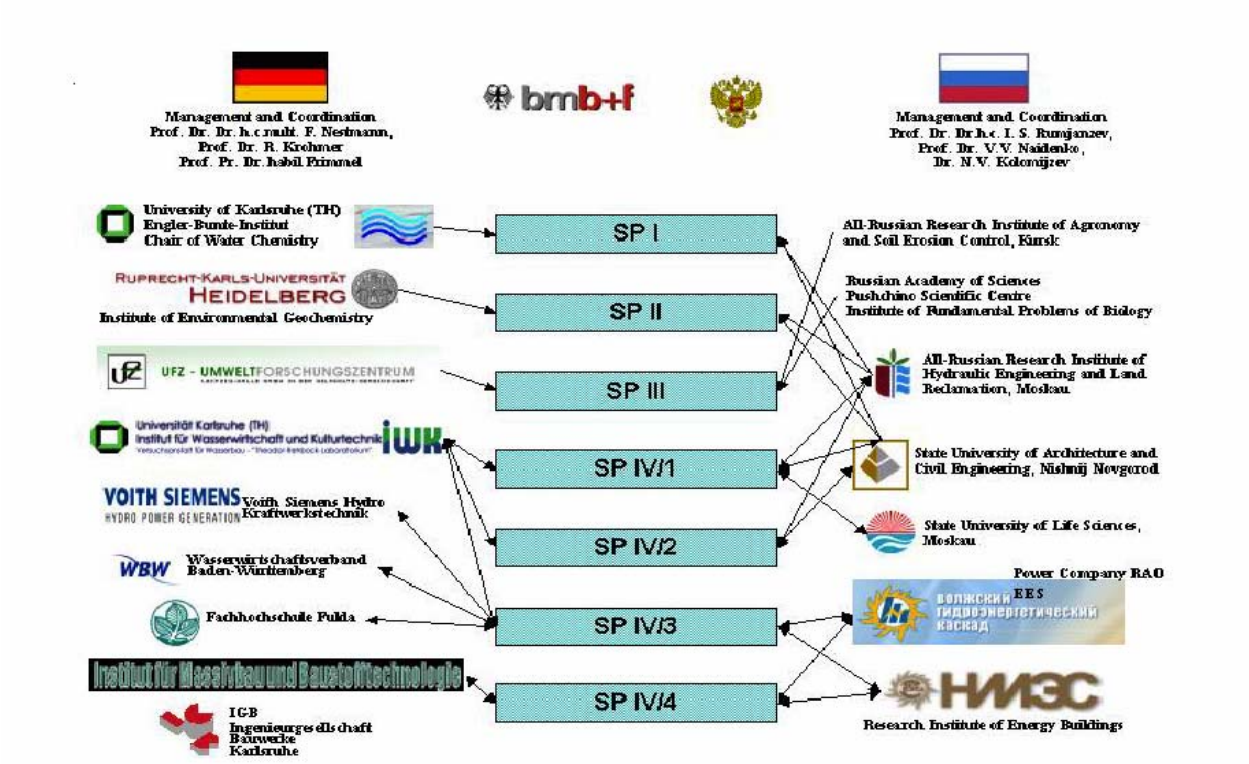


Fig. 5: The Volga-Rhine project structure

Subproject I

Effects of congested areas, damming and tributaries on the water quality und drinking water supply in the Volga area – project study Nizhny Novgorod.

Within this subproject the water quality of the river Volga, especially around Nizhny Novgorod has been investigated. Systematic studies on the impacts of municipal and industrial effluents, damming (Gorki, Cheboksary) and tributaries (Oka) on the water quality of the Volga have been carried out. The water works have been checked, and the quality of drinking water and its dependence on the river water quality have been investigated. Additional studies were focused on compilation of the water quality data within the entire river. The aim was to establish a quality card of the river and to characterize the water-supply situation. The results are used for developing recommendations for water quality amelioration and protection measures, and to stimulating the technology transfers.

Subproject II

Non-organic and organic pollutants and nutrients in the Volga sediments–verifications, sources, effects on aquatic ecological systems, particular on eutrophication effects and the processing of drinking water from the river

Studies of the sediments quality in the Volga had been undertaken; the origins of pollutants and their effects on the aquatic system have been tracked. The following substances, which

accumulate in sediments (due to their low water solubility, or their low biodegradability) have been investigated:

- heavy metals, their compounds and radio-nuclides,
- chlorinated hydrocarbon (pesticides, polychlorinated biphenyls, dioxins, furans),
- polycyclic hydrocarbon,
- hydrocarbons derived from petroleum.

Furthermore (degradable) phosphorus compounds, which serve as indicators for the trophic state of the waters, have been investigated. These compounds can be eutrophic, if they are re-dissolved.

Subproject III
Quantification of erosive discharge of nutrients in river catchment area and development of sustainable land-use concepts

The purpose of this subproject is the characterization of the nutrient discharge, especially of phosphate, to compare and assess the effects of melting snow in winters and heavy rains in summer time. These results and the development of a scenario have been the basis for a reconstruction concept. For this purpose the model system ASGi has been used. ASGi combines the advantages of the water supply model WASIM with the substance budget model AGNPS, and it is suitable for the Volga Basin. The model has been developed and fit to the local conditions.

Subproject IV/1
GIS-supported hydrodynamic-numerical modeling for flow simulation of the river Volga

The reservoirs Rybinsk (Volga-km 310 – 430) and Gorky (Volga-km 430 – 855) were analyzed with the help of hydrodynamic-numerical models and results were combined with a geographical information system (GIS). The digital elevation models constitute a substantial element of GIS. It is created from all available elevation information compiled from different data sources, especially from topographical maps and navigation maps, including information about the river channel and its water depths. Within the project adapted methods to process the different data formats were developed, respectively enhanced and techniques for validation were worked out.
The necessary geometry data for hydrodynamic simulations in form of river cross sections and retention cells were extracted out of the digital elevation models and combined with hydrodynamic numerical models. A one-dimensional unsteady simulation method is used, which allows to calculate complicated meshed and branched systems.

The methods of GIS and flow simulation were enhanced and combined with the Decision Support System “DSS Volga”, which integrates the depicted models in a compact way and allows users without detailed knowledge to use them. Thus, it constitutes a powerful, multi-purpose tool for the practice in water resources management.

Subproject IV/2
Hydrological modeling of the catchment for the forecast of the flow and pollutant transport in the river channel

Due to various demands within the river system of the Volga the integrated water management approach is required. It is necessary in order to provide decision support system for development of sustainable concepts for the use of enormous water and energy resources of the Volga. The Volga-Rhine project suggests that it is necessary to know the natural boundary conditions, especially the flow process. Therefore, models for the statistical description and for the forecast of flow (precipitation-runoff simulation) at various scales and catchment sections of the Volga Basin were applied. In combination with a GIS-based spatial data management two complementary approaches („top-down" und „bottom-up") were applied. The results serve for an operational flood forecast system and for the modeling of mass transport in river channels. An example of the latter has already been demonstrated for a fictive scenario in the Kostroma

River. Finally, interfaces to other disciplines regarding cooperation in the joint research project (especially hydraulics and modeling of mass transport in catchments) have been considered.

Subproject IV/3
Exploitation of Volga Cascade - energy sector and ecology

The objective of this subproject is to outline strategies to optimize the management of the Volga cascade in terms of enhancing interactions between energy production, flood protection and ecology conservation. The cascades Cheboksary, Rybinsk and Gorky were exemplary tested. A hydrodynamic numerical model and the regulation, control and automation of the cascade were used as tools.

The use of numerical models and methods for automated operation of barrages and hydropower plants has technologically become possible in recent years. Existing simulation programs for analysis and development of operation strategies for barrages proved to be valid and useful in various applications. Nevertheless, their potential for upgrades, extension and integration into modern development environments in combination with other simulation programs in interdisciplinary tasks is very limited. Especially in automation engineering powerful tools for the development of conventional and non-conventional methods and technologies already exist, but they are hardly compatible with existing hydrodynamic-numerical models.
For the development and implementation of new, future-proof advances as well in automatic control engineering through the use of new automation algorithms as in simulation technique, a modern, seminal and effective simulation tool was needed. An important aspect was the possibility of integrating the new developed operation strategy as well as connecting the hardware controller with the implemented strategy to the hydrodynamic-numerical model.
The development of a modular, sustainable and complete simulation system for the management of cascades of hydro power plants was the result of this subproject. This includes the development and implementation of an unsteady one-dimensional hydrodynamic numerical method in C++ for integration as S-function block into the powerful, science and engineering oriented development environment of MATLAB/Simulink and the linking with automatic control functions.

Subproject IV/4
Reinstatement concepts of hydraulic structures for the improvement of the operational safety

The economic and environmentally sound water quality and quantity management of the river Volga and its watershed requires fully efficient and reliable hydraulic engineering constructions, such as dams, locks, spillways and power houses. However these structures exhibit damages in many areas. Thereby the efficiency and most notably the reliability are partially severely limited.
Hence, an economically and environmentally sound water management cannot be guaranteed any longer. In addition to that, former restoration measures often turned out to be of low durability.

Against the background of this the aims of the project were to enable a durable rehabilitation of the above named structures as well as the supply of means for an ideal maintenance concept, taking into account the economical and technical possibilities in Russia.
The restoration concept based on an extensive survey conducted at the hydroelectric power plant ”Wolzhskaja“. The main elements of this survey consisted of the registration of history, the utilization, exposure of the structure and/or of structural members as well as examinations conducted on specimens obtained from the structure (rating of the actual state of the structure). The discrepancy between the actual state and the target state forms a prerequisite for the development of applicable restoration concepts as well as it is the basis for a durability prediction. This durability prediction of a structure or its components is carried out on the basis of probabilistic methods, regarding the scattered characteristics caused of utilisation and environmental exposures as well as the resistance of structures and components, with also scattered characteristics. Simultaneously the age (durability) is specified, at which the stresses

of the construction or component become equal to or greater than the existing resistance of the structure or component (ultimate state) with a certain, predefined (admissible) probability.

On the basis of laboratory examinations and examinations on the structure and after the clarification of the relevant deterioration mechanisms restoration concepts for the hydroelectric power plant „Wolzhskaja“ have been developed, which are specially fitted for the problems of the power plant. The mechanisms which leads to damage the hydraulic engineering structures made of reinforced concrete are mainly the corrosion of the reinforcement due to carbonation of the concrete boundary zones and freeze-thaw attack together with a high saturation and the abrasive stresses by means of water and bed loads. The damaging processes have been formulated as deterioration-time-laws in dependence on the actual environmental influences and the existing concrete resistance. They form – embedded into a probabilistic safety concept, already existing in main features – the basis for a durability prediction and for an economically sensible design of maintenance and restoration measurements, respectively. The development of durability prediction models for hydraulic engineering structures is a significant innovation worldwide.

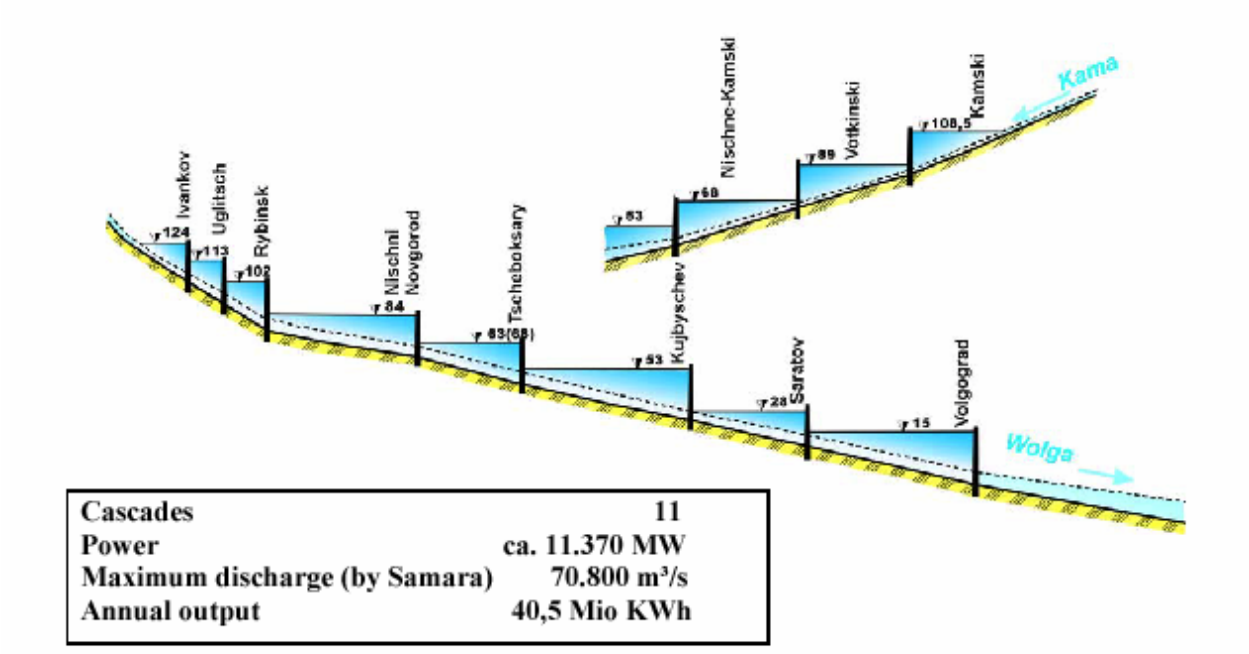


Fig. 1.2: Longitudinal section of the Volga cascade

Fig. 6: Longitudinal section of the Volga Cascade

Project results

The main outcomes of the project so far are:

- Experience in integrated river basin management.
- As an instrument of river management, a decision support system (DSS) including a digital terrain model and a hydrodynamic numerical model was developed for the section between Rybinsk (Volga km 720) and Cheboksary (Volga km 1184) (subproject IV/1).
- Identification of the complex oscillation structure of the flow of the Volga River and its main tributaries and development of simulation tools for the precipitation-runoff in the Kostroma catchment: This can serve as a basis for an operational flood forecast system and for the modelling of mass transport in river channels (subproject IV/2).
- The developed estimation models for the assessment of the remaining service life of reinforced concrete structures will be an important device for a selective economical sensible design of restoration measurements (subproject IV/4).

- In the course of the project an intensive cooperation with the Russian project partners has grown and an active scientific exchange has evolved. Thus a knowledge transfer in both directions was established concerning GIS-techniques, hydrodynamic numerical methods, general working manners and much more.
- Within the scope of this project, a basis for numerical simulation of barrages and cascades of hydro power plants linked to automatic control functions was established and applied to the reservoirs of Tscheboksary, Gorky and Rybinsk. The consistent and sustainable simulation tool can be used for discussions of energy production and ecological issues as well as for the development of practical application methods.
- Capacity building.
- Establishment of the Voith company in Moscow.

http://www.wasserchemie.uni-karlsruhe.de/Deutsch/WolgaRhein/index.html
http://www.internationale-kooperation.de
http://www.iwk.uni-karlsruhe.de
http://www.iksr.org/)
http://www.ikone-online.de

3.1.2.3 IKoNE: INTEGRAED WATER MANAGEMENT IN THE NECKAR RIVER, BADEN-WURTTEMBERG, GERMANY

Karlsruhe University, Germany

Introduction

In Germany, the federal state governments and local authorities (cities, districts and municipalities) are responsible for enforcement of water regulations. The Water Resource Administration of the federal state Baden-Wurttemberg[16] reflects the three level structure of the state administration in the country. IkoNE project “Integrating Conception of the Catchment Area of the Neckar River” is an example from current practices of this Administration in integration and coordination between various directions of water management within a single river basin, as well as in cooperation between various stakeholders. It is performed in the Neckar River Basin. The IkoNE co-ordinates river-related measures - structure and quality of the river, sewage regulation, flood protection, - with other local and supra-local plans and integrates other sectors planning. Flood mitigation is a part of integrated approach to water management within a catchment area of a river basin, and this approach is adopted in practical activities of this state. The Neckar is the biggest river flowing within the state from its source to its mouth. Its catchment area of almost 14,000 km^2 is also located almost entirely in the State of Baden-Württemberg, and half of the population of this state live in this catchment area.

[16] The state of Baden-Württemberg in Germany is one of its 16 federal states. It is subdivided into 4 Regional districts, each of them having a Regional District Authority. The city of Stuttgart is the legal seat of the State Government, the State Departments and one of the Regional District Authorities.

Administrative Structure and Coordination in Water Management

Germany has a federal structure, which means that governmental tasks are shared between the federal and the state governments. The constitution envisages that the federal government has the right to issue framework regulations relating to water resources. The state governments then have to fulfil these frameworks by passing their own state legislation, and they are also entitled to add supplementary regulations.

Enforcement of all statutory regulations concerning water resources, including federal legislation, is the responsibility of the state governments.

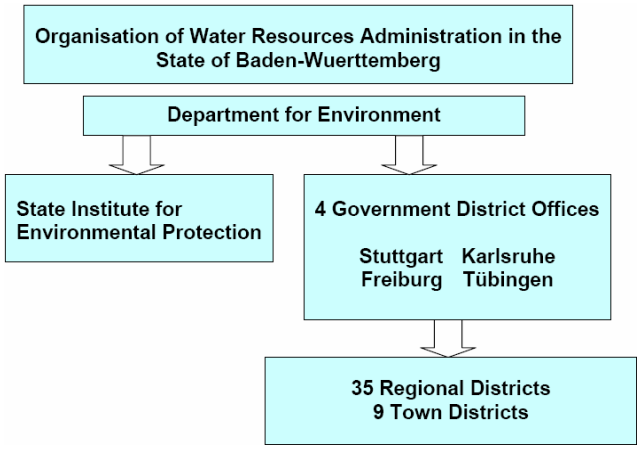


Fig. 7: Collaboration of the Federal and the State Governments

Administrative structure and Water Resources Administration of Baden-Württemberg

Only the state governments and local authorities (cities, districts and municipalities) are responsible for the enforcement of water resources regulations. The water resources administration in Baden-Württemberg reflects the three-level structure of the state administration in general.

Highest Level: Environmental Department with a section for Water and soil.

Tasks: Management of water resources administration and general administrative procedures.

Middle Level: Four Regional District Authorities, each of them with a section for pollution control and water resources management.

Tasks: Water resources management on a regional basis, significant legal procedures in this sphere, administrative procedures, counselling services, funding of water resources measures taken by cities and amalgamations of cities

Lowest Level: This level is formed by 35 districts and by those 9 big cities which constitute districts on their own.

Tasks:

- process water resources legislation, provide specialist advisory services, monitor surface waters and affluent run-off into these
- ground water protection, water supply
- sewage/waste water disposal, protection of surface waters
- waste management, waste treatment techniques
- surface waters, hydraulic engineering, flood protection
- land protection, restoration of contaminated sites

Water supply and sewage disposal are part of the tasks of the municipalities. In order to cover these costs the water-users have to pay contributions and fees to the municipal administrations. They are responsible for the preservation of smaller surface water bodies which they own. In Germany, associations play an important role. Usually voluntary but in part also set up by the Federal State, they are amalgamations of municipalities regulated by contracts. Their task is to manage specific water resources problems exceeding municipal boundaries, e.g. water supply, sewage treatment, preservation of surface waters and flood protection.

IKoNE – Integrating Conception of the Catchment area of the Neckar River

IKoNE is an example of the activity of the Water Management Administration of Baden-Württemberg. It integrates other partners and coordinates technical procedures in a catchment area - not only for flood protection.

The Neckar is the biggest river flowing within the State from its source to its mouth. Its catchment area of almost 14,000 km^2 is also located almost entirely in the State of Baden-Württemberg, 50% of the population of this State live in this catchment area.

The Minister for Environment of Baden-Württemberg has given the go-ahead for IKoNE in 1999 which consists in a river-basin-related action framework concerning water resources management for the entire catchment area of the Neckar river including its affluents. Thereby planning and acting of water resources management in the catchment area of the Neckar river are provided in a synoptic way, taking into account also the requirements of the European Union framework Directive about water.

Significance:

•50 % of the resident population of Baden-Württemberg

•40 % of the surface of Baden-Württemberg• Land use legend at the right and text of map non readable

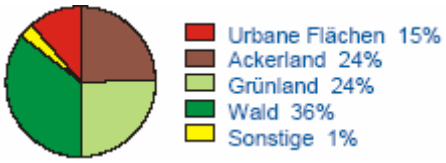


Fig. 8: The Neckar catchment area

Basic Idea of IKoNE

As action framework concerning water resources management, IKoNE co-ordinates river-related measures - flood protection, structure and quality of the river - with other local and supra-local plans and integrates other sector plannings. The objective is to preserve and improve the rivers as living spaces and lifelines of the landscape as well as important natural factors for business locations. IKoNE addresses citizens, industry and business, associations and authorities, thus all parties living at the Neckar river and its affluents and feeling responsible for this region. In a joint responsibility for today's and future generations, preservation of nature and use by humans have to be brought into harmony.

In order to achieve a broad acceptance of the action, the objectives of the water management administration must be anchored into the awareness of the general public. This requires to know about and to understand the complexity of water resources management. IKoNE aims at achieving its objectives basing on the following principles:

- acting from a synoptic view
- orientation by joint objectives
- partnership of all participating parties

IKoNE is not construction and investment program, but a tool for preparing the realisation of such programs.

Action programs of IKoNE

IKoNE defines and bundles the multiple tasks of river management into action programs. This includes measure-related action programs and fundamentally-orientated action programs. The latter serve to gather and make available water resources management data. Within the action programs, the following specialised objectives are formulated:

- Flood management
- Management of flood endangered surfaces and catchment areas
- Technical flood protection
- Flood damage prevention
- Quality of the waterway:
- Target Quality Class II – slightly polluted
- State-of-the-art sewage installations
- Structure of the waterway:
- Eco-morphology
- Minimum run-off
- Permeability

By means of this action programs and the framework conditions which have to be taken into account, conceptions are elaborated for the entire catchment area of the Neckar river and its affluents e.g.:

- Conceptions for flood protection
- Conceptions for waterway restoration
- Conceptions for waterway development

On the basis of these conceptions the planning authorities of State and municipalities elaborate concrete action procedures and construction projects.

Working methodology of IKoNE

Within the work of IKoNE, the concept "integrating" means the following:

- The entire catchment area is considered.
- All subjects of water resources management are considered in a synoptic way.
- The interdisciplinary approach ensures that also other subjects are integrated.
- The expectations of the population concerning the living space of the river with its recreation and leisure function
- All partners from within the administration and from outside as well as the task promoters are involved.

Besides the traditional administrative work, communication is of special importance within IKoNE. The communication within IKoNE should

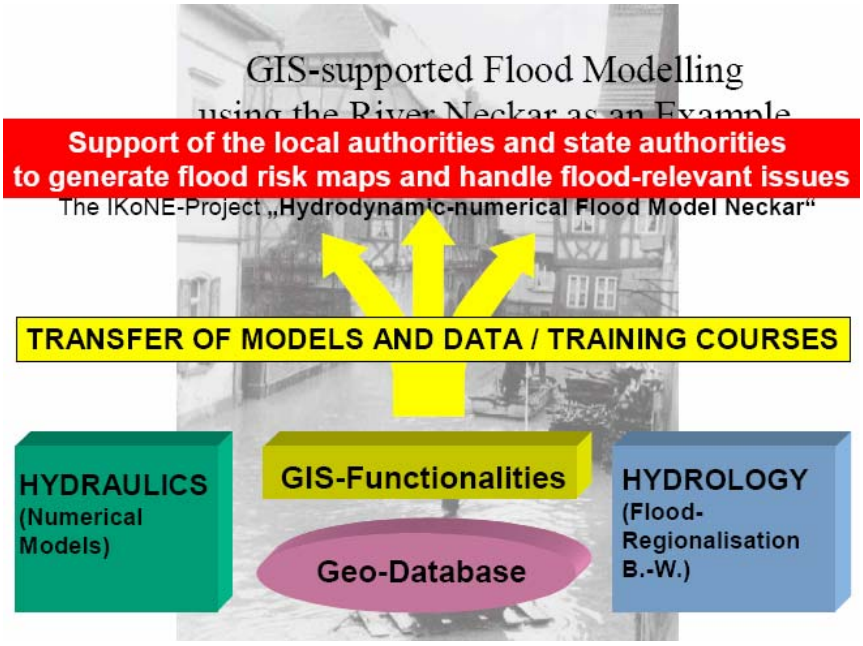
- Present the water resources management with its tasks and objectives in a convincing way.
- Create confidence.
- Influence behaviour.
- Win co-operation partners.

IKoNE provides a guiding tool with agreements upon objectives for the catchment area of the Neckar river from which environmental, technical and financial priorities can be deduced. IKoNE is an agenda for politic, administrative, scientific and private action for the sustainable management and development of the waterways in the catchment area of the Neckar river.

All responsible and participating parties can use these documents.

The IKoNE handbook 4 describes flood management with all its components with the joint objective of reducing flood damages.

A tool developed jointly by research and administration within IKoNE which should support the all-encompassing flood management:



GIS-supported flood modelling by the example of the Neckar river

Fig. 9: GIS-supported flood modeling

On request of the Water Management Administration of Baden-Württemberg, the Institute of Water Resources Management, Hydraulic and Rural Engineering (IWK) of the University of Karlsruhe has developed in the context of the program IKoNE a GIS-supported flood model for the Neckar river. The model is transferred to the water management administration of Baden-Württemberg with the goal of supporting the handling of flood-related issues (determination of legally defined flood areas, analysis of flood protection level, risk analysis etc.). GIS-functionalities and user interfaces that are particularly aligned with the needs of the administration have been developed. In addition, training courses are organised.

The project is a positive example of the successful co-operation of the water management administration of the State with research and the waterways and shipping administration of the Federal Government. This network has been substantial for the success of this project. By this means it was possible to create sustainable co-operation relations, a realistic requirement profile for the needs of the water resources administration, an effective data and know-how transfer as well as transparency for all involved parties and users.

The model has proved to be very useful: overflow scenarios have been visualised in such a comprehensible and convincing way that municipalities could be induced to take measures for flood protection and damage prevention before a damaging flood took place and not only after having experienced material flood damages.

3.1.2.4 THE ELBE DSS: "DEVELOPMENT OF DECISION SUPPORT SYSTEM FOR THE ELBE RIVER BASIN"

Karlsruhe University, Germany

Introduction

As a methodology and the instruments for integrated river-basin management are scarce, the German Federal Institute of Hydrology (BfG) initiated a project 'Towards a generic tool for river basin management'. The ultimate goal is to develop a prototype decision-support system, which helps the water managers to formulate an effective strategy for sustainable management of the Elbe river basin. A key aspect of the design is the combination of process models and data from different scientific disciplines in an integrated systems network. In general these models differ in sensitivity and accuracy, while non-linear and qualitative models can be present. The current practice is that the experiences and preferences of the designers as well as practical considerations such as data availability, usually, guide the selection of models and data. Due to a lack of clear scientific guidelines the design becomes an ad hoc process, depending on the case study at hand, while selected models can be overly complex or too coarse for their purpose. The research focuses on the pitfalls and possible solutions encountered during the design and application of a decision-support system. Quantitative analysis of the integrated model system based on techniques such as sensitivity and uncertainty analysis plays a central role. The project started in March 2002 and was completed in April 2005. The format of this project is applied to the Volga Basin, and the Oka River DSS has been already developed.

Background

Water resources management on the river-basin scale as envisaged by the EU Water Framework Directive, as well as flood control and the maintenance of rivers as navigable waterways constitute an essential elements in integrated water management. It is a highly complex task. The understanding of the consequences of anthropogenic interventions into river ecosystems presupposes predictions of the impacts that have to be expected. Only then decisions can be taken that ensure adequate consideration of the interests of river-landscape protection as well as the social use interests. For this reason the German Federal Institute of Hydrology (BfG) initiated the development of a Decision Support System (DSS) with the example of the River Elbe in the process of pooling the results achieved within the BMBF Research Association "Elbe Ecology".

Objectives

The aim was to get and provide knowledge on the interactions of natural and anthropogenic factors available for decision-makers in a user-friendly and practice-oriented way. The following topics are included into this system:
1) water quality and reductions in pollutant loads,
2) flood control/flooding risks,
3) ecological state of floodplains,
4) navigability.
External scenarios such as climate change, agricultural policy, and demographic developments are taken into account.

Organization and partners

The Elbe DSS was developed within the framework of the Research Association "Ecology of the Elbe River", funded by the German Ministry of education and research (BMBF). The following project partners were involved: BfG/Project group Ecology of the Elbe River; Infram, Marknesse NL; Deptartment of Water Engineering & Management University of Twente NL; Institute of Environmental Systems Research, University of Osnabrück, Germany; Research Institute for Knowledge Systems (RIKS), Maastricht NL.

Results and impacts

A pilot version of the DSS was completed and provided to the authorities. It is a useful tool for decision making and administration. It allows the user to assess the impact of chosen measures

and alternative solutions as well as those of external developments. Existing models developed in preceding projects were made applicable for a wide circle of users.
The development of the DSS followed a participative approach. The requirements and recommendations of the potential system users – professional and local authorities, nature conservation associations - were integrated. Thus, it is guaranteed that the system works user-friendly and practice-oriented and that it is well accepted.

Problems

The Czech parts of the Elbe River and its catchment area are not considered in the DSS so far. It should be included in the future and cooperation with Czech partners should be established.
The developed DSS is just a pilot version. Future use of the DSS requires an ongoing actualisation of data.
Highly complex and detailed models relating to ecology of the floodplains are only applicable for a short section of the river.

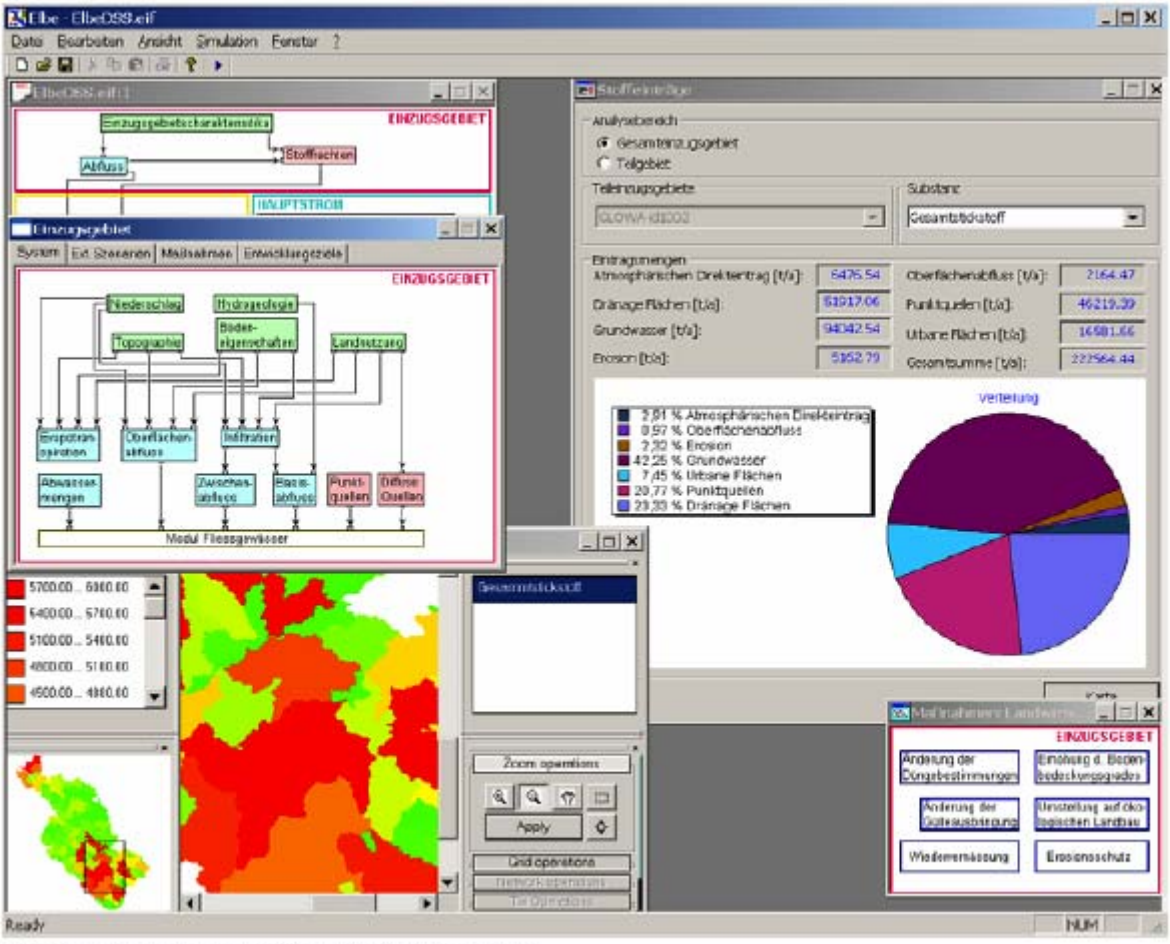


Fig 1: User screen of the pilot Elbe DSS

Fig. 10: User screen of the pilot Elbe DSS

http://elise.bafg.de/?618

http://www.bafg.de/servlet/is/5714/Beschreibung_DSS-Projekt.pdf

http://www.wem.ctw.utwente.nl/onderzoek/Projecten/Elbe%20DSS

3.1.2.5 THE VOLGA: APPLICATION OF INTEGRATED WATER MANGEMENT TO WATER PROTECTION IN RIVERSIDE AREAS

International Ocean Institute, Malta

Introduction

In Russia, new management practices in the riverside areas suggest a number of tools, including, for example, the legal zoning of riverside areas, land-use planning, special water protection regulations and norms, and flood protection. Integrated water management approaches are a part of water protection in riverside areas. These tools are being applied in the Volga Basin. Activities in riverside areas have a considerable impact on the river's environment. These areas are in a focus of various interest groups, and they are particularly attractive to a variety of investors. Traditionally riverside areas have been used for maintaining fisheries and navigation. The use of the riverside areas by industry, trade, tourism, recreation and for residence often results in conflict of multiple interests. New versions of Water Code, Land Code and Town Planning Code create legal regimes for riverside protection. Leading Russian cities are gaining experience in application of riverside integrated management. They also apply existing international experience in this field: riverside areas are interesting sites for transfer and application of international experience on legal zoning, public participation in strategic decision-making and in conflict resolution.

Present situation

In the Volga Basin, the riverside areas are traditionally used for settlements. This case-study illustrates existing practices of the several cities located in the Volga Basin in application of local legal zoning and in development of land-use strategies for riverside areas. Cities of the Volga Basin including Nizhny Novgorod, Samara, Kazan, Novgorod and Perm gained interesting experience in development of building regulations, zoning of riverside areas, public hearings and planning. Recent practices in Nizhny Novgorod are also based on public hearings and public discussions organized during the period of 2003-2005 (see, CABRI D2 Report). The Legal Zoning Code for Nizhny Novgorod was approved by the City Duma of Nizhny Novgorod on November 15, 2005. The Legal Zoning Code and relevant maps are available for the public at the site of the city administration (www.goradm.nnov.ru)

Role of riverside ecosystems

The role of riverside ecosystems in maintaining the environmental balance in a river is enormous. Their functions include:

- Water level regulation and control. Flora in flood prone area acts as a sponge absorbing water during flooding and minimizing flooding damage.
- Filtering of sediments. Riverside area filters organic, mineral and toxic matters transferred by surface and ground waters.
- Thermoregulation. Flora hanging over water and growing along rivers reduce water heating and makes comfortable niches for fish.
- Bank bracing. Roots of trees and bushes prevent soils and sediments to be washed away.
- Nutrition and environment for variety of species. Flora growing (rising) along river banks is a food source and environment for diverse fish species.

The functions of riverside nature are important for sustaining the environmental values of the area. They contribute to increase in the value of riversides and adjacent areas. Sustainable development of riversides also encompasses the land-use practices in adjacent lands.

Applications

Russian legislation for riverside area is based on the Water Code, the Land Code and the Town-planning Code. Current practices in riverside protection and conservation are based on development of the special regulation for water protection areas. They are an integral component in a number of national laws. For example, the new Water Code, 2006 sets up rules and norms for water protection areas adjacent to rivers, lakes, artificial water reserves, canals, seas and other water bodies. It introduces special regimes for activities within such areas in order to prevent pollution and degradation of water resources and to preserve their natural

habitats. Within water protection areas special coastal water defense zones with additional limits and regulations are established. The width of water protection areas and defense zones is defined depending on the type and the size of a water body. Special bans are introduced within water protection zones (art. 65), and they are applied to:

1) use of waste water for soil fertilization
2) location of cemeteries, cattle graves, hazardous wastes dumping sites, etc.
3) air-chemical treatment against insects and flora infestations
4) transportation and parking (except special parking lots)

Additional regulations and controls are imposed for activities within defense zones.

Riverside regulations are also a part of the acting federal Regulation N 1404 on riverside area protection adopted in 1996. Regional authorities develop more detailed regional regulations based on federal rules. Special regulations for riverside areas, i.e. for the water protection areas, and for the so-called guard strips of land along the banks of water bodies, are envisaged by this federal legislation. Later, it is supposed to be adjusted and made compatible with respective provisions of the new RF Water Code.

Special detailed rules and norms are established by this regulation for riverside areas. For example, it is required that the guard strips of land should be covered by trees, bushes or grass. Specially allocated cites within this zone can be used for water supply, recreation, fishery, hunting, construction of ports and hydro technical facilities. These activities are performed on the basis of a special water-use license. It also sets up a basis for informing all stakeholders about the size and borders of water areas and about the rules applied within them. Banned activities in water protection areas include:

- air-chemical treatment;
- pesticide treatment;
- use of manure discharge for soil fertilizing;
- location of toxic matters, fertilizers, oil products, farmyards, solid and liquid waste disposals, graveyards and slaughter-graves;
- location of garbage and manure;
- car refueling, washing and repair;
- location of dachas and gardens in water protecting area width less than 100 m and surface decline more than 3 grade;
- parking of vehicles, etc.

Banned activities for riverside guard strips of land include:

- plugging up of lands;
- pasture and camping of cattle;
- fertilizer use;
- camping;
- land reservation for dachas, gardens and residential building;
- transport of motor cars, tracks and special vehicles, etc.

Development of building regulations

During the last eight years a number of cities in Russia are involved in development of building regulations. Nowadays the Russian legislation includes functional zoning as a basis for building regulations. Existing local legislation in town planning and land-use is similar to the European municipal legal regulations. For example, nature protection areas and industrial buffer zones are regulated by federal norms. Legal zoning integrates building regulations, environment protection and flood protection in flood prone areas. City planning practice in the Russian Federation is widely applied in Chabarovsk, Novgorod and Kazan. Development of city strategies is considered as a basis for town planning and legal zoning; it attracts investors and supports economic development. Kazan is an example of successful development of city strategy and legal zoning.

Re-profiling of land-use

Re - profiling of land use in cities is among key practices for sustainable development. Pollution

and land degradation has been significantly reduced in Russia as a result of re-profiling of lands in the urbanized areas. Re-profiling of land-use is also one of the mechanisms for water quality improvement. European cities designed special programmes of re-profiling. Experience of Munich was under a special study during development of the Nizhny Novgorod Legal Zoning Code.

3.2. Flood Risk Management

3.2.1. RESULTS OF CABRI EXPERT DISCUSSION

Introduction

This chapter of D3 Report presents the results of CABRI-Volga expert discussion during the CABRI-Volga Expert Group Meeting in Nizhny Novgorod, 2005. Its focus is on how to enhance human and environmental security in large river basins with a special emphasis on reducing risks from floods. Expert assessments relate to present practices, experiences and major problems in flood risk reduction in large river basins in Europe and in the Volga Basin. Its red thread is how to enhance human security of local population in flood prone areas and what are the lessons learned from recent practices in flood risk reduction in that respect.

Particular topics for expert discussion include:

- Basic approaches and definitions
- Flood management: Technical issues and planning
- Institutional considerations
- Public participation and socio-economic issues

Nowadays the concept of human security may be extended from its traditional meaning of worldwide political and military security to also embrace the idea that every citizen should be able to benefit from sustainable socio-economic development. From amongst different natural resources, water has been recognized as the key environmental resource for social security, economic growth and prosperity. Human security can therefore be seen to be related to environmental preservation (water, ecosystems and biodiversity) and to socio-economic stability and sustainable development. All stages of flood mitigation are directly linked to enhancing human and environmental security.

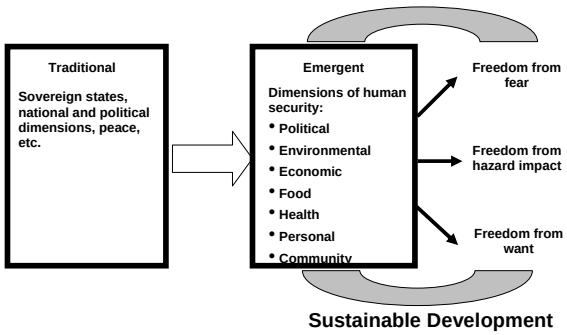


Fig. 11: The paradigm shift for the concept of Human Security.

Major Approaches

Floods are essentially natural hazards that occur regularly, but become disasters when they interact with human society. Natural factors, in most cases, are the main cause of catastrophic

floods. However, anthropogenic factors, such as human occupation of floodplains, extensive urbanisation, basin-wide land use changes, and structural measures to mitigate floods (flood levees and walls, cutting of the river meanders, river training) have modified the natural characteristics of extreme floods. Recent catastrophic flood events both in Europe and the USA (Rhine River, Mississippi River) have shown that human activities and traditional river engineering works may result in an increase in the frequency of extreme floods and, most importantly, in negative economic consequences such as loss of property, destruction of livelihoods and loss of human life. Possible climate change might increase both the intensity and the frequency of catastrophic floods.

To reduce the risk of floods and alleviate the consequences, two different attitudes can prevail. The first is to consider the flood as a random natural disaster and to only respond on an ad hoc basis through emergency programmes. The alternative, favoured within the CABRI-Volga project, is to recognize that floods are recurring phenomena and to adopt a proactive and strategic approach including combination of mitigation measures with emergency response and rehabilitation along with incorporation of disaster risk reduction into sustainable development strategies. In this way, the hazard is "internalised" whereby vulnerabilities can be reduced and coping capacities enhanced.

Basic definitions used during discussion

Human Security: The ability to benefit physically, economically and culturally from sustainable socio-economic development

Vulnerability: The possible degree of damage due to an incident such as a flood.

Integrated flood management: could mean very different things, according to different approaches such as engineering, social or institutional. It is recommended that integrated flood management be defined as a multi-dimensional and multi-disciplinary activity, which takes into account institutional, economic, social and environmental aspects of flood prevention, mitigation and land use, as well as promotes a more holistic view on the whole spectrum of human security, vulnerability, risk and floods.

Flood management: Technical issues and planning

- Flood management and protection of people and property should take into account the fact that major cities are often better protected than small settlements and rural communities. Therefore special emphasis should be given to the problems and vulnerabilities of rural communities and small and medium sized cities.

- Awareness rising is an important issue, particularly for those people living in areas prone to floods.

- Floods cannot be avoided, however human intervention, especially land use patterns and engineering works, is a key factor affecting the impact and magnitude of medium and small scale flood events. Specific attention should be given to deforestation, change of hydro-morphological situation of a river, the conversion of open space in a settlement area and the construction of infrastructures, such as roads and highways.

- A key element for integrated river basin management and the reduction of potential damages and losses is the strategy based on allocating more space to the river bed through effective national and local planning

- It is recommended that structural and non-structural measures be integrated and considered at the same time, instead of one after the other.

- Furthermore, it was mentioned that a recent study in Switzerland came to the conclusion that increasing investments in systems of flood protection lead to higher economic losses after catastrophic floods. There will always be a risk element when catastrophic floods occur, and a wrong perception of this kind of risk and reliability may create

problems, especially for people living in floodplains, who are highly exposed to such hazardous events.

- Increasingly extreme weather events and rapid temperature changes resulting from climate change, which could result in snow melting, can be dangerous for dams, dykes and engineering structures used for flood control. The possibility of dam failure cannot be neglected.

- Improved monitoring of flood events, impacts and vulnerabilities is important to increase human security. It has been shown that poor people generally face a higher risk of mortality and relatively higher economic losses from hazards of nature.

- The quality of data and reconstruction of the monitoring systems should be focused on, particularly after the decline in the 90s due to the general economic crisis in the post-communist countries.

- Additionally, building codes, guidelines for flood proofing constructions[17] and structural measures (e.g. giant levees) are also important elements that can increase human security in terms of natural hazards, such as floods.

- In the Volga basin it is also important to focus on droughts, water scarcity and technical hazards.

Institutional considerations

Existing practices in the Volga Basin indicate that a special body responsible for emergency management is essential with flood mitigation being among its competences. For example, a commission for emergency management should exist for emergency response and disaster risk reduction. This commission should encompass local and regional authorities of the respective river basin. It should have regular linkes to important agencies and enterprises. Together with engineers and emergency response agencies, the commission should prepare a planning document every year for the spring floods in the region. A special safety brigade should be responsible for rescue operations and emergency management during the event. The emergency plan for flooding should focus on aspects of evacuation, potential coping capacities and places of evacuation. Specific plans should also be formulated regarding the dissemination of information to radio and TV stations.

A number of problems relating to discussion of lessons learned from existing institutional frameworks for flood risk reduction worldwide were identified. Among them are the following:

- Information exchange and an in-depth cooperation between institutions as well as the active participation of the public in developing strategies for integrated flood management are essential.

- A lack of appropriate cooperation is also a major problem of human security, such as the lack of information sharing between national states along the same transboundary river.

- One should also consider the different steps in the disaster phase (prevention and coping) and level of regulation, such as normal regulation and emergency regulation. That leads to a crucial question: who is able to act appropriately in the different phases of disaster? The coordination of different functions and institutions is essential. One has to acknowledge the fact that institutional solutions cannot be generalized.

- Moreover, it is recommended that the historical dimension should be included in risk assessment, certain processes or events of the past should be included. In the

[17] Engineering Principles and Practices for Refitting Flood Prone Residental Buildings, FEMA US, 1995

Netherlands for example, water management and water related risks have been key issues for several decades.

A serious problem regarding human security and vulnerability reduction is also false alarms that delay services giving out early warning information. No or late warnings may cause fatalities and increase damage. Local information services (radio, newspapers or TV) with which people are familiar are most important methods of spreading information about flood warnings.

- A crucial issue is the organization and promotion of quick and effective response.

- The case of New Orleans highlighted the need to also take into account the multi-ethnic aspect of different social groups and their social structure. This leads to the recommendation that cultural, social and linguistic aspects should be paid more attention to.

Elderly people are very vulnerable (e.g. casualties in old people's homes in New Orleans). The protection of societies where elderly citizens are in the majority is a challenge today.

Public participation and socio-economic issues

- Public participation is especially well developed in the Netherlands, where the way of life and the perception of risk have also been addressed in integrated flood risk and flood vulnerability reduction approaches.

- Besides early warning and the awareness of people, the general status of maintenance of infrastructures is also a key element of vulnerability. Therefore one can conclude that disasters are often a combination of different causes leading to disaster.

- More attention has to be given to secondary damage and secondary effects. Often only the primary effects and damages are considered.

- Holistic and integrative risk and vulnerability assessment also has to be based on ex-ante and ex-post analysis. The limitation of the analysis of past events is not adequate for the estimation of present and future vulnerabilities. In this context, scenario-based assessment strategies are important.

- It seems to be impossible to generalize good practices, especially with regard to institutional structures in terms of flood management, since many aspects have to be taken into account, including the specific local and regional context.

Several examples of good practices have been discussed. They include, for example, Integrated Flood Management in City of Curitibá (Brazil)

Good examples of public participation in water management in the Netherlands had been discussed.

3.2.2. EXAMPLES OF GOOD PRACTICES

Introduction

This section of CABRI D3 Report presents four examples of practices in the European countries related to various aspects of flood risk reduction, including a combination of a variety of structural and non-structural responses. The first example describes the **European Flood Forecasting System, EFFS** (*chapter 3.3.2.1*). It is a component of the European Flood Alert System and aims at improving capacities of national water services. The recent large river floods in Europe have emphasized the need for reliable flood forecasting systems. They are an

integral element in flood risk reduction activities and they are extremely important for enhancing human security in the areas prone to floods.

The next example presents existing practices in flood risk reduction in the small towns in Greece **Flood Protection of Small Towns: Case Study from Greece** (*chapter 3.3.2.2*). This interesting case-study illustrates methodology for flood management based on multi-objective planning under risk. Together with application of engineering risk analysis these methods are considered as tools for protection from extreme floods at small scale and floodplain management at the catchment scale. Possible solutions for flood protection are assessed on the example of inhabited areas and important public buildings in a small town Heraklion which has been hit by a devastating flood in 1994.

The following chapter illustrates **Indicator Design for Flood Vulnerability Assessment** (*chapter 3.3.2.3*). This chapter discusses and contrasts two recent approaches to the issue, including the Disaster Risk Index developed by UNDP for the global scale and also the Vulnerability and risk identification applied at the local scale and developed by the German Technical Cooperation programme. It also presents BBC framework for measuring various types of vulnerabilities to floods, including social, economic and ecological.

The final chapter presents practices within **Flood Protection and Flood Damage Mitigation Experiences and Policies in Water Resources Administration in the Federal State of Baden-Wurttemberg, Germany** (*chapter 3.3.2.4*). It discusses application of practical results from activities of the multidisciplinary group formed in 2000 to design strategies for flood damage mitigation at the level of the state Baden-Wurttemberg. Basing on its evaluations the regional regulations for flood damage prevention in flood prone areas are to be designed and introduced, while its hazard maps are to be considered within municipal planning process aimed to minimize flood risks.

These examples from a number of countries of Europe are interesting multi-scale evidences about existing practices and approaches to flood risk reduction. They present a broad variety of practices from development and application of flood forecasting an modelling, the related research projects and initiatives to a formulation of policies, measures and results of their implementation at various levels. They discuss a combination of structural and non-structural measures applied in practice, and also coordination of actions of various stakeholders at different stages of flood mitigation. Together with other elements they present a multidisciplinary integrated perspective to flood management.

3.2.2.1 THE EUROPEAN FLOOD FORECASTING SYSTEM, EFFS

Aristotle University of Thessaloniki, Greece

Introduction

Recent large floods in Europe, such as those that occurred in the Meuse and Rhine basins in 1995, over large areas of the UK in 1998 and 2000 and in the Elbe basin in 2002 have emphasized the need for developing reliable flood forecasting systems. Flood forecasting systems serve as an important component in flood risk reduction strategies and measures. The European Flood Forecasting System (EFFS) is a part of the European Flood Alert System (EFAS). EFAS is a research project led by the European Commission's Joint Research Centre, ISPRA, Italy. The output of EFFS, which is in a prototype phase of development, is a probabilistic assessment of the n-day ahead risk of river discharge accidence (n< 10) for the whole of Europe at 5 km resolution. This output may be updated as the forecast lead-time is reduced.

Objectives

It aims at improving the European national water services capacities with 4-10 day flood forecast, whereas warning time is generally between 0 and 3 days. The extension of the lead-time warnings allows preventive measures to be undertaken, exposed populations to be

informed, water retention reservoirs to be emptied and additional emergency services to be prepared.

Structure

The prototype of the European Flood Forecasting System is composed of:

- global Numerical Weather Prediction models;
- optional downscaling of global precipitation using a regional Numerical Weather Prediction model;
- catchment's hydrology model comprising a soil water balance model with daily time step and a flood simulation model with hourly time step;
- high-resolution inundation model.

Numerical weather prediction models

The equations expressing the mass, momentum and energy balance are solved every 15 minutes. The atmosphere is divided into 60 layers up to 0.1 HPa (64 km). The horizontal resolution is about 40 km for deterministic forecasts and 80km for probabilistic ones, with a lead time of up to 10 days.

Catchment hydrology models

The default model used in the EFFS system is LISFLOOD. LISFLOOD is a physical based catchment model, especially developed for the European river basins. It is a rainfall-runoff model that takes into account the influence of topography, precipitation amounts and intensities, antecedent soil moisture, land use type and soil type.

Physical processes such as interception of rainfall by vegetation, evapo-transpiration, snowmelt, infiltration and capillary drive are simulated, and it is shown in the figure below.

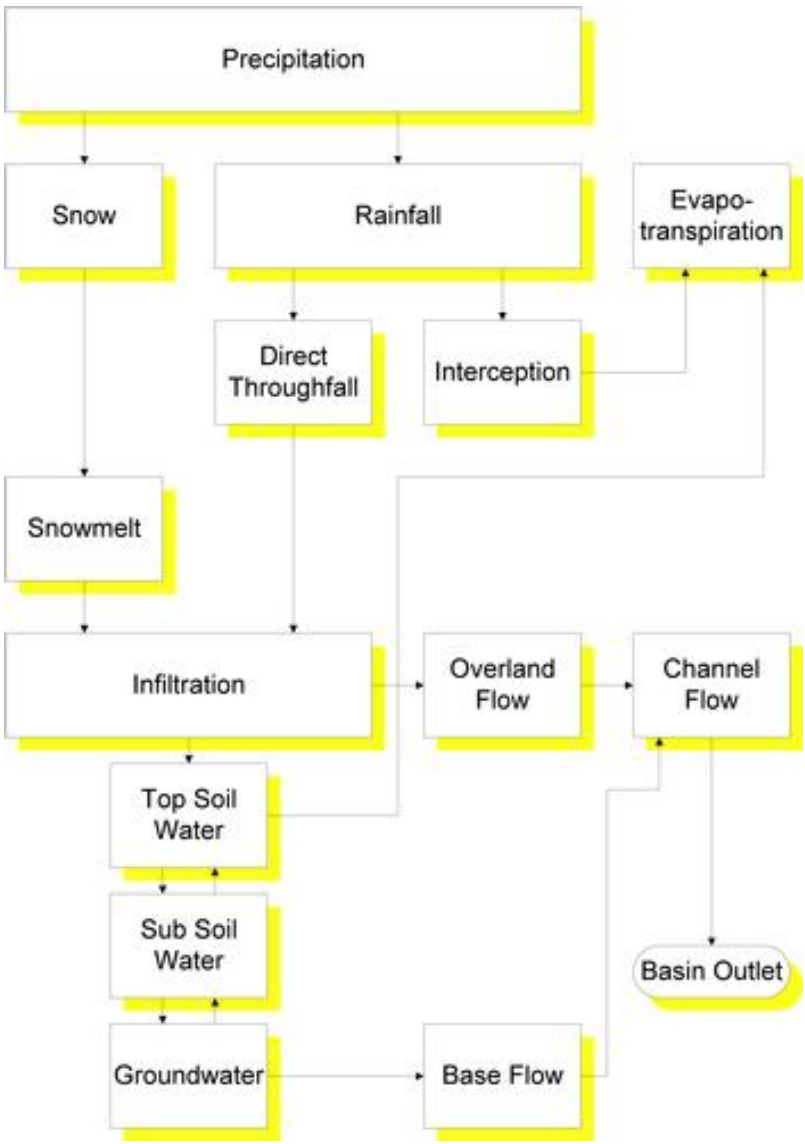


Fig. 12: Physical processes simulated in the LISFLOOD model.

Application to the 1995 Meuse River flood

At the beginning of 1995, most European river basins had been hit by floods, especially the Meuse River which experienced a rare event with discharge up to 3000 m3/s. By comparing the result of the modelling and the measured past events the validation of the flood forecasting system should be possible.

The simulation of this event was developed in two steps:

- The water balance model was first run and calibrated for the whole of Europe with a 5 km resolution for the period 1992–1995 using observed precipitation data.
- Simulations were then attempted using LISFLOOD for the Meuse basin upstream of the Borgharen gauging station in The Netherlands at 1 km resolution.

Results

Cumulative distribution of the ensemble forecasts allows obtaining a good degree of precision for a lead time of up to 5 days, and then gives an idea of the probability of occurrence of an extreme event.

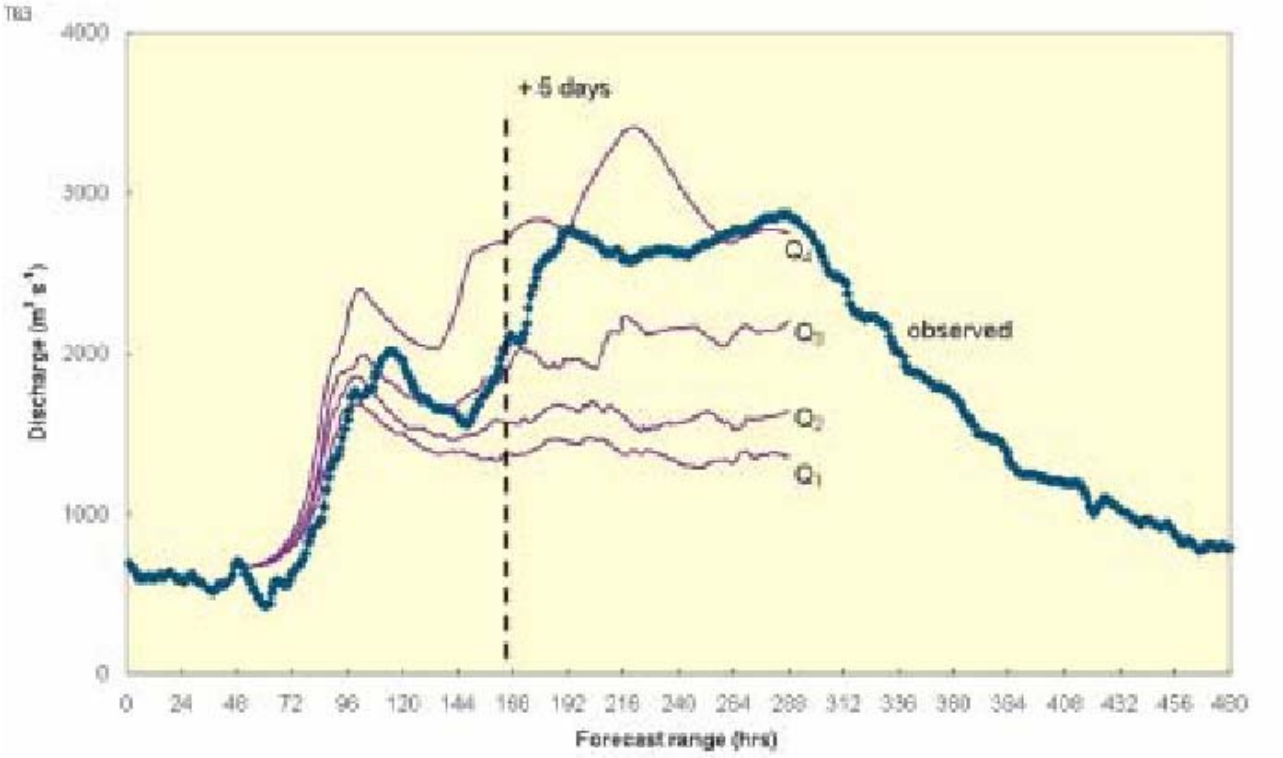


Fig. 13: Interpretation of 5-day discharge forecasts

Interpretation of 5-day discharge forecasts from the LISFLOOD model on 21st January 1995 (hour 48) for the Borgharen gauging. The observed discharge is shown as a thick blue line. 25% (Q1), 50% (Q2), 75% (Q3) and 100% (Q4) quartiles for the 51 ensemble members are shown, the 50% corresponding to the median value.

Concluding observations

Even using coarse resolution meteorological forecasts the LISFLOOD simulations in the Meuse basin achieved a number of encouraging results. The simulations show that the system provides a good forecast of discharge up to 5 days ahead and a probabilistic assessment of extreme flooding for forecast lead times in the range 5–10 days

This preliminary work requires confirmation for other basins and flood events; however the general principles and potential utility of the system are apparent.

3.2.2.2 FLOOD PROTECTION OF SMALL TOWNS. A CASE STUDY FROM GREECE

Aristotle University of Thessaloniki, Greece

Introduction

A methodology for flood management based on multi-objective planning under risk is illustrated in a case study from Greece (Giofyros Basin, Crete Island). Alternative remedial structural and non-structural solutions are analysed in order protect the inhabited area and important public buildings from future extreme floods in a small city. It is applied to Heraklion with population of 50 thousand, where a devastating flood occurred in January, 1994. The use of engineering risk analysis and multi-objective decision-making under risk are considered as tools for (a) protection from extreme floods at *small scale* and (b) floodplain management at the *catchment scale.* The methodology can be applied in different river basins.

Objectives

This methodology is aimed at:

- Protect a particular local inhabited area from future floods

- Propose measures for floodplain protection and management

Organization

The Organism for Eastern Crete Development (OANAK) financed a research project after the devastating flash flood in 1994 in the Giofyros Basin, Heraklion city, Crete island. The research was carried out by the Hydraulics Laboratory, Aristotle University of Thessaloniki and has been completed two years later.

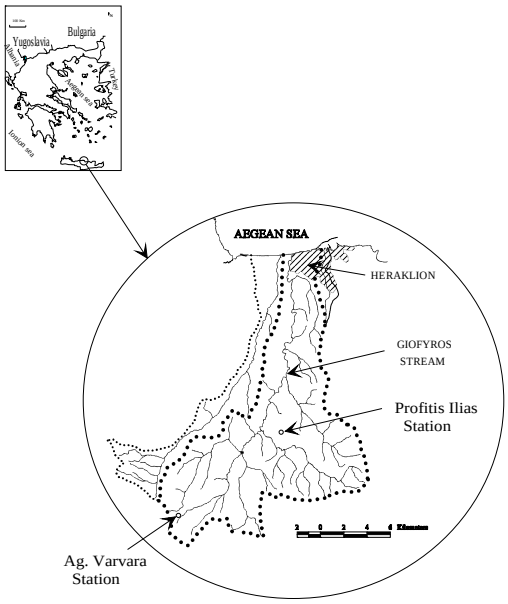


Fig. 14: Location of the case study

Present stage of implementation

- Dikes to protect public property in the area of wastewater treatment plant of the city of Heraklion have been constructed. This area was affected by the 1994 flood.
- Storm retention reservoirs in the upstream catchment area under construction

Results

On 13th January 1994, a devastating flood occurred in the Giofyros basin. The extreme flood resulted in a series of events, which may be summarised as follows:

- Heavy rainfall. The total rainfall recorded on the day of the flood was about 185 mm, which is equal to about half of the mean annual precipitation in the region of Heraklion. A maximum rainfall intensity of 37 mm/h was recorded at the hydro-meteorological station of Aghia Varvara (Fig. 11). In 6 hours, which is about the retention time for the Giofyros basin, a total rainfall of 143 mm was recorded.
- Rainfall of a light intensity had persisted several days before the critical storm of 13th January 1994. The soil was almost completely saturated and runoff was high during the critical storm.
- Deforestation and the removal of several hectares of vineyards during the months preceding the storm probably also influenced the increased intensity of the flood.
- Many houses located downstream, near the coast, were flooded and material damage was evaluated at several hundreds of thousands of Euros. The most important effect of the flood was the damage caused to the city's wastewater treatment plant, which was still under construction at the time. Many of the plant's reservoirs, made of concrete, were rendered unserviceable or completely destroyed by the force of the incoming water.

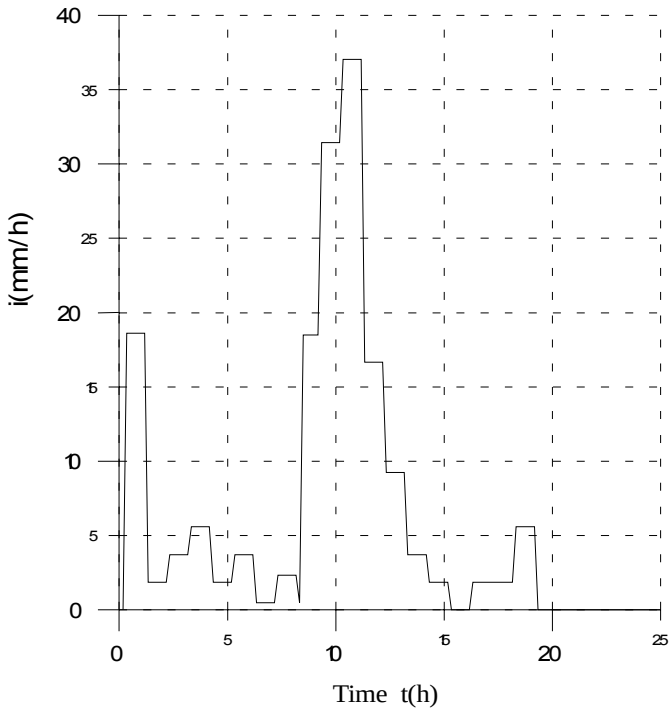


Fig. 15: Rainfall intensity i (mm/h) versus duration t (h) between 13-14 January, 1994

Distinction is made between the local scale of protection from floods. and the catchment scale planning. On the local scale, reliability of the protection measures were based on more traditional techniques involving hydrological and hydraulic modelling of two-dimensional unsteady flows (Fig. below). (St Venant equations, Ganoulis, 2003).

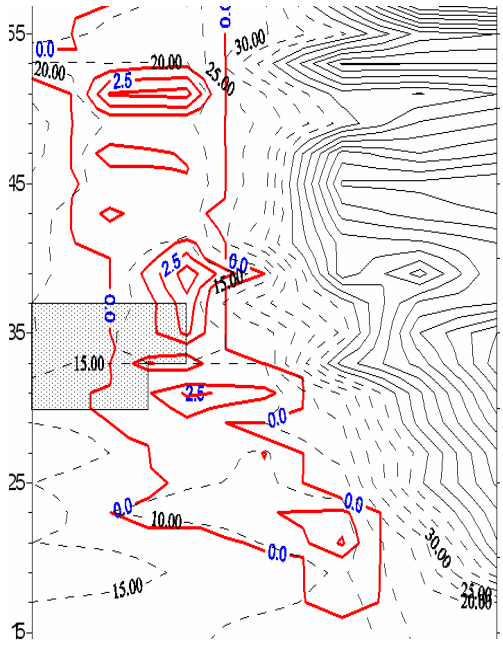


Fig. 26: Contour lines of water stage for the 1994 flood *(no flood levees around the wastewater treatment plant.)*

On the catchment scale, a multi-criteria trade-off approach was used for choosing between different alternatives. Multi-objective risk-based flood management methodologies for protection

measures resulted in trade-offs between risk and costs, as well as between environmental and social impacts (Ganoulis, 2003). By combining three structural solutions, the following 5 alternatives were investigated:

- Regulation of the downstream part of the river (R) and construction of a large reservoir (LR)
- (R) + Construction of a small capacity reservoir (SR)
- (R) + Storm Detention Basin network of T=30-yr floods (DB30)
- (R) + Storm Detention Basin network of T=50-yr floods (DB50)
- (R) + Storm Detention Basin network of T=100-yr floods (DB100)

The principal function of a storm detention basin network distributed over the tributaries of the main stream is to reduce the peaks of the floods hydrographs. At the same time, significant volumes of water may be retained locally for agricultural purposes

Concluding Observations

The main objectives for ranking the above 5 alternatives are: (1) costs and benefits, (2) risk of failure, (3) environmental impact, and (4) social effects.

Alternative No 3 resulted as the most appropriate for satisfying the multiple objectives.

In areas without too many constraints (e.g. high population or intensive agriculture) a storm detention basin system distributed over the entire catchment area seems to be the most appropriate from technical, economical, environmental and social point of views.

3.2.2.3 INDICATOR DESIGN FOR FLOOD VULNERABILITY ASSESSMENT

United Nations University Institute for Environment and Human Security, Germany
Nizhny Novgorod State University of Architecture and Civil Engineering, Russia

Introduction

Developing, testing and implementing indicators to identify and assess vulnerability and coping capacity to floods is an important pre-requisite for effective disaster risk reduction. Although strengthening capacities to reduce hazardous events are important (magnitude and frequency of hazardous events), it became evident that we have to live with natural hazards, such as floods. Particularly in view of the ongoing global warming and the increasing frequency of extreme weather events technical solutions alone, such as dams and dykes, will not be adequate to ensure human security in the long term. Therefore it is important to promote a paradigm shift form the quantification of the hazard and primary focus on technical solutions towards the identification and assessment of the various vulnerabilities of societies, their economy and environment.

The international community stressed the fact that there is a collective requirement worldwide to increase the understanding of vulnerability and also to develop methodologies and tools to measure and assess vulnerability and risk. In this context the final declaration of the World Conference on Disaster Reduction (WCDR) in Kobe, Japan in 2005, underlined precisely the necessity to develop vulnerability indicators in order to enable decision-makers to assess the impact of disasters (Hyogo Framework for Action 2005-2015, UN 2005).

The precise formulation of the necessity to develop vulnerability and risk indicator is an important step forward, however, major difficulties arise if one aims to operationalize the multi-faceted and complex concept of vulnerability (Birkmann 2006). The numerous definitions of vulnerability (see e.g. Thywissen 2006) correspond to numerous ways of conceptualising, assessing and quantifying it (Schneiderbauer/Ehrlich 2004). Downing concludes that a confusion of meanings has surrounded vulnerability research, and even more so applications (Downing et al 2006). He stresses the fact that the indiscriminate use of indicators for measuring vulnerability - pick any that seems to be relevant and/or available - must be avoided;

rather, it is important to define and develop a model or framework to serve as a systematic basis for indicator development and selection (Downing 2004). That means good practice of vulnerability indicators has also to examine the underlying framework of the respective approach.

This chapter gives an insight into some theoretical fundamentals of vulnerability indicators and illustrates the state of the art on selected current approaches. Furthermore a new conceptual framework for vulnerability assessment and vulnerability indicators will be introduces and first results of its application into a questionnaire based vulnerability assessment are outlined.

Theoretical fundamentals: indicators, data and goals

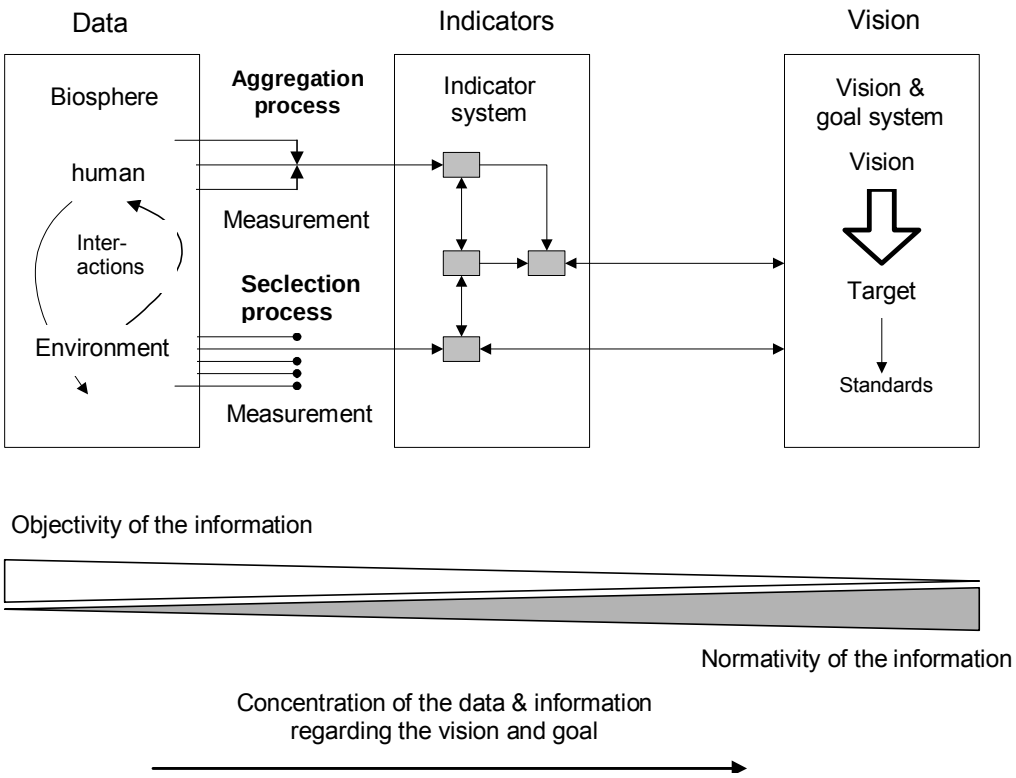
Interestingly, the term indicator is well known and indicators are broadly applied in economic and environmental analyses. For example the GDP is an important and well known indicator in the economic assessment of countries. However, only few approaches formulate precisely what they define as an indicator, especially in contrast to normal data. Currently, different authors define indicators differently and one can find many contradictions regarding the general concept of an indicator.

Based on the discourse regarding indicators for sustainable development Gallopin (1997) defined indicators as variables (not values), which are an operational representation of an attribute, such as a quality and/or a characteristic of a system (Gallopín 1997: 14).

Consequently a vulnerability indicator can be defined as an operational representation of a characteristic or quality of a system able to provide information regarding the susceptibility, coping capacity and resilience of an element at risk to an impact of an albeit ill defined event (flood, landslide, drought) linked with a hazard of natural origin (Birkmann 2006).

The relevance of the indicator to estimate a quality or characteristic of a system or element at risk arises from the interpretation made about the indicator and its relationship to the phenomena of interest. That means assigning a meaning to the variables and defining the indicting function of the indicator makes an indicator out of a single variable or data set (Birkmann 2004).

In this context it is essential to acknowledge that the main interest is not in the indicator itself, but in the indicandum (phenomena of interest). The quality of the indicator is determined through the ability of the function to indicate the characteristic of a system that is relevant to the underlying interest determined by the goal or guiding vision. The link between the indicator and the indicandum should be theoretically well-founded. The interrelation between indicators, data and goals can be illustrated as shown in Figure 1, revealing the necessity for any indicator development to collect data as well as to formulate goals that define the underlying interest.



Source: Birkmann et al 1999: 122

Fig. 37: The model of the three pillars: indicators, data and goals

The figure shows the fact that the assumptions and judgements made in selecting relevant issues and data for the indicator development, as well as the evaluation of the indicator's usefulness, require the existence of goals, whether implicit or explicit. Interestingly one can find at least tow different indicator – goal relations.

- On the one hand some vulnerability indicator approaches focus on the direction of the development or a comparison between the current "vulnerability status" and the "status in the past", this allows evaluating whether vulnerability is increasing or decreasing.

- On the other some indicator approaches regarding vulnerability and damage assessment are focussing on precise goals for the specific indicator to define vulnerability. Especially the insurance industry is able to estimate precisely a value and target of potential economic losses of a firm or a household due to a specific event, such as a flood event of the magnitude HQ 200 for calculating their insurance risk. However, the definition of a single value to estimate, for example, social vulnerabilities is often problematic and needs additional interpretations.

Since vulnerability assessment and also the judgement whether the value shows a high or low vulnerability is a complex task, many approaches define a relative vulnerability that views, compares and interprets vulnerability between different groups, entities and geographic areas in order to assess it, such as the relative vulnerability calculation within the Disaster Risk Index developed by UNDP (UNDP 2004).

Requirements, functions and quality criteria

The usefulness of vulnerability indicators is determined by their success in achieving their objective and function, such as identification and visualisation of different characteristics of vulnerability or evaluation of political strategies and monitoring of its implementation. According

to Benson (2004) the identification and the understanding of vulnerability and its underlying factors are important functions of measuring vulnerability (knowledge for understanding).

In contrast to the intention to create primarily knowledge for understanding, Queste and Lauwe (2006) (in Birkmann, 2006) underline from a practitioner point of view that vulnerability indicators are needed for practical decision-making processes, such as to provide disaster managers with appropriate information about where the most vulnerable infrastructures are. That means they underline the interest to use indicators not only for understanding vulnerability, rather they aim at using them for direct decision making (knowledge for action).

Generally, any indicator development should be based on quality criteria that support the selection of sound indicators. While standard criteria for indicator development encompass, for example, the fact that these indicators should be "relevant", "analytically and statistically sound", "reproducible" and "appropriate in scope", participatory indicator development often focuses on criteria such as "understandable", "easy to interpret" and "policy-relevant". In contrast practitioners often underline that indicators which should be applicable in praxis need to be "based on available data" as well as be "cost effective" (Birkmann 2004). An overview of standard criteria for selecting good and appropriate indicators is shown in figure 2. This overview underlines the fact that many criteria have to be specified according to the specific intention and context of the approach, such as the "relevance for the topic" and the "policy relevance". This also explains why different approaches imply different priorities and weightings of these criteria.

Fig. 18: Standard criteria for indicator development

- Measurable
- Relevant, represent an issue that is important to the relevant topic
- Policy-relevant
- Only measure important key-elements instead of trying to indicate all aspects
- Analytically and statistically sound
- Understandable
- Easy to interpret
- Sensitivity, be sensitive and specific to the underlying phenomenon
- Validity/accuracy
- Reproducible
- Based on available data
- Data comparability
- Appropriate scope
- Cost effective

(see EEA 2004; Birkmann 2004; NZOSA 2004; Berry, 1997; Parris 2000)

While, for example, the international indexing projects, such as the Disaster Risk Index and the Hotspots programme, define the availability of already existing data as a key criterion for providing useful global information in order to allow comparison of different countries, methods of self assessment regarding vulnerability and coping capacity often do not count for available data (Wisner and Walter 2005); rather these approaches focus on people's knowledge and policy relevant recommendations.

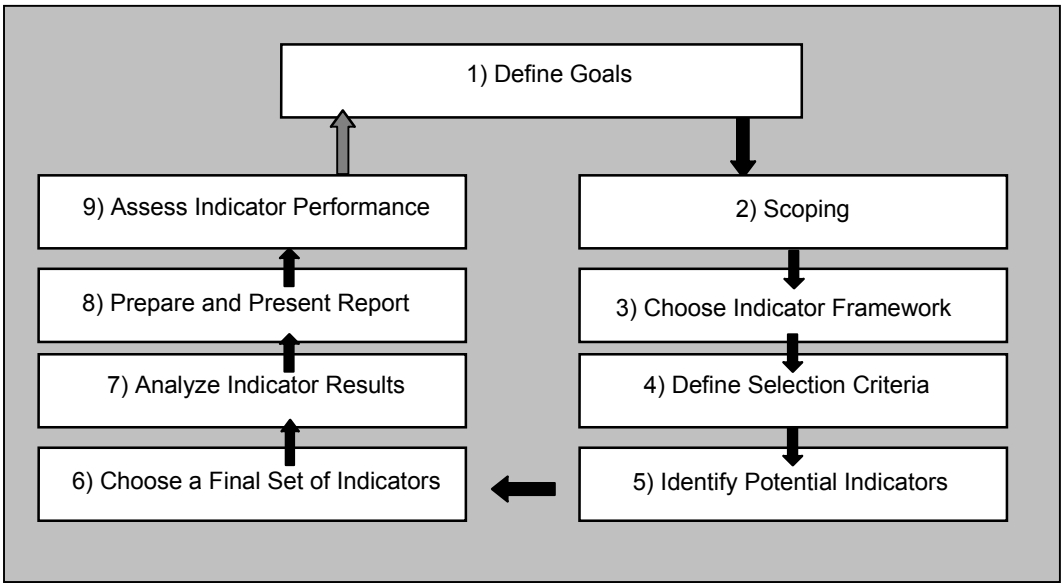
However, one of the most difficult points in measuring vulnerability is the gathering of appropriate data.

Besides the discussion of major functions and quality criteria of vulnerability indicators, the analysis of the process of indicator development is important in order to understand the different phases and judgements that the construction of indicators and criteria are based on.

Phases of indicator development

Based on research regarding environmental assessment, the development process of indicators can be classified into nine different phases. According to Maclaren (1996), indicator development starts with the definition or selection of relevant goals. Thereafter a scoping process clarifies the scope of the indicator by identifying the target group and the associated purpose for which the indicators will be used as well as the temporal and spatial bounds, which means identifying the time frame over which indicators are to be measured and determining the spatial bounds of the reporting unit. In a third phase a conceptual framework has to be formulated in order to structure the potential themes and indicators. The fourth phase implies

the definition of selection criteria for the potential indicators as shown in figure 2. In this context a crucial task for all approaches aiming at measuring vulnerability is to find the right balance between the accuracy of data and the limited data available.



Source: based on the general figure according to Maclaren 1996: 189

Fig. 19: Development process of indicators

The fifth phase a list of potential indicators is derives, while in the sixth phase a final set of indicators is selected. The analysis of data and the application of the indicators in selected areas is often the most difficult one, especially since many characteristics of vulnerability are linked to intangible factors and aspects which are difficult to quantify, such as coping capacity of households to floods. The final phases of the indicator development can be seen in the preparation of a report and the assessment of the indicator performance (Maclaren 1996).

The whole development process according to Maclaren is an “ideal process”, which in practice is characterized more through an iterative procedure of going backwards and forwards.

Current concepts

In the last 5 years important initiatives and research projects were initiated to assess risk and vulnerability at global, national, sub-national and local level. An overview of major approaches for measuring vulnerability, risk and coping capacity as well as lessons learned can be found in Birkmann 2006. Moreover, important reviews of selected approaches to assess vulnerability can be studied in Birkmann 2005 and the website of the ProVention Consortium. In order to provide an overview of the variety of current concepts, their challenges and limitations two approaches are presented in the following. The first approach is the Disaster Risk Index developed by UNDP and experts for the global scale. In contrast the second approach shows a case study of vulnerability and risk identification at the local scale adopted by the German Technical Cooperation (GTZ).

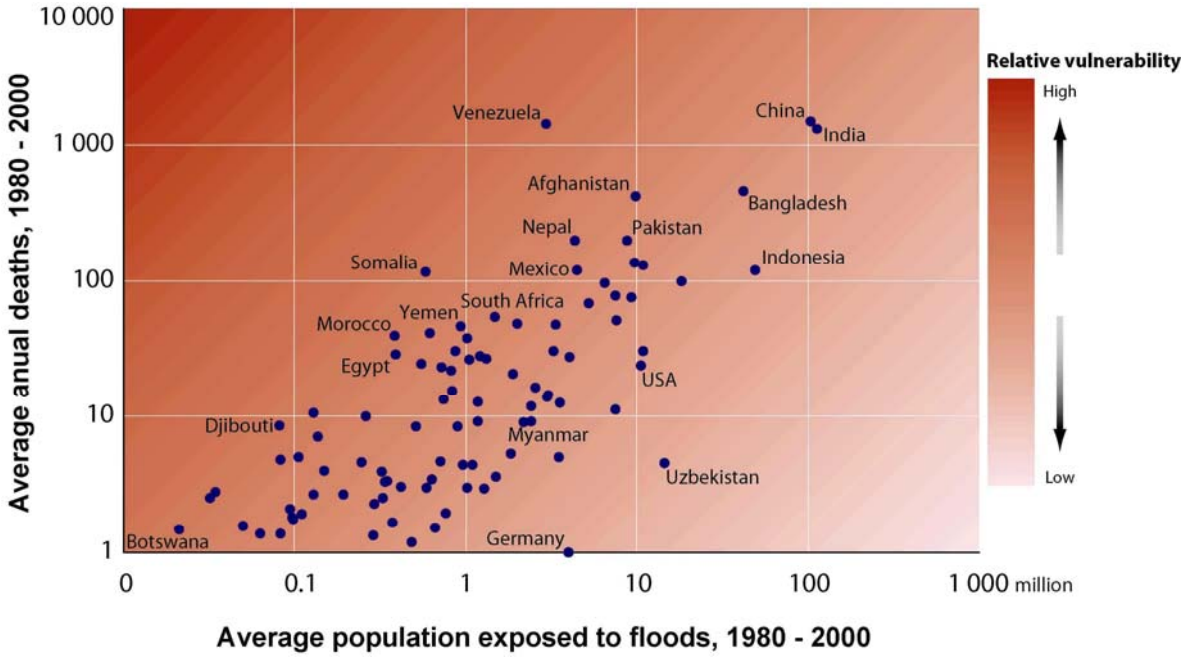
The Disaster Risk Index

In order to promote prevention and other risk reduction measures the United Nations Development Programme (UNDP) conceived the idea of creating an index based on a quantitative approach that would allow for comparisons between countries. The challenge was how to compare countries hit by different hazard types, such as drought versus floods? The response was to build an index based on mortality. One person killed by a cyclone is comparable to one person killed by a flood (Peduzzi 2006). Moreover, the Disaster Risk Index (DRI) of UNDP aims to demonstrate the ways in which development influences disaster risk and

vulnerability. The DRI has global coverage and a national scale of resolution. The DRI is applied in full to earthquakes, tropical cyclones and flooding. Preliminary analysis was also undertaken for volcanoes, landslides and drought.

Vulnerability is perceived as the concept that explains why people with the same level of physical exposure can be more or less at risk. Coping capacity and adaptive competence are then the variables that modify the vulnerability. In order to compare the vulnerability levels of different countries, the DRI calculates the so-called relative vulnerability of a country to a given hazard.

The relative vulnerability is obtained by dividing the number of people killed by the number of people exposed. The more people killed in proportion to the people exposed, the more vulnerable a country is to the given hazard.



Source: EM-DAT OFDA/CRED and UNEP/GRID-Geneva (in UNDP, 2004)

Fig. 20: Relative vulnerability for flooding, 1980-2000

Higher relative mortality equates to higher relative vulnerability. The simplicity of the model means that no country is excluded for showing outlier characteristics.

The high relative vulnerability displayed by Venezuela (upper left hand site) is a result of the large number of deaths associated with catastrophic flooding in 1999. Also China and India show a high number of average annual deaths due to floods, however, these countries have also the highest average population exposed to floods. Therefore the result and position of Venezuela in the upper part – with a lower amount of people exposed indicates a higher relative vulnerability value.

The time-period of mortality data availability for example for flooding is 21 years, thus the time span is relatively short. This also explains that Venezuela with one major event during this time period shows up as a highly vulnerable country.

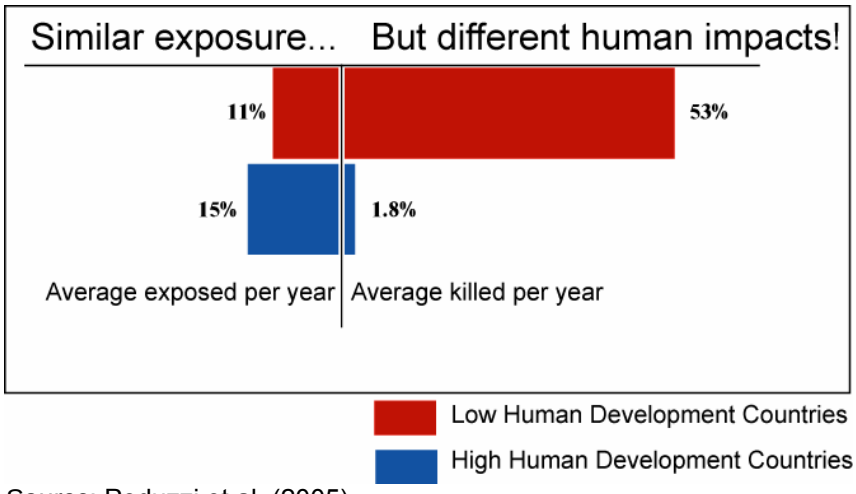
The second measure of vulnerability aims to identify those socio-economic variables that best explain recorded mortality to individual hazard types. A step-wise multiple-regression is used with disaster mortality from EM-DAT as the dependent variable. Independent variables include

physical exposure and a list of 24 socio-economic variables selected by an expert group to represent: economic status, type of economic activities, environmental quality, demography, health and sanitation, education and human development. Those independent variables that best explain the variation in the dependent variable are chosen to describe the global characteristics of vulnerability for each hazard type. The analysis identified the following variables for flood risk in addition to physical exposure:

- Low GDP per capita; and
- Low density of population.

In other words, according to the DRI, the risk of dying in a flood is greatest in countries with high physical exposure to flooding, small national economies and low densities of population. These results may show the greater difficulty of preparing for floods in low density rural areas (Pelling 2006). That means also that urban agglomerations and megacities might be the hotspot of vulnerability regarding the concentration of values, however, these areas do often also have considerable resources for dealing with hazards and disasters, thus their coping capacity is higher than the respective capacities in rural communities.

Interestingly the global analysis showed that especially the least developed countries are most vulnerable, since although they only represent 11% of the physical exposure to hazard, they were accounting for 53% of the casualties. In contrast the most developed countries represent 15% of the physical exposure to hazards, yet they only account for 1.8% of the victims (Figure 4). This disparity also can be understood as an indication that the status of development has an impact on the potential of being killed by hazards of natural origin under the same conditions of exposure.



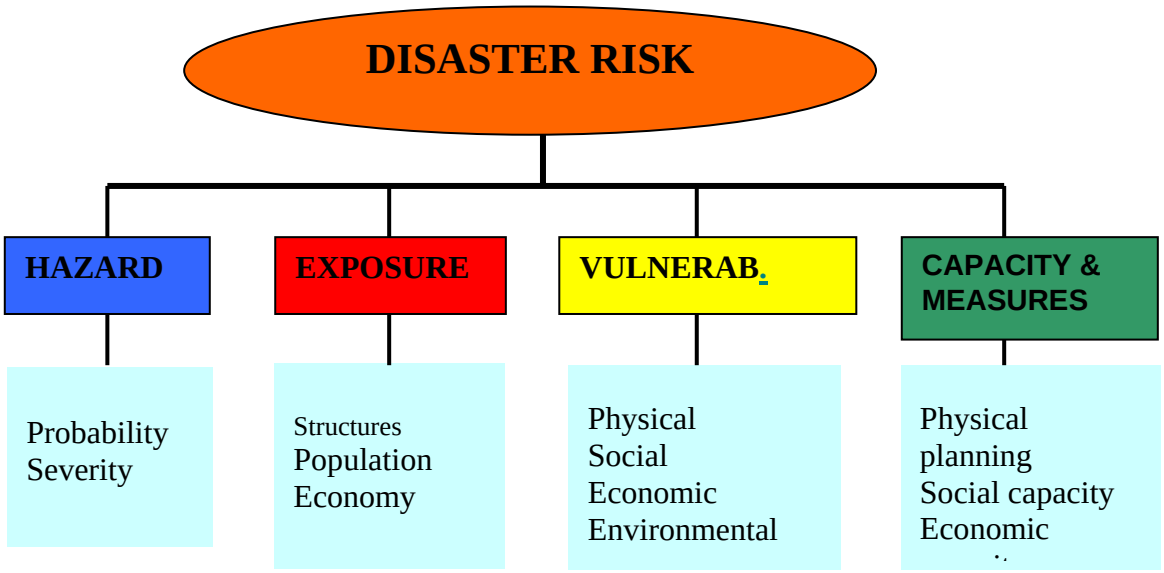
Source: Peduzzi et al. (2005)

Fig. 21: Comparing exposed and killed per category of Human Development

The results were surprising and showed strong correlations. However, the approach does not accommodate the fact that disasters affect people's lives and livelihoods in many ways besides the loss of life. People may also suffer injury, illness or stress (physically as well as psychologically), houses may be destroyed and social networks disrupted. Although the number of people killed and death is a robust indicator, the approach limits the assessment of vulnerability to an ex-post analysis of past mortality. Moreover the DRI accounts only for large- and medium scale disasters, defined as those events involving more than 10 deaths, 100 affected and/or a call for international assistance. Thus small and medium scale events which might cause many losses are not counted if they do not imply the loss of life. Moreover, the relatively short time span (1980 to 2000) of the survey and data is a problematic factor, since some countries might show up as highly vulnerable due to a single event. Overall, the study proved the connection between the level of development and vulnerability.

Local Approach – GTZ

In contrast to a global vulnerability and risk assessment which focus necessarily on a very limited number of indicators, the following approach shows a local disaster risk index approach using various variables. The Community-Based Risk Index developed by GTZ and partners aims at identifying the vulnerability and the capacities of households and local communities to manage and overcome disasters. It is a quantitative tool that was developed and tested in selected areas in Indonesia. The conceptual framework for the community-based disaster risk indicator system is based on the conceptual framework of Davidson, who defined risk as a result of the interaction of the hazard, exposure, vulnerability and capacity. Thus vulnerability in this framework is clearly separated from exposure and coping capacity (see figure).



Source: Davidson 1997: 5; and Bollin et al. 2003: 67

Fig. 22: The conceptual framework to identify disaster risk

The indicator approach of the GTZ was structured according to these components. The result is an indicator set of 47 individual indicators (see the following table and Bollin, Hidajat 2006).

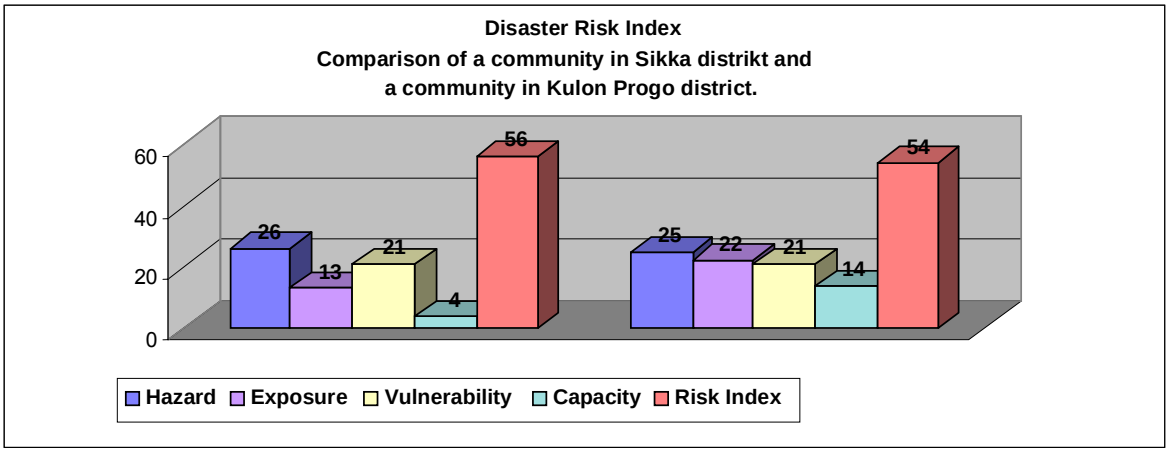
Main factor and factor component	Indicator name	Indicator
EXPOSURE		
Structures	(E1) Number of housing units (E2) Lifelines	Number of housing units (living quarters) % of homes with piped drinking water
Population	(E3)Total resident population	Total resident population
Economy	(E4) Local gross domestic product (GDP)	Total locally generated GDP in constant currency
VULNERABILITY		

Physical/ demographic	(V1) Density (V2) Demographic pressure (V3) Unsafe settlements (V4) Access to basic services	People per km2 Population growth rate Homes in hazard prone areas (ravines, river banks, etc) % of homes with piped drinking water
Social	(V5) Poverty level (V6) Literacy rate (V7) Attitude (V8) Decentralisation (V9) Community participation	% of population below poverty level % of adult population that can read and write Priority of population to protect against a hazard Portion of self-generated revenues of the total budget % voter turn out at last communal elections
Economic	(V10) Local resource base (V11) Diversification (V12) Small businesses (V13) Accessibility	Total available local budget in US$ Economic sector mix for employment % of businesses with fewer than 20 employees Number of interruption of road access in last 30 years
Environmental	(V14) Area under forest (V15) Degraded land (V16) Overused land	% of area of the commune covered with forest % of area that is degraded/eroded/desertified % of agricultural land that is overused

Source: Bollin/Hidajat 2006

Fig. 23: Set of community based disaster risk indicators (selection exposure + vulnerability)

For each indicator cut-off points were defined in order to classify the result in low/medium/high vulnerability. Moreover, the individual indicators were weighted, for example with hazard specific weighting factors, taking into account the importance of the different indicators for the specific hazard, such as for floods (Bollin/Hidajat 2006). This weight had also to be adjusted for the country specific conditions and has been defined in Indonesia, mainly with experts from national research institutions, universities, NGOs and representatives from local government. Finally, the overall composite risk index is derived from the four factor indices resulting again in a score that ranges between 0 and 100. The "Community Based Disaster Risk Index" was applied in selected case study areas in Indonesia, such as in Yogyakarta, Central Java. The following figure provides an illustration of the results and the comparison of the different disaster risk index elements (hazard, exposure, vulnerability, capacity and the sum risk) between a community of the Sikka district and a community from the Kulon Progo district. The risk index of the two communities is almost the same. However, if one takes a closer look at the factor scores one can see that the hazard has almost the same value. The difference between the two communities can be found essentially in their exposure and capacity scores.



Source: Bollin/Hidajat 2006

Fig. 24: Results for two communities: a) the Sikka district and b) in Kulon Progo district

It turned out that the indicator system is a good tool for sensitising decision makers and creating awareness about the complex forces driving disaster risk. It is useful to have a structured system for these different aspects of risk that helps to clarify the conceptional terms of exposure, vulnerability and capacity. However, many indicators are solely measuring vulnerability indirectly and also the differentiation between exposure, vulnerability and coping capacity need to be reviewed. Especially since some indicators are even the same. Thus the approach uses a broader set of indicators and represents more characteristics of disaster risk, but on the other hand the concept of vulnerability is very narrow and is excluded from coping capacity and exposure.

Comparison

Although the brief description of the approaches also showed major differences, one can systematize major differences of the approaches according to the following criteria: spatial focus, function and the thematic scope. Furthermore, the data basis, the target group and the level of aggregation are important criteria to distinguish current approaches (see table 2).

Criteria	Disaster Risk Index	Community based Disaster Risk Index
Spatial level	Global (national resolution)	Municipal level
Function of the approach	Identification of vulnerability Comparison of vulnerability between countries	Identification and knowledge generation Empowerment of people Promoting gender equity
Thematic focus on vulnerability	Mortality (average annual death) as the calculation of relative vulnerability, various socio-economic aspects (24 variables) are selected in order to explain the variation of the vulnerability between countries	Vulnerability regarding physical, demographic, social, economic and environmental assets
Data basis	CRED (Center for Research on the	Questionnaire based data

	Epidemiology of Disaster)	
Target group	International community and national states	Local population, local government
Link to goals	No direct link to goals	Classification of vulnerability (low, medium and high) No direct link to goals
Level of aggre-gation	Medium (the relative vulnerability measure shows a relatively low aggregation level, the exposure component is more complex)	Medium, high indicators and index (47 single indicators, aggregation into 4 factor scores and 1 risk index)

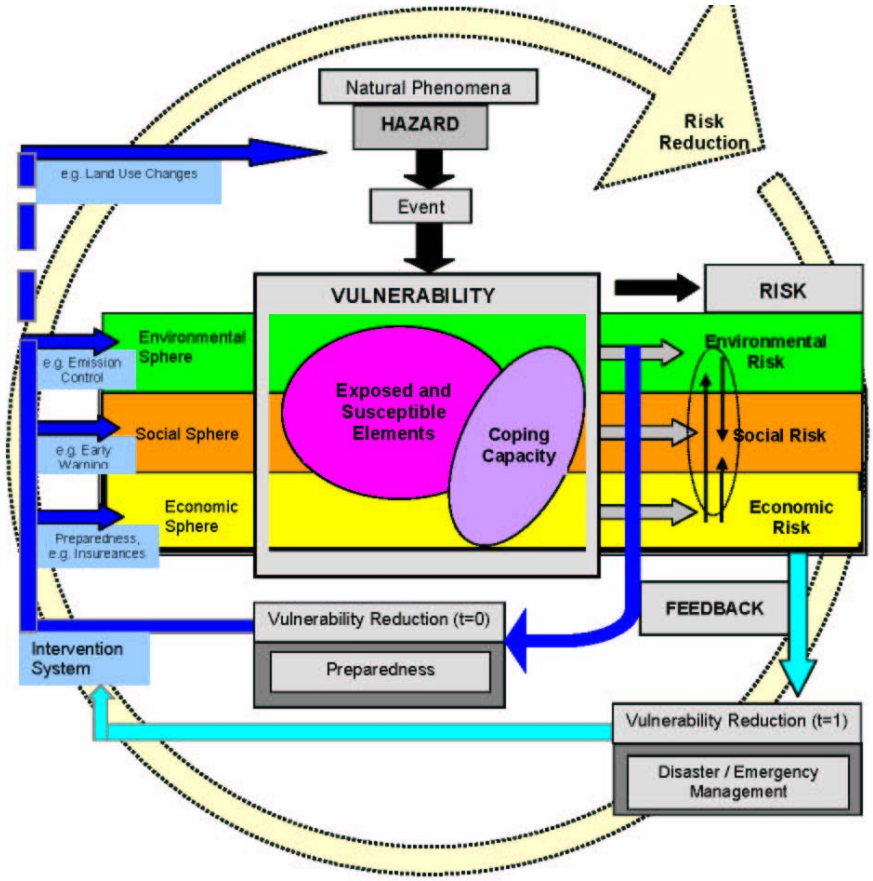
Source: own figure

Fig. 25: Overview of the selected indicator approaches to measure vulnerability

The "BBC-framework" for measuring vulnerability

While some approaches view vulnerability primarily with regard to the degree of experienced loss of life (mortality) (e.g. Disaster Risk Index), the BBC conceptual framework addresses various vulnerabilities in the social, economic and environmental sphere. These three spheres have been defined as the three main pillars of sustainable development (UN 1993, Agenda 21; WCED 1987). That means the BBC-framework also accounts for example for environmental vulnerability, which is often difficult to assess (Renaud 2006).

The BBC framework stresses the fact that vulnerability analysis goes beyond the estimation of the deficiencies and the assessment of disaster impacts in the past. It underlines the necessity to view vulnerability within a process (dynamic), which means focussing simultaneously on vulnerabilities, coping capacities, and potential intervention tools to reduce vulnerabilities (feedback loop system). In contrast to some other approaches which define vulnerability separate from coping capacity and exposure, the BBC-framework views vulnerability as the susceptibility and the degree of exposure of an element at risk as well as the coping capacity. Furthermore the BBC-framework underlines the importance of focussing simultaneously also on potential intervention tools to reduce vulnerability (Birkmann 2006).



Source: Author, based on Bogardi/Birkmann (2004) and Cardona (1999/2001)

Fig. 26: The BBC conceptual framework

The term "BBC" is linked to conceptual work done by Bogardi/Birkmann (2004) and Cardona (1999/2001), which served as a basis for this approach. It grew from three discussions: how to link vulnerability, human security and sustainable development (Bogardi/Birkmann 2004); the need for a holistic approach to disaster risk assessment (Cardona 1999/2001; Cardona/Hurtado 2000a/b/c, Cardona/Barbat 2000, and Carreño/Cardona/Barbat 2004/2005a/b); and from the broader debate on developing causal frameworks for measuring environmental degradation in the context of sustainable development.

Through the linkages between sustainable development and vulnerability reduction, the BBC conceptual framework underlines the necessity to give due account to environmental considerations, on which human conditions depend. Moreover, the BBC conceptual framework promotes a problem-solving perspective, by analysing probable losses and deficiencies of the various elements at risk (e.g. social groups) and their coping capacities as well as the potential intervention measures, all within the three key thematic spheres. In this way it shows the importance of being proactive in order to reduce vulnerability before an event strikes the society, economy or environment (t=0).

The BBC-conceptual framework implies that the development of vulnerability indicators and the assessment of vulnerability should address on the one hand the susceptibility and exposure of different elements at risk in the economic, social and environmental sphere on the other it should also identify and assess coping capacities and potential intervention tools.

Implementation of the BBC framework in Europe and Russia

In the first phase of the vulnerability assessment research in Russia an overview of statistical data was developed as well as a questionnaire-based vulnerability assessment approach. This

is aimed to explore various characteristics of vulnerability of different social groups and economic sectors to floods in the Volga Basin. It takes into account different elements outlined in the BBC-framework.

The questionnaire 1) examined the degree of exposure of different social groups and the susceptibility of the different households; 2) captured aspects of coping capacities, such as social networks and membership in local organisations.

The first testing of the questionnaire showed that in the selected villages in the Volga Basin only minor damages occur due to recent floods. However, the questionnaire will be revised and conducted for the second time more broadly in those communities which will face the spring flood. It will allow to get a more comprehensive picture and to assess potential intervention tools and actions undertaken by different agencies involved in disaster management, such as EMERCOM.

The questionnaire-based assessment was chosen, since the normal statistic does only encompass very general aspects related to vulnerability. Although the testing of the questionnaire-based vulnerability assessment revealed important differences between various social groups, the direct impact of flooding and under-flooding in the Volga Basin implies primarily only minor damages, thus it is more complicate to examine the specific coping strategies and coping capacities of affected people. Vulnerability to floods is highest for small settlements located on small rivers.

		Event	Settlement	Flood					
				Residential area			Streets	What was influenced	
District	River			Number of streets	Houses	Residents		Sector	Scope
Balakhna	Volga	Road was flooded	Smirino	1	27	124	Zarechnaya	Agriculture	200 cows were isolated dy flood
Buturlino	Pyana	Under-flooding	Buturlino	7	110	280	Oktyabrskaya		
Voskresensky	Usta	Under-flooding	Bolshiye Otary	4	14	42	Centralnaya		
Semenov	Tiosha	Flood	Semenov	0	91	157	Kalinina		
Uren	Usta	Under-flooding	Atazik	0	30	70	-		
Shatki	Tiosha	Flood, Road was flooded	Shatki	1	67	120	Okolitsa	Employment centre, tax inspection and heat unit were flooded	
Nizhny Novgorod	Volga	Under-flooding	Nizhny Novgorod	5	64	141	Pos. Sortorovochny		

Preliminary conclusions

One of the most important goals of developing tools for measuring vulnerability is to help bridge the gaps between the theoretical concepts of vulnerability and day-to-day decision-making. Therefore it is important to view vulnerability as a process encompassing the susceptibility and coping capacity of affected societies, their economy and environment as well as to identify and measure potential intervention tools. These coping capacities and intervention tools require a more specific analysis of the instruments and agencies involved in Disaster Management in the specific country. Moreover, it is essential to use a broader thematically framework to assess vulnerability, for example to include also environmental aspects and the vulnerability of environmental services. Especially in Russia and in the Volga Basin flooding does not imply many fatalities, thus this indicator (mortality) - which is often used in global approaches - does not provide an adequate basis for local and sub-national vulnerability assessment in the Volga. Besides the broader conduction of the questionnaire-based vulnerability assessment in spring 2006, it is important to also examine the specific data sets the disaster management agencies to have, such as EMERCOM. Furthermore, the data and indicators which can be derived and tested need to be evaluated in a following phase. This evaluation of the indicator results should especially take into account the following question:

- How do perceptions of vulnerability (hypotheses of main characteristics and driving forces) compare with the revealed vulnerability in disasters?

Finally it will be important to examine how for these indicators and information can also be applied in decision-making processes and tools at the local and sub-national level. However, the research regarding the development of vulnerability indicators to assess the vulnerability of different social groups and economic sectors to floods in Russia is in its initial phase[18]. We expect that it take at least 1 or 2 more years to create a profound basis to assess vulnerability at the local level and to derive specific policy recommendations out of it.

3.2.2.4 FLOOD PROTECTION AND FLOOD DAMAGE MITIGATION PRACTICES AND POLICIES OF THE WATER RESOURCE ADMINISTRATION, FEDERAL STATE OF BADEN – WüRTTEMBERG, GERMANY

Karlsruhe University, Germany [19]

Introduction

Flood mitigation is a part of integrated water management performed by the federal state administration on water management in Baden-Wurttemberg, Germany. Integrated water management practices of this administration are discussed in the earlier chapters of D3 Report. One of the prior objectives of this administration is to reduce damaging effects of floods as there is no absolute flood protection. Such approach has been developed on the basis of lessons learned from the recent damaging floods. This goal is more difficult to attain than the tasks of hydraulic engineering aimed at providing technical flood protection. Prevention of flood damages requires an organised, well-aimed and integrated cooperation of many different partners of administration and society.

Objectives and Strategies for Flood Management in Baden-Württemberg

The experiences of several extreme flood events of the past 10 years and the following discussion have led to three important findings:

- Flood events are natural and cannot be avoided.
- Due to settlement and high-class use of flood endangered valleys, natural floods become disastrous events causing high material damages and threatening humans in their living environment.
- There is no absolute flood protection. The protection by technical measures is limited by technical or financial constraints and is only sufficient up to the planned limit, i.e. the design flood[20]. There will always be larger run-offs and higher water levels against which technical measures do not provide protection any more.

From this, also in Baden-Württemberg two important conclusions have been drawn:

- It is not so important to influence the flood. The most important among flood protection measures is rather to reduce the damaging effects of flood events.

[18] Advanced version of questionnaire will include questions: 1) Householder decision on house design and construction 2) Insurance 3) Measures preventing flood losses (New constructions, facilities, materials) 4) Detailed description of reduction of losses during and immediately after flood 5) Participation of local community and relatives in reduction of losses 6) Readiness to help on community level 7) Importance of external experience, education/training

[19] This Case-study is prepared by Konrad Störk

20 Design flood: The flood event which is used in order to design the flood protection plant: maximum run-off in a certain recurrence period for which a structure is dimensioned.

- The task of reducing flood damages is more complicated than the former task of hydraulic engineering which was to provide for technical flood protection. To prevent flood damages requires an organised, well-aimed and integrated co-operation of many different partners of administration and society.

There are 3 sub-strategies in order to achieve the objectives:

In principle, the largest possible damage mitigation can only be achieved with the combination of the three sub-strategies.

- **Management of flood endangered areas and management of catchment areas** aims at a surface use which is adapted to the flood danger and at increasing the water retention in the catchment area.
- **Technical flood protection** prevents damages up to the design flood.
- **Flood damage prevention** reduces, beyond this, damages also during more extreme events.

By Management of **Flood endangered areas and catchment areas** we understand the adjustment of the land use which is necessary in order to reduce the damage potential (surface prevention). Furthermore we assign all measures in the catchment area serving to influence the development of flood (water retention) in the surface to this sub-strategy.

The valleys must, as far as possible, be kept free from additional flood-endangered structures.

1. Management of flood endangered areas and catchment areas

Land use control

- Surface-related information about the flood hazard (Flood hazard maps)
- Planning-related and legal safeguarding of the flood-endangered areas against high-class land use
- Adapted use of flood-endangered areas

Water retention in the surface

Preservation and restoration of retention areas and soils enabling

2. Technical Flood Protection:

Construction of dams, dykes and water retention basins, river improvement and flood-proofing measures according to the present risk potential

3. Flood Damage Prevention:

Flood proofing constructions

Adaptation of construction type and equipment of buildings according to the flood risk –"living with the flood"

Flood preparedness

- Flood alarms in good time and well-planned action before and during flood in order to reduce damages
- Drawing-up alarming- and action plans

Risk Prevention

Financial prevention by means of savings and insurances

Fig. 47: Flood Risk Management in Baden-Württemberg

Guidelines for Flood Hazard and Strategies for Flood Damage Mitigation

This section presents a project which has been very successfully run in Baden-Württemberg in the field of flood risk reduction.

The Ministry for the Environment and Transport formed a multi-disciplinary working group at the end of 2000. Group members include representatives of disaster control, municipalities, municipal associations, spatial planning, regional planning associations, the Chambers of Industry and Commerce, the insurance industry and water management administration. In addition to the Ministry for the Environment and Transport, the Ministry for the Interior and the Ministry for Economics are also represented. This coordinated initative confirms the need for interdisciplinary co-operation.

The members quickly determined that flood hazard maps for all relevant areas were urgently needed. As a basis for their work, all parties required hazard maps showing the spread of floods and flood depths for various recurrence periods. In addition, information is required on historical extreme events and threats to surfaces of high-grade use located behind protective devices.

Based on the flood hazard maps covering all relevant areas, it is possible to draw up precautionary and flood damage mitigation plans for the protection of humans and property, public facilities and for securing business and industrial locations. Only those who are familiar with the hazards involved are able to take the right prevention and preparedness measures. The working group drew up the "*Guidelines for Flood Hazards and Strategies for Damage Mitigation in Baden-Württemberg*". All group members agreed on an 11 - point program. By acting together at a preliminary stage, targeted flood management should be used to mitigate flood hazards as much as possible and to reduce or even completely prevent flood damage. All

members support each other through close co-operation and through the inclusion of potentially affected residents, municipalities and of the local disaster control administration together with the fire department and police, the State and regional planning authorities, water management authorities, industry and business as well as insurance companies.

"11 – Point Programme for Flood Damage Mitigation"[21]

(1) Sustainable interdisciplinary co-operation and State-wide development of flood hazard maps

(2) Joint regulations and information from the State government

(3) Regulations on handling water-endangering substances in flood-prone areas

(4) Defining methods and area categories for regional planning

(5) Adoption of water management information in developing and modifying municipal development plans

(6) Inclusion of hazard maps in municipal planning

(7) Integration of essential regionally planning features into the State Development Plan

(8) Development and maintenance of warning and action plans, regular practice exercises for risk defence

(9) Risk Prevention through Insurance

(10) Public Relations – Development of Flood Partnerships

(11) Interdisciplinary action plans on flood defence in the catchment areas in Baden-Württemberg

Action Plan on Flood Defense

Long-term and sustainable consensus is needed among the responsible authorities and those affected in order to ensure acceptance of comprehensive flood management and the necessary measures and resources used. An Action Plan on Flood Defence will combine the goals of all parties involved in flood protection and prevention within a catchment area and describe the measures to be taken by all responsible and affected stakeholders.

The basis of this plan is the LAWA (Joint State Working Group for Water Resources) action instructions produced in 1999. They contain items to be observed by decision-makers within affected special administrations, associations, cities and municipalities; points should be equally understandable to citizens affected by flooding. When all points have been worked through and implemented, it should be possible to reach the objectives contained in the action plan on flood defence:

- Reduction of damage risks
- Reduction of flood water levels
- Increase flood awareness
- Improvement of flood information

Action Plan has been completed for the Rhine River. Drafts of Action Plans have been completed for the Neckar and the Donau rivers.

[21] For details, see Annex

3.3. Institutional Coordination and Cooperation between Stakeholders

3.3.1. RESULTS OF CABRI EXPERT DISCUSSION

Introduction

This chapter of D3 Report is based on the results of CABRI-Volga expert discussion during the CABRI-Volga Expert Group Meeting in Nizhny Novgorod, 2005. Its focus is on how to enhance *institutional* coordination, including design and performance of institutions, and how to strengthen *partnerships of multiple stakeholders* (including civil society, business and water services providers, decision-makers and scientists) in environmental risk management in large river basins in the EU and in the Volga River Basin. It provides a number of aggregations and comparisons of insights and lessons learned from coordination/cooperation practices in thematic areas of environmental risk reduction discussed in the preceding chapters.

This chapter assesses major existing problems and gaps between 'design and action' that became obvious from practical applications. For this purpose it concentrates on exploring the following framing questions that are cross-cutting to all CABRI thematic areas:

- How to improve institutional design for administrative coordination (vertical and horizontal) between authorities at various levels responsible for environmental risk management in large river basins?
- How to develop stable partnerships and promote coordination of interests and cooperation between stakeholders within integrated river basin management?
- How to strengthen public participation and awareness in environmental risk reduction, particularly of the local communities?
- What are the common and specific coordination problems for large river basins in the EU and in the Volga Basin and how to enhance cooperation in their sustainable development in the European context?

During the Nizhny Novgorod Expert Group Meeting experts from Russia and the EU had an opportunity for in-depth and moderated discussion. Due to the limited time available for discussion experts concentrated on concrete topics that are most pressing for the assessment of current practices and experiences in the Volga Basin and other large river basins in Europe. The major discussion topics included:

1) Coordination mechanisms
2) Partnerships and cooperation between stakeholders
3) Insights from EU-Russia cooperation in environmental risk management in large river basins

COORDINATION MECHANISMS WITHIN RIVER BASIN MANAGEMENT

Basin management approaches

Currently, basin management approaches are not effectively applied in the Volga. *Technical and scientific questions* within river basin management (RBM) are mingled with *governance* issues. Moreover, the RBM application needs to be coordinated within broader socio-economic regional and national frameworks, including sustainable development issues. Existing 'situational' economic, political and social factors significantly affect RBM performance turning it into a complex multidisciplinary problem.

Basin management in the Volga is also a difficult *multilayered institutional* problem, which is deeply embedded into the national institutional context. The existing structure of government authority and dissemination/coordination of functions - vertically and horizontally between bodies involved in environmental risk reduction in the Volga Basin (including federal bodies and their territorial affiliations responsible for environmental management, administrations of federal districts, regional and local authorities) overlaps with RBM application.

There is an expert opinion that the RBM approach in the Volga Basin (four Basin Management Administrations under the RF Ministry for Natural Resources) 'contradicts' with the existing administrative system, and particularly with the system of federal districts (Volga, Central, South, North-West): in each federal district there are representatives responsible for environmental management.

It also overlaps with another 'layer' of administration, i.e. with the 39 federation subjects in the Volga Basin with respective environmental and disaster risk reduction authorities responsible for management of respective segments of the Volga Basin.

The lack of effective vertical coordination between local-regional-federal levels is indicated as negatively affecting the RBM application. Existing uncertainties in division of responsibilities between authorities of various scales are perfect means to avoid responsibilities in practice. Experiences and problems in coordination through the Interagency Group for Volga-Kama Cascade were discussed, as well as challenges posed before the Volga Basin Council(s) which are to be established according to the new RF Water Code (for details, see chapter 3.5.2.2). The approach "one river basin – one governing body – one programme" was indicated as important for effective water management.

Environmental programmes: Design and Implementation

Why the well-structured federal "Volga Revival" programme which has been important for the Volga Basin, has been recently closed. Why are there significant gaps between its ambitious and progressive, on the one hand, and their implementation in practice, on the other? Why do implementation failures occur? Why has coordination and cooperation between multiple partners in performing this programme not been successful? How to enhance local partnerships and dialogue between stakeholders within initiatives of this kind?

It is noted that not only Volga Revival (closed in 2004), but many other important federal environmental programs have been suspended in Russia. Most of them had progressive goals, but performance has been poor. Many of their failures were rooted in the implementation stage. There is an opinion that the core reason for shortcomings is usually not in the programmes' design, but is associated with programme management and coordination mechanisms applied. Although the design of the Volga Revival programme was based on an integrated river basin management principle and it had a very strong scientific background, its practical application has not been very successful. Lessons learned in a course of its implementation are to be taken into account.

Many shortcomings in Russia during the last decade were rooted in serious economic and social problems that negatively affected implementation of environmental programmes and plans. There is an expert opinion that combination of positive results in socio-economic development with advances in legal framework for environmental risk management in Russia will help significantly to solving implementation and coordination problems in the Volga Basin.

Coordination of resource allocation

Various kinds of coordination problems that emerged in practice can be identified. Among serious concerns is the problem of resource allocation and, particularly, shortages of funds for implementation of programmes and plans despite the sufficient funding planned at their design stage. Shortages in financing when only one-tenth of the targeted funds had been allocated to implementation of Volga-Revival and other similar programmes were indicated as major causes for failures. It was also the reason for the recent closure of many ecological programmes in Russia. Failures in coordination of funds allocation between various levels, corruption and misuse of finance are indicated as a serious problem of the nineties in Russia. Often regions complained that the federal center was not meeting its financial obligations for transfer of funds,

while the representatives of the federal center indicate that regions do not use funds apportioned according to envisaged priorities. Control of resource flows is important as well as transparency and accountability of all actors involved in the implementation of environmental programmes.

The growing attention is paid today to mobilisation of local and regional capacities and resources. At the same time financing and resource allocation problems are common to many countries in Europe. In many cases resource allocations are accompanied by strong lobbying by various interest groups. Quite often financial allocations appear to be not just a technical problem, but a political one. In Russia, recent reforms in mechanisms of vertical coordination of resource allocations through the so-called 'national projects' is expected also to contribute to problem-solving in coordination between levels of authority in such large river basins as the Volga.

PARTNERSHIPS AND COOPERATION BETWEEN STAKEHOLDERS

Lessons learned and problems identified

A variety of issues related to coordination and interaction between the government and various stakeholders were identified. Experiences, good practices, failures and lessons learned both from practices in Russia and in the Volga Basin as well as in the EU and the US have been assessed. The focus has been on exploring experiences and problems in interactions within *triangle* 'government-business-civil society'. Experts discussed existing practices in Russia and possible involvement of the government authorities in building interactions and stable partnerships with stakeholders, including the local public, businesses, NGOs, and the scientific community. Special attention was paid to problems and challenges of how to establish effective cooperation between authorities of various levels, on the one hand, and business and civil society, on the other hand. It was noted that this domain is a *terra incognita* for Russia and a lot should be urgently accomplished as existing coordination mechanisms are really weak. It relates to developing institutional settings, including legislation, incentive mechanisms, coordination of resource allocations, tools and methods for support of formation of partnerships between stakeholders, etc.

Interaction and coordination with business

Recently in Russia a growing attention of the government is paid to constructing new frames for interaction with the business community, which is a new societal challenge. It is of a particular importance for the Volga Basin. Among major goals is how to modify existing environmental mechanisms in order to overcome the problem that only modern and rapidly developing enterprises (many of which have an export orientation) are interested in compliance with existing environmental regulations and in adherence to the Polluter-Pays Principle (PPP). During recent years they started to install new environment benign technologies. Large companies are engaged in their products' standardization, the 'green image' is becoming increasingly important for them. Today they are likely to be important drivers towards environmental problem-solving.

At the same time many small firm polluters prefer to pay fines (or not to pay at all) and meet sanctions because externalities associated with obedient following of the PPP norms are too high for them; they are not able to invest in environmental reconstruction. Significant problems are also associated with municipal enterprises and water services providers. Another problem in Russia in contrast to many other countries is that business does not get practically any incentives from the government either for environmental activities or for developing cooperation with the environmental NGOs. As a result, the aggressive image of business is a benchmark in current interaction between business and civil society, and this situation will prevail until new institutional frameworks are introduced by the state.

Business - Civil society interaction

Various aspects of possible cooperation between civil society and business in environmental management and possible mechanisms for building dialogue, identifying common interests and problems in the Volga Basin are becoming increasingly important. Today, growing attention is paid to establishing partnerships between civil society and business. The same relates to

consolidating the 'social functions' performed by some, especially, large companies in the basin. They are involved in partial coverage of costs for dwellings for their staff, healthcare, education. Ammophos, for example, besides other social responsibilities supports the non-governmental center "Drozd: Russian children are healthy". At the same time the EU experts indicated that such practice of social support is widely spread in the West. Unfortunately, special 'charity' funds recently established in Russia by some large companies tend not to include 'environment' in their agenda (exception – Fund of Vernadsky supported by Gazprom) and some of them are directly involved in political issues.

Building regular and stable partnerships between civil society groups with business is believed to be a promising avenue for the Volga Basin. Some environmental NGOs that are active in the Volga area (for example, "Dront" from N.Novgorod) are seeking their niches to establish cooperation and identify common interests with the business community in the basin. Such approaches are based on perception that "business is able to ameliorate the environment" and develop its environmentally responsible image, while environmental NGOs are able to help business to change its behaviour to become environment friendly.

Interaction and coordination with the public

Although increase in public awareness has been among the priority directions of environmental reforms initiated in Russia during the last decade, the public environmental consciousness is still weak, and ecology has been receding to the bottom in priorities of the local public agenda. Insufficient recognition of environmental NGOs both by the public and by private sector is characteristic. Environmental NGOs are much less developed in Russia than in the EU. However, a number of them are active in the Volga Basin. Mobilization of the public and problem pressure groups is regarded as a promising tool for the nearest future.

New patterns of cooperation between environmental NGOs and authorities are being gradually developed in Russia. Particularly important is establishing the dialogue between the public and authorities in the Volga regions. For example, although Dront is sometimes regarded as oppositional to the government (due to its campaigns in civil rights protection), it develops cooperation with authorities, and particularly with the regional environmental agency in performing a number of joint projects. As interaction with the civil society in Russia in general, and in the Volga Basin in particular is far from desired – really constructive actions are needed. Among the burning problems is establishing the accountability and transparency of local authorities before the local public in environmental problem solving.

The interesting WECO initiative of the North Carolina State University, USA has been discussed. WECO stands for "Watershed Education for Communities and Local Officials" and considers how to develop local participation and build stable partnerships among stakeholders in watershed management. The US government policy encourages development of local partnerships. While the federal regulations provide the general legal framework, the states are introducing their laws taking into account regional and local specifics, and most importantly the interests of the local stakeholders. Within a vertical interaction chain federal – state - local level authorities the participation of local stakeholders is always secured. For example, it is achieved by establishing local committees with participation of representatives of the local public, NGOs, business, scientists, practitioners who are involved in collective discussions and who can influence the decision-making process. Federal government allocates grants for the development of local partnerships.

WECO's mission is to help local stakeholders to learn how to negotiate and participate in the dialogue for better watershed management as public and business sectors are not always ready and properly trained to participate in the joint dialogue. For this purpose WECO develops special training programmes at the local level targeting various stakeholders on how to establish and maintain contacts with each other and act jointly. Experiences and tools of the WECO initiative can be applied by the Volga regions in developing the local awareness and education programmes.

WECO: Watershed Education for Communities and Local Officials, USA

Watershed Education for Communities and Local Officials (WECO) is an innovative programme administered by the North Carolina State University, USA. It focuses on addressing water quality problems at the local level through education. WECO engages citizens at the community level to identify key watershed management issues, potential solutions and recommended actions. Although the N.Carolina state is rich in a variety of water resources the communities face the struggle to balance local economic interests with effective stewardship of water resources. WECO actions suggest tools for communities to accomplish this goal. The central organizers of the WECO programme are based in the Department of Agriculture and Resource Economics of N.Carolina State University. Together with the members of North Carolina Extension Service, the group brings together concerned local citizens, country officials, local municipalities and state and federal agencies together to develop local solutions for water quality problems of the area. WECO's main contribution to problem-solving includes:

- Empowers local citizens through increased involvement in the policy-making process
- Delivers important scientific information and educational material
- Facilitates the development of recommendations and actions to improve water quality at the watershed level
- Increases local awareness of water quality issues
- Develops new important partnerships between various groups

http://www.cs.ncsu.edu/WECO

Fig. 28: WECO: Watershed Education for Communities and Local Officials, USA

Coordination for local Involvement in riverside regeneration in Europe

A number of common environmental problems for river basins in the European countries have been discussed. Lessons and possible tools for cooperative responses were outlined. For example, in some riverside areas, including Ruhrtal, Rhine-Neckar, Stuttgart-Neckar, Hollandsche-IJssel, Mersey Basin, former intensive industrial development, mistakes in regional planning and development have resulted in a range of social, environmental and economic challenges including derelict land and loss of employment.

Recently, cooperative pilot projects and actions of stakeholders have been initiated in several river basins to remediate contaminated river banks, transform the riverside and open new leisure opportunities. Interesting practices in coordination of actions of various stakeholders in the Mersey Basin, UK were described ("Artery Project: Mersey Basin Campaign"). The Mersey Basin campaign has a major goal to facilitate and develop partnerships, while building public and private volunteer networks is an important coordination tool applied by this project. Involvement of local communities into "River Basin Initiative" to clean the riverside is growing, while the active participation of business is defined by economic and PR advantages (Shell); common trust between stakeholders is widely supported. These regional development problems are still common to some areas of Europe and concrete cooperative practical steps of planners and developers are especially important for implementing the European Spatial Development Perspective (ESDP) and the EU Water Framework Directive (WFD). These experiences and lessons learned from them are really interesting and useful for the Volga Basin.

Artery Project: The Mersey Basin Campaign, Great Britain

Artery is a project funded by the EC and its major goal is to develop a new benchmark in riverside generation and contribute directly to the European Spatial Development Perspective through better understanding of regional development. Five European partner regions from Germany, Netherlands and United Kingdom develop ten pilot projects that explore four common themes: regional strategy, public participation, raising awareness, and public private partnerships in the river basins. Their mission is to bring life back into the Europe's former industrial riversides, creating new economic opportunities for local communities. One of its projects in the Mersey Basin area of the UK Northwest intends to improve regional image and the sustainable development of the river basin. It promotes business development, community involvement, recreation and partnerships of stakeholders; community participation is a particular priority. Special coordination mechanisms are established within each of partner projects. For example, the members of the 'Mersey Basin Campaign' Council are drawn from a number of different

sectors, including business, academia and local authorities, helping to sustain the Campaign's links with stakeholders in these areas. Advisory groups are established throughout the basin as well as action groups for each of its main river catchment areas (e.g. rivers Ribble and Goyt) which oversee local projects and programmes. Within them representatives of local community and the Environment Agency (major public body for protecting and improving the environment) work together. Riverside regeneration in the Mersey Basin is supported through combining various sources of funding, including direct and in-kind contributions from the private sector, from funds of the regional development agency, from the UK national government and from the EU public funding.

http://www.merseybasin.org.uk
http://www.artery.eu.com

Fig. 29: Artery Project: The Mersey Basin Campaign, Great Britain

EU-RUSSIA ENVIRONMENTAL COOPERATION

Road Maps in EU-Russia cooperation

It is believed that the EU can be considered among important stakeholders having an impact on the decision-making process in environmental risk reduction in the Volga Basin. The role of cooperation between the Volga regions with their counterparts in Europe and building twinning partnerships is of a growing importance. Interesting experience of cooperation has already been accumulated between the EU and the Volga regions, including, for example, the Volga Vision and the Volga-Rhine project. The latter one contributed to particular aspects of problem solving during the freshet floods on the Volga and its tributes, to the Volga hydraulic modelling and assessing bottom sediments.

Starting from spring 2005, the Road Maps in cooperation between EU and Russia were initiated. There is an opinion that *common environmental space* should be at the focus of a special Road Map. It should not be diffused (as it is at the moment) within *common economic space*, although there are close and integral links between them within sustainable development pathways. It should be a separate priority along with other common spaces, including economy, international security, external defence and education-research-culture. Currently, environmental space and respective strategies in building partnerships between the EU and Russia look like nothing more than a set of 'wishful declarations' instead of concrete proposals. Insights from building other successful cooperative environmental initiatives between the EU and Russia, as for example, the Northern Dimension with concrete partnership programmes might be useful. Specific project proposals for building common environmental space and development of international twinning might be a backbone for common environmental space formation.

Transfer of good practices, mechanisms and tools

Essential components of 'good practices' and tools for coordination between stakeholders in river basins can be exchanged and transferred across borders. However, in some cases direct transfer and introduction of 'standard' mechanisms of environmental management from the EU countries to Russia without their prior adaptation to domestic contexts might produce unexpected results. Possible deformations in these mechanisms might occur. During the session there was an active discussion regarding outcomes in application of Polluter-Pay Principle in Russia which have been borrowed from the West in a course of environmental reforms in the nineties. Experts noted that there were a number of failures to coordinate interactions between authorities and industrial polluters. Existing environmental standards in Russia are often more stringent than in Europe, many polluters are not able to comply with them because they are not realistic, and thus some stakeholders, unlawfully choose just not to pay environmental taxes (experts indicated that environmental taxes are relatively milder in Europe than in Russia). Also, the weakness of environmental authorities in Russia allows for means to avoid payments. Local authorities provide tax exemption for municipal or state enterprises although they discharge heavily polluted sewage into the river. Thus, application of the PPP borrowed by Russia appears to be deformed under domestic specifics.

There is also an opinion that 'packaging and transfer' of practices across basins, or across national borders might be misleading. The alternative possible option might be borrowing the experiences and learning from each other in creating capacities and building pre-conditions that promote equal access, effectiveness transparency, and openness in water protection and conservation in river basins. The process of learning from each other is definitely to be built on careful evaluation and taking into account the existing national peculiarities in economic, social, cultural and political development.

Exchange of experiences and lessons learned

Experts from EU and Russia exchanged lessons learned from good practices in coordination and cooperation between stakeholders in river basin management During the session the following examples of practices and experiences were discussed:

- River Po Basin Management Administration, Italy
- Mersey Basin Campaign, UK
- Watershed Education for Communities and Local Officials (WECO), USA
- Ammophos, Cherepovets, Russia
- Environmental NGO Dront, Nizhny Novgorod, Russia
- RAO UES Volga-Kama Cascade, Russia
- Center for Civil Defense and Natural Emergencies of Nizhny Novgorod Oblast, Russia
- Research Center on Biodiversity "Fortes", Astrakhan, Russia

3.3.2. EXAMPLES OF GOOD PRACTICES

Introduction

This section of CABRI D3 Report presents three examples of practices from the EU and Russia related to present national and bilateral institutional settings to promote administrative coordination and cooperation between various stakeholders in river basins.

The first example (chapter 3.2.2.1) is **the Po Basin Water Board (PBWB), Italy**. Among river basins authorities in Italy, this agency is among the most concerned about involving local stakeholders and, particularly, local public from the basin area into consultations, decision-making and selection of programming instruments to be applied for the water management in the Po Basin. This is especially important as the scope of its competence relating to environmental risk reduction in the river basin includes a combination of regulatory and management functions to maintain the hydrographic network on the river, to protect water quality and rationalize water use, to reduce risk of floods and to regulate land use practices.

Another example on **River Basin Councils in Russia** (*chapter 3.2.2.2*) is an innovative experience introduced recently in this country by the new RF Water Code, 2006. Similarly to the PBWB, this new domestic institution aims to coordinate interests and actions of multiple stakeholders within a river basin, to establish a dialogue and consensus between them. Its membership also has a broad representation from various actor groups within a river basin. However, in contrast to a variety of PBWB water management and regulatory functions, the competences of Basin Councils in Russia are of a consultative status within existing national administrative system of river basin management.

The final chapter in this section is **The Scheldt Estuary case: from Conflict to Cooperation** (*chapter 3.2.2.3*) illustrates the effectiveness of coordination tools that have been applied in solving water-related conflict of interests between the Netherlands and Belgium in the Scheldt River estuary in the North Sea. Recent bilateral efforts in establishing joint coordination bodies and agreements allowed to proceed not only to a productive dialogue and policy-making, but shift to joint implementation of water management pogrammes.

These three examples from Italy, the Netehrlands, Belgium and from Russia are interesting evidences about existing practices and approaches to coordination of actions and stakeholders cooperation and participation in water use and water protection. Lessons and experiences from the Po River Basin and from establishing the coordinating regimes in the Scheldt estuary might be taken into account in formation of River Basin Council system in the Volga Basin.

3.3.2.1 THE PO BASIN WATER BOARD, ITALY

Centro Volta, Italy

Introduction

Among a variety of national authorities for river basins, the Po Basin Water Board (PBWB) in Italy is assessed by the experts as the most concerned about enhancing coordination between stakeholders in the river basin. In this context its particular focus is how to involve public in decision-making, i.e. in designing the planning and programming instruments applied by the agency. It has taken practical steps to involve both public and private individuals with varying interests in its activities, with the aim of:

- making optimum use of knowledge, experience and initiative of various stakeholders in order to improve the quality of planning in river basin management;
- obtaining consensus and mandate to operate and the public support in decision-making process;
- reducing conflict and misunderstanding and thus guarantee of effective and rapid action;
- achieving maximum transparency of decisions;
- promoting constructive dialogue via exchange of experience between parties involved in the decision-making process.

The overview below outlines the role, tasks and planning activities carried out by the PBWB. It describes regulatory procedures for designing/adopting the plans and programmes and lessons and the most important practical experiences of the Board related to the issue of participation and shared involvement in river basin management.

The Po Basin Water Board: administrative bodies, roles, goals and instruments

PBWB was established in 1989 by the Law no. 183/89 to enhance “protection of lands, water rehabilitation, the use and management of hydro resources for the rational economic and social development, and protection of related environment” (Art. 1) within the water basin of the River Po.[22]

[22] The basin is defined in the law 183/89 as "the territory from which rainwater or snow and glacier melt flows on the surface, gathers in streams of water either directly or via tributaries...".

The River Po Basin

The River Po Basin is the largest water basin in Italy covering the area of more than 71,000 square kilometres, or about a quarter of the national territory. It includes about 3,200 council areas and six regions: Piedmont, the Aosta Valley, Lombardy, Veneto, Liguria, Emilia-Romagno and the Autonomous Province of Trent.

The Po is the largest Italian river both in terms of its length - 652 kilometres, and its flow volume - reaches its maximum of 10,300 cubic metres per second at Pontelagoscuro. Its source is at Monviso in Piedmont, and it is fed by 141 tributaries before flowing into the Adriatic Sea in the north of Ravenna through its delta of 380 square kilometres.

The basin has a population of about 16 million. The territory is unevenly populated: population density range from a maximum of approximately 1,500 inhabitants per square kilometre (the Lambro area) to 25 (the Trebbia sub-basin).

The Basin accounts for 40% of Italy's GDP. It is home to 37% of the country's industry, providing 46% of jobs, about 55% of livestock in only 5 provinces and 35% of the country's agricultural production. Electricity consumption accounts for 48% of the national total.

Fig. 30: The River Po Basin

Structure

The PBWB has a mixed representation of both the state and the regions. It is formed from representatives of the ministries involved in activities for protection and development of natural resources in the Regions or Provinces situated in the Po Basin and also from regional representation.

The decision-making body of the Water Board is the Institutional Committee which is composed from several ministries, including the Ministries for the Environment and Protection of the Territory (President), Infrastructures and Transport, Cultural Heritage and Affairs, Agriculture and Forestry, the Interior (delegate for the Coordination of Civil Protection), as well as from the presidents of the Regional councils in the basin (Liguria, Piedmont, Aosta Valley, Lombardy, Emilia-Romagna, Veneto and Tuscany) and of the Autonomous Province of Trent, and the PBWB General Secretary[23] with a consultative vote.

Goals

The major directions of environmental activities in the basin as defined by the Law no. 83/89 include:

- Hydro-geological protection and maintenance of the hydro-graphic network;
- Protection of water-bodies quality;
- Rationalisation of water use;
- Flood control;
- Regulation of land-use.

Major operational means within PBWB planning, programming and implementation efforts are (art.3):

- Organisation, conservation and recovery of the lands and soils in the basin through intervention and control in the hydro-geological, hydraulic, hydraulic-forestry, hydraulic- agrarian, forestry-pastoral, forestation and reclamation and drainage fields;
- Protection and regulation of water-courses;
- Control of water extraction to prevent environmental disruption;

[23] The General Secretary is responsible for the Water Board, represents the Institutional Committee and heads the Technical Committee, e.g. the body which advises and assists the Institutional Committee, and heads the technical-operative secretariat.

- Consolidation and reinforcement of riverbanks and unstable areas, as well as settlements and infrastructures to protect them against landslides, avalanches and other risks;
- Containment of soil subsidence and the upstream movement of seawater along rivers and into water-bodies;
- Coastline protection;
- Reclamation of surface and ground waters to stop their degradation and make them to conform with the EU and national legislation, ensuring their rational use for food production, leisure, recreational and tourist requirements;
- Rational use of surface and underground water resources;
- Regulation of the territory to safeguard and conserve state property and creation of river parks and protected areas;
- Integrated management of public services.

Instruments

The main planning and programming instrument of the PBWB is the Hydro-graphic Basin Plan. It is used as a territorial plan for various sectors and defines the frames for regulatory regime for particular activities and plans/programmes for the use of the territory. Once approved, it provides directives which have immediately binding effect on both the public administration and organisations and private entities.

The Basin Plan is drawn up for sub-basins, or "transitional extracts" (Law 183/89, art. 17, para 6-ter). The extract or *transitional plans* are acts relating to particular sectors or parts of the entire river basin; such approach allows mobile and effective interventions in critical and urgent cases. A variety of other operational instruments are applied: while waiting for the Basin Plan to be approved, and in addition to the transitional plans, the PBWB can also use other legal instruments such as: *provisional and programmatic tables*[24] and *safeguard measures*[25]. The PBWB is able to operate according to the following transitional plans:

- Transitional plan for restoration of hydraulic structure (PS 45)
- Transitional plan for hydro-geological structure (PAI)
- Extraordinary plan for areas at high hydro-geological risks (PS267);
- Transitional plan for fluvial areas (PSFF), integrated into and acknowledged by the PAI;
- Transitional plan for the control of ephtrofication (PSE).

[24] The provisional and programmatic table sets the general strategic lines of the plan and specifies the actions required for their implementation. It identifies the critical points, means of intervention and outlines an initial estimate of the financing required (para.31 of Law 183/1989).

[25] The safeguard measures, defined in relation to the particularly urgent situations, are immediately binding and remain in effect until the Basin Plan is approved and, in any case, for a period of no more than three years (17 para 6-bis of Law 183/89).

Combination of these planning instruments allows dynamic approach and ensures that the Basin Plan is not a static institution, but is flexible for updating by subsequent planning acts, each of which can be viewed as a fundamental element in the overall planning activity. In it turn, coordination of these structural elements of programmatic activities ensures the development of efficient inter-governmental network with all interested parties being involved in formulating the plan and putting it into effect.

Regulatory context

To understand more clearly the implementation process and activities carried out by the PBWB it's useful to provide some overview of concrete regulatory procedures and mechanisms it applies in practice for coordination and stakeholders participation in decision-making. This regulatory framework had been under formation since the Law 183/89 has been enacted.

For example, this Law (Art.14) foresees an internal preparatory phase for the development of the Basin Plan by the PBWB Technical Committee and its adoption by the Institutional Committee. This internal phase is followed by a rather brief phase of *public consultations*: interested parties have a 45-days period within which they can provide their remarks and communicate them to the relevant Region of the basin. Regions are free to "declare themselves" and formulate their opinion on the project under consideration. In relation to comments from the private sector the rules provide the widest legitimacy for its participation in decision-making and linking it with its practices in the basin. Some experts assess this public consultation stage as a weak segment in the entire participatory chain. The problem is that Regions are not obliged to carry out an analytical evaluation of the comments received, the time period for comments is limited, and, finally, the entity being approached to make a review, usually, is the same one that participated in designing the project plan.

Once the Regions involved have expressed their views, the Institutional Committee adopts the Basin Plan, taking into consideration their opinion and comments. After the second approval of the Institutional Committee the Basin Plan is being passed to the national level (due to national significance of the Po River Basin) for further approval by the Prime Minister decree, with following deliberation by the Cabinet and proposal by the Minister for Public Works (art. 4, para. 1, item C.) and, it is finally published in the Official Gazette and in the Official Bulletins of the Regions.

In 2000, in order to enhance coordination between basin plans and territorial plans the Law 183/89 has been modified, and substituted by the Law 365/200; it sets specific rules for adoption of transitional project relating to hydro-geological risks. This law, in particular, foresees that "in order to adopt and activate transitional plans and the required coherence between the basin plan and territorial plans, the regions shall call a planning conference which is divided into provincial subsections, or other subdivisions agreed upon by the regions themselves, within which the provinces and council areas involved shall participate, together with the regions and PBWB representatives". This Conference then expresses a joint opinion about a project plan, with particular reference to its provincial and council-scale context (local hydro-geological and city-planning limitations are taken into consideration as well), while the Institutional Committee, in adopting the plan, takes into consideration the decisions reached by the Conference.

Public participation: Lessons learned

It is remarkable that PBWB managed to actively involve public and private entities characterized by various interests. It ensured their participation in both environmental planning and decision-making, as well as in programmes implementation. For these three level stages, i.e. planning-programming-execution the aims, instruments and bodies/individuals to be involved are identified.

Advisory Committee

The first important PBWB initiative undertaken to ensure coordination of interests, consensus and wider communication relating to plans design has been creation in 1994 of a consultative body - the Advisory Committee. It was formed for earlier consultations and to promoting and disseminating the knowledge about project plans for the basin and making comments and observations before projects are adopted by the Board.

Advisory Committee has a wide representation from various stakeholders in the Po Basin, including representatives of local authorities associations[26], agricultural and industrial associations such as the Chambers of Commerce[27], conservation organisations[28], the natural parks[29], cooperatives[30], the reclamation and drainage consortiums and the Italian Electricity Board (ENEL).

The Committee participates in designing the main PBWB planning acts through consultations with multiple stakeholders; it also promotes meetings and conferences. It also has drawn up numerous documents and summarized opinions regarding the PBWB plans and main acts, provided assessments of different planning approaches to the river basin management. It is also involved in decision-making during natural disasters and other crisis situations in the basin. Since 1997, the Committee has examined and discussed the principal planning acts of the PBWB, and in particular, the Transitional Plan for Fluvial Areas (PSFF) and the Plan for hydro-geological structure (PAI). During the last few years, it has promoted a number of conferences and meetings with a broad stakeholders participation that were focusing on territorial maintenance of the basin[31].

Over the years the Advisory Committee has taken on an important role, not only in formulation and registry of local interests, but also as a proposal-making organ of the Water Board itself, drawing attention to problems and possible sources of conflict in the planning processes. However, its informal nature with the lack of concrete regulations regarding its roles and tasks, has limited its potential and actions which are mainly defined by practice and informal agreements with the top levels of the management and coordination bodies. At the same time, the Committee's activities have significantly helped to enforce certain innovations in relation to participatory management in the river basins. In a course of project preparations the Committee interacts not only with PBWB internal organs, but also counteracts with external technical bodies, members of the national government and regional and local authorities which are responsible for putting the plans into effect, with various associations and other stakeholders.

Strategic Plan

During recent years the PBWB has included into its priorities the development of Strategic Plan aimed at common strategies for enhancing security, maintenance and development of water-courses, the fluvial areas and the territory of the Po Valley. The crucial aspect of the strategic planning is the development by 2007 of the Pact for the Po River Basin. This document will define the institutional capacity by summarizing common goals and actions within the basin at *various levels* - regions, provinces, mountain communities, councils and council associations, etc. as well as by stakeholder groups representing major interests in the basin.

Such approach is a significant innovation in terms of procedure and substance as PBWB intends not to limit its scope by planning and programming activities, by adoption of directives or other regulations. It broadens its mandate to include implementation of plans and norms for basin maintenance and restoration. This plan is regarded by different levels of territorial authorities as an overall vision of development for the Po basin that can be discussed among stakeholders, amplified, improved and implemented.

The Strategic Plan consists of:

- 5 strategic directions, including establishment of basin governance, reducing risks associated with hydro-geological instability, enhancing the value of the territory and fluvial areas, control of the water management and support for local development;

[26] ANCI, UPI, UNCEM

[27] CONFAGRICOLTURA, CIA, COLDIRETTI, CONFINDUSTRIA, CONFAPI, COMUNITÀ PADANA DELLE CAMERE DI COMMERCIO, CISPEL), trade unions (CGIL, CISL, UIL

[28] WWF, LIPU, LEGAMBIENTE

[29] Ticino and Po, Orba Park

[30] National Cooperative League and the Confederation of Italian Cooperatives

[31] Seminar "Technical and legal problems for development of a maintenance plan for the Po Basin" (Parma, 31 May, 2000); conference "Internal Navigation Programmes and Planning for the Basin" (Parma, 18 September 2000); the "First Conference on Territorial Maintenance" (Turin, 9 March 2001).

- 19 strategic aims;
- 46 activities;
- 166 actions.

The major goal is to make the territorial systems work together through participatory and integrated approach that can offer:

- effective representation of territorial interests;
- greater and highly-qualified capacity for coordination and cooperation;
- strengthening and rationalizing of co-planning activities
- new role as a facilitator assisting and speeding up projects realization;
- transfer of tested good practices in river basin management, organisation, finance and project development.

Priority projects for the basin management

The SAFE project reflects the principle of maximum involvement in enforcement and keeping up to date the Basin Plan of major institutions from all local governments. It envisages a variety of operational actions to be carried out jointly by PBWB and local bodies, including:

- Support for the local authorities in carrying out actions aimed at reducing vulnerabilities and river ecosystems rehabilitation;
- Identification of sample areas to conduct experiments with financing of strategic "pilot" projects for maintenance of high-risk areas;
- Issue of directives to reduce the vulnerability of settlements and infrastructures.

The first phase of the project ended in June 2003 and work groups were created with the task of drawing up guidelines to support local authorities. It was carried through updating the census of all infrastructures, buildings and businesses included in the Levels A and B[32] defined in the PAI.

In 2004, PBWB initiated the MIRAPO project (Monitoring-Investigation-Research-Analysis-Proposals-Orientation) aimed at increasing the awareness and security of inhabitants of the middle Po valley against the risk of floods and sustainable conservation of the fluvial areas. This project envisaged collection of information combined with regular communication with the locales in the basin. Information brochures about the flood risks were widely disseminated and this action contributed to building strong local consensus. The activity, which involved an environmental association and students was repeated in 2005 in other areas of the basin.

Protocol of Understanding

"The Protocol of understanding for the protection and improvement of the territory and promotion of security for the population of the Po Valley" was adopted in Mantua 27 May, 2005 between the PBWB and 13 provinces of the basin - Alessandria, Cremona, Cuneo, Ferrara, Lodi, Mantova, Parma, Pavia, Piacenza, Reggio Emilia, Rovigo, Turin and Vercelli. Its aims include:

- To define an action plan for protection and improvement of the territory and promotion of security for the population of the Po Valley;

[32] The fluvial areas are so defined on the basis of hydraulic criteria with the aim of hydraulic defence of the territory.

- To jointly implement the goals of the Strategic Plan mentioned earlier.

The action plan is to integrate into one system all initiatives currently being undertaken by the signatories of the Protocol, stressing the positive cumulative effects and reducing areas of incompatibility between separate initiatives. Common actions will be defined bearing in mind local specifics of the territories as well as integrity of the Po River Basin. The objectives of this Protocol are:

- To support cooperation between various actors on the basis of the assumption that "none of them can pursue global strategies, but that each can hinder/assist the projects of others";
- To create opportunities for various actors to clearly define their objectives and thus assist for establishing coordination between multiple actors, including "weak elements" of this network, i.e. actors whose opinions are not so easily heard;
- To create an awareness about the fact that by forming alliances and partnerships, it is possible to increase the weight of decisions and control over scarce financial and technical resources.

RIVAdiPO Project

The RIVAdiPO Project is the activity in which, more than in any other, authority has moved further from the planning level to approaching local contexts. It examines the territory of 3 different regions (Piedmont, Lombardy and Emilia Romagna) and 7 provinces (Alessandria, Piacenza and Parma, on the right bank; Pavia on both banks; Milan, Lodi and Cremona on the left bank). Its aim is to develop through the agreement with the Councils of the Middle Po Valley[33] a common strategy for economic, social and environmental amelioration and development of the Middle Po Valley with a major focus on sustainable local development and security of fluvial lands. It intends to coordinate economic use of resources with enhancing ecological characteristics in the area.

The work conducted in 2004 indicated at willingness to apply project to different many Council areas and identify their approaches. They were almost unanimous in approving the PBWB as a partner with whom to conduct joint projects for local development of the territory. Development strategy for the Middle Po Valley is expected to include specific actions and projects indicating the resources to be employed and actors to be involved. Selection criteria are to be proposed so as to guarantee that actions and projects are feasible and can in effect be carried out within a mid-term perspective. The sustainability of the actions proposed will have to be assessed from environmental, economic and social standpoint; it is also to be compatible with both the PBWB Strategic Plan and socio-economic and financial programming of the regions and provinces involved.

Actions aimed at improving the environment and the security of the territory are supposed to produce integrated package of interventions for making the Middle Po Valley an area of excellence in environmental terms. The following strategic objectives, in particular, will be taken into consideration:

- creating conditions for the maintenance and improvement of the quality of life;
- supporting the development of eco-compatible production activities.

Programme Agreements

The review of PBWB initiatives that have either reached their conclusion or are currently underway finilises with the list of Programme Agreements on specific topics of the Po Basin management. These are interesting institutional arrangements for development of coordination and partnership agreements between various actors in the basin. They can be regarded as

[33] Agreement for performance of activities aimed at the development and security of the communities of the Middle Po Valley

useful and flexible instruments, agreed upon and coordinated by various actors involved in the planning processes and constructed in line with the specific needs of the territories involved (see Annex).

3.3.2.2 RIVER BASIN COUNCILS IN RUSSIA: EXAMPLES OF INNOVATIVE APPROACHES AND PRACTICES

Autonomous Non-commercial Organization "Environmental Projects Consulting Institute", Russia[34]

Introduction

Among the possible tools for the coordination of interests of multiple stakeholders, for the establishment of a dialogue between them, for the enhancement of their cooperation and for the solution of possible conflicts between various water users, River Basin Authorities such as Committees of Councils (RBC) have gained an increased and worldwide recognition. RBC type organizations are today common to different parts of the world following different types of institutional models. Recently, RBC mechanisms were introduced in Russia by the new version of the RF Water Code adopted in 2006 as an innovative practice for the country. Major pursued objectives include finding ways to coordinate and to preserve the interests of all stakeholders with respect to the conservation and protection of water resources. An important item of the agenda related to the implementation of RBC mechanisms in Russia is how to ensure the means for involvement of local population, for development of partnerships and for the establishment of adequate decision-making processes. How this approach will actually be implemented in practice within the framework set up by the RF Water Code is still a considerable challenge to river basin management in the country.

Worldwide experiences

At present, there are different national systems of *river basin administration* worldwide making use of different institutional models. Their design has to a large extent been defined by domestic administrative frameworks and practices, as well as by existing national regulations and perceptions towards river basin management. However, most of these models are based on the existence of *river basin authorities* that are responsible for individual *basins* and have different degrees of authority and functional competences, including a combination of regulatory and executive functions as well as responsibilities for consultations and building a dialogue with multiple stakeholders. Usually, they receive a general orientation at the central or federal level.

For example, for several decades France has established quite effective system of River Basin Authorities such as for the Rhone, the Loire and other river basins. An important feature is that they got a general mandate from the federal level, but are quite independent in their executive action and practices. Another interesting example of present practices is the Po Basin River Board in Italy, which has been analyzed in the previous chapter of D3 Report (see, chapter 3.2.2.1). It demonstrated a success by investing a great deal of efforts into building a dialogue and consensus between various stakeholders in the Po Basin, into promoting public participation in decision-making.

An important case of *river basin authorities* is given by transboundary basins established to manage and enforce established *agreement* between riparian countries. In fact, such authorities have influenced the development of national water related frameworks as well. They differ in objectives, mandate and juridical personality, however, a most typical cmmon function is that of coordination. Examples of Transboundary Basin Authorities are found in all regions of the world and include the notable cases such as the Nile, Mekong, Indus, Parana-Plata, etc. Examples from Europe include the Rhine River and the Danube River Commissions[35]. A total of about 150 accords involving 52 rivers or lake basins are registered worldwide since the end of 19th century[36]. Many of these gave birth to a river basin authority.

[34] With contribution of Bela Petry
[35] The Danube has been the subject of at least 22 bilateral and multilateral accords.
[36] Inventory of the Transboundary Freshwater Dispute Database, Oregon State University, USA

Experiences accumulated with RBC in the world provide a general testimony of their ability and potential in addressing and contributing to the solution of water related problems and conflicts, often through coordination mechanisms.

Among countries of the former Soviet Union Kazahstan has been one of the first to introduce the RBC system. It is established by its National Water Code of the Republic of Kazakhstan. According to its Article 43:

- The order of the Committee for Water Resource of April 21, 2004 states that the River Basin Organs (RBO) shall report on their activity on establishment of the RBCs.
- An RBC shall be chaired by the head of the relevant RBO and shall comprise the heads of local representative and executive bodies as well as territorial bodies of the state authorities and representatives of water users. An RBC can also include representatives of NGOs. The organization of RBC activities shall be assigned to a corresponding RBO.

Formation of Basin Councils in Russia

So far, there has not yet been a corresponding experience in Russia concerning the development of RBC. None of the previous national legislations on water use and water protection contains this approach or corresponding river basin principles. The new RF Water Code adopted in 2006, for the first time in national legal practice envisages the creation of Basin Councils.

RF Water Code, 2006
Article 29. Basin Councils

1. For the purposes of rational use and protection of water bodies the Basin Councils are created to develop recommendations in the sphere of use and protection of water bodies within the limits of basin okruigs.

2. Recommendations of Basin Councils are taken into account in development of integrated schemes for use and protection of water bodies.

3. Membership of Basin Councils consists of the government representatives of federal executive organs, of the federation subjects' government organs, of local self-governance organs, as well as of representatives of water users, public organisations, communes of indigenous people of the North, Siberia and the Far East of the RF and it is authorized by the government of the Russian Federation.

4. The procedures for setting up and for activities of Basin Councils are defined by the government of the Russian Federation.

Source: Vodny Kodeks Rossiiskoy Federacii, N 74-ФЗ, 2006.

Fig. 31: The 2006 RF Water Code, Art. 29

According to the new national water legislation the RBC participatory pattern is quite wide. It is an innovative practice for Russia. Besides representatives of *government administration* at various levels the representatives of other multiple stakeholders are to take part in their activities. They include representatives of various *water users*, *public* organizations and *indigenous* people.

The RBC structure is to be embedded into the existing domestic water management system. Along with other administrative bodies responsible for regulation of water resources conservation and protection at various government levels the RBC form the institutional framework for water governance within particular basins (for details, see chapter 3.5.I), or basin okruigs.

It is interesting to note some peculiarities in the process of formation of the RBC concept in Russia. For example, in the process of its discussion several proposals relating to RBC *mandate* were introduced. It was suggested to incorporate a number of amendments to the draft national law in order to expand the functions of Basin Councils. Particularly it related to the scope of their *competences* in decision-making and coordination of projects with ecological and social impacts. The final version of the RF Water Code contains a more neutral formulation: it allocates *consultative* status to the RBC. The earlier proposed amendments to the draft Water Code are summarised in the table below.

No.	Article, paragraph	Draft Legislation	Suggested Amendments
1	Article 29. Basin Councils, paragraph 2	Membership of Basin Councils could include representatives of interested federal organs of executive authority, including the federal executive organs responsible for management of water bodies, executive organs of the Russian Federation subjects, organs of local self-governance, water users and non-government associations (organizations).	Membership of Basin Councils could include representatives of interested federal organs of executive authority, including the federal executive organs responsible for management of water bodies, executive organs of the Russian Federation subjects, organs of local self-governance, water users and non-governmental associations (organizations). Within decision-making by executive organs in relation to implementation at water bodies of hydro-engineering and other projects with potential environmental and social consequences for two or more federation subjects located within the basin territory, the consent by the Basin Council has to be mandatory.
2	Article 29. Basin Councils, paragraph 3	Procedures for setting up and activities of Basin Councils shall be established by the Government of the Russian Federation.	Procedures for setting up and activities of Basin Councils shall be established by the technical regulations.

Fig. 32: Proposed amendments to the draft of the RF Water Code

Implementation challenges

The RF Water Code establishes a general framework for RBC creation and development. Similarly to existing practices worldwide the federal government defines the RBC mandate and competences. It means that after the Water Code becomes active in 2007 the design, functions, scope of competences, membership and strategies of RBC in various basins are to be established by the federal authorities.

According to some experts the process from elaboration of detailed institutional design of RBC to their practical actions might take quite a long period of time. Some of them consider that it might take up to decades to develop a well performing RBC system in Russia.

The scope of their functions and thematic areas would be defined within this process as well. Experts consider that among possible focal points for activities may include the coordination of water quality issues in the entire basin area. At the present time, there is no organization in the country that has the responsibility to manage and improve water quality within a river basin. There are bodies responsible for water quality monitoring. There are organizations issuing permits for industries and municipalities to be able to discharge wastewater into the rivers. But, there is no agency looking after the river and its basin as a whole. So, one of the options could

be that RBC might consolidate capacity aiming at basin water quality rehabilitation. Most experts agree that establishing RBC system in Russia is a significant institutional step forward.

From conflict to cooperation in the Volga Basin

RBC in Russia in general, and in the Volga Basin, in particular, are expected to support a dialogue and partnerships, building a consensus and promote possible conflict resolution between various water-users.

According to experts a number of water-related conflicts between various stakeholders in the Volga Basin can be identified. Possible conflicts related to water use and water protection within this basin include:

- Water pollution conflicts between the federation subjects located in the Upper Volga and the Lower Volga when the upstream regions are polluting those that are downstream.
- Conflicts between federation subjects relating to joint use of artificial reservoirs along the river. 'Cheap' electricity generated by hydro-power stations of one down-stream region might lead to water-logging, bogging, loss of residential and agricultural areas, uprising of ground waters in up-stream region.
- Cross-sectoral conflicts between hydro-energy producers and other sectors due to existing lack of coordination in exploitation of reservoirs, including flood control.
- Conflicts between municipalities and power industry. Energy facilities as owners of hydro- stations and reservoirs do not provide adequate investments into bank - protection, dredging, drainage maintenance and other measures in order to keep low the costs of energy production. Municipalities complain about increase in costs to protect banks and maintain other necessary works[37].
- Conflicts between federation subjects in the Volga Basin related to fisheries and control over poaching. Excessive catch of valuable fish species in down-stream results in decrease of catch in other regions, and also negatively affect the biodiversity in the whole basin.
- Conflicts between municipalities arising from contamination of municipal drinking water sources as a result of up-stream waste water discharges.
- Conflicts between population, municipalities and districts related to poor drinking water quality. The family budget of poor population groups suffers from necessity of using pure drinking water from alternative sources more strongly than the family budget of reach people.

Public participation

Building a dialogue, consultations, establishing consensus in water use and water protection between various stakeholders in river basins is among primary goals of RBC. At present the promotion of public participation is very important for Russia. Experiences of RBC in other countries demonstrate that there is a trend towards better representation of general public residing in the cities and rural communities within the basin.

At the moment it is uncertain how the opinions of the general public will reach the RBC, who will represent them and how they will be represented. These questions may become key topics for discussion within the CABRI-Volga. The general idea is that representation is to be selected through a democratic process.

[37] Another possible conflict originates in the slowness of Volga stream, which increasing (up to 10 000 times) the water bacterial pollution, which results in its turn in increase of costs of drinking water decontamination.

Experts assess the RBC as institutions where the public has a voice on how water is managed. Thus, the RBC design might evolve according to the needs and interests of the residents within the basin. Experts underline, that so far, in Russia, there is no culture when the public or water-users have influence on how water is managed. The RBC is believed to be the very first step in developing such attitude in water resources management. The RBC is to provide an opportunity to overcome one of the biggest barriers in the country: by establishing a dialogue between local public and government officials. There are great hopes that this system could become effective in practice.

When local public has recently been approached with a question about their attitudes towards establishing a RBC in the Volga, they initially even could not understand why there was a desire to have river basin councils. The general public had never heard about such a concept before. The initial discussions on the issue always appear to be very difficult, as the whole idea is completely new to many people in the river basin. Maybe in some countries there is no need in RBC as such. Particularly it relates to those where people have a real 'say' in how the water resources are conserved and protected through an electoral process, i.e. the parliament or the local legislatures. For Russia, this mechanism is of a particular importance: local public needs to be sure that their interests and needs are to be known, and that they are real actors in water policy formulation and performance. Through development of RBC system, the water policies might become public, and local people might get more interested in the issues and realize that they have a capacity and power to contribute to changes and improvements in water quality in their rivers.

Public poll results

Interesting public poll results were obtained within the survey performed among the local residents in the regions adjacent to the Cheboksay hydro-power station and its artificial reservoir which are a part of the Volga hydropower cascade. The problem is that neither the federal nor local authorities have considered the local population living in the impact areas as an equal partner having a democratic right in decision-making related to operation of hydropower plants and reservoir and their environmental impacts.

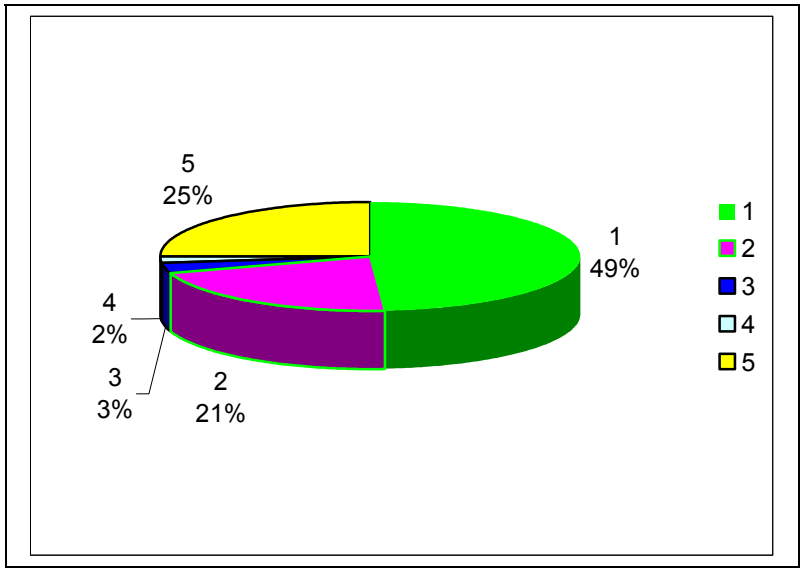
Within the project area two public polls were held in 2002 and in 2004 in three regions (in Chuvash Republic, Mary El Republic, N.Novgorod) adjacent to the Cheboksary hydropower facility. Among three questions[38] asked there had had been an inquiry about: *"How do you evaluate a possibility of influencing conflict situations around Cheboksary reservoir by creating a Local Residents Council?"*

Results of the 2002 public poll indicated that public opinion was evenly divided whether it was useful to create public Councils that could act not only as mediators in conflict situations around the Cheboksary hydropower plant and reservoir, but also effectively influence decision-making. Half of the 80 respondents considered that public Councils could be useful in resolving conflicts. Other respondents were skeptical that the Council could be effective. In 2004, the public poll results were similar to those of 2002 poll: in favor were 49% (50%). The number of negative replies decreased almost by a factor of 2 – 21% (50% in 2002). Both positive and negative were 5%, and undecided - 25% (results are presented below).

[38] The following questions were asked: 1) How do you evaluate the hydropower plant impacts on the environment and region status? 2) What could you propose on improving the environmental status in the coastal zone of the reservoir?

Fig. 33: Opinions of local residents on Local Residents Council

Question 3: How do you evaluate a possibility of influencing conflict situations around the Cheboksary reservoir through creating a Local Residents Council?



A total of 120 respondents were questioned

1. Positive.
2. Negative.
3. Positive rather than negative.
4. Negative rather than positive.
5. It's difficult to answer.

Opinions by undecided respondents:

- I think it is unrealistic.
- I am not confident that the Council may have any effect in a conflict situation.
- I doubt that the Council opinion will be taken into account.
- The Councils could be helpful but they usually rely on emotions.
- The Council will have zero effect. The issues should be resolved by competent professionals, not laymen.

3.3.2.3 THE SCHELDT ESTRUARY CASE: FROM CONFLICT TO COOPERATION

Wageningen University, The Netherlands[39]

Introduction

The Scheldt estuary situated in the northwest of Flanders (Belgium) and the southwest of the Netherlands is the downstream part of the Scheldt river basin. The total basin area amounts to 21,863 km^2 and is divided over France, Belgium and the Netherlands. From its source in Northern France to its mouth in the North Sea, the river has a length of 355 km. Downstream of the sluices of Ghent, about 160 km from the sea, tidal influences are already noticeable. From the border between Flanders and the Netherlands the river widens considerably and becomes the brackish estuary, called the Western Scheldt. The Scheldt estuary region is both an important agricultural and industrial area. It is of a high ecological importance. So, conflicting interests exist in the region with respect to water control and management. Moreover, since the 16th century the Scheldt estuary has been a source for political conflict between Flanders and the Netherlands.

[39] This chapter is prepared by Helle Peeters, Bert van Hove, Annemiek Verhallen, Wim Cofino

Coordination of policies, measures and approaches is essential. Recently, a closer cooperation between the Flemish and Dutch governments developed and a joint initiative was started, The Scheldt Estuary Development Project (ProSes). Its main purpose is to make a solid, broadly supported Development Plan taking into account the different interests of participating parties. This plan is the starting-point for a joint policy–making by the Flemish and Dutch government, aiming at a more sustainable development in the Scheldt estuary.

This chapter presents a short overview of the different functions of the river, the main issues and the institutional framework established to underlie joint policy-making. It may contribute to the discussion on existing practices with respect to the Volga basin.

Fig. 34: The Zeeschelde (zone 3 and 4) and the Scheldt estuary (zone 1 and 2) region.

Main functions

The main functions of the Scheldt estuary are navigation, ecology, recreation and fishery. Because the estuary contains salt or brackish water, it is not used for drinking water.

Navigation. The estuary forms the maritime access to the port of Antwerp that is one of the largest ports in the world. Together with the port of Ghent (B), Vlissingen (NL) and Terneuzen (NL) the port of Antwerp is situated in the Rhine-Scheldt basin, which belongs to the most prosperous areas in Europe. The Western Scheldt, the canal Ghent-Terneuzen, the Sea Scheldt and the Canal Brussels-Ghent are important navigation routes from and to Antwerp. A considerable part of the fresh water discharge of the river Scheldt is diverted to the North Sea by several canals in order to improve navigation possibilities on these canals as well as for industrial purposes.

Ecology. The Scheldt estuary is one of the few remaining European estuaries that include the entire gradient from fresh to salt water tidal areas. The brackish tidal water areas and

marshlands, such as the “Verdronken land van Saefthinge” and the fresh tidal water areas in the upper estuary are unique and belong to the largest brackish marshes of Western Europe. All of the remaining salt marshes and mud flats in the Scheldt estuary fall under the protection of the European Habitat Directive.

Recreation and fisheries. Recreation in the Scheldt basin mainly concerns riverside recreation. In the Dutch part recreation is concentrated around the river mouth. Marinas are situated in Antwerp, Terneuzen, Breskens and Vlissingen. Because of the intensive professional navigation to the port of Antwerp, yachting is concentrated in the western part of the Western Scheldt. Recreational and commercial fishery activities take place in the relatively clean areas in the catchment’s-area.

The Scheldt Estuary: main issues in integrated management

Accessibility. Since 1970, large dredging activities took place in the estuary to deepen the navigation channel. Sea vessels with a draught of up to 11.85 meters can now sail as far as Antwerp regardless of the tide. Ships with deeper draught must wait for a favourable tide to be able to sail over the various bars in the navigation canal. In the near future, shipping lines will make use of larger container ships and tighter time schedules in order to reduce costs. Therefore, a second deepening was conducted in 1998 and recently Antwerp requested for a further deepening of the channel in order to remain accessible for larger sea vessels.

Nature conservation. The total area of salt marshes, mud flats and shallow water has decreased dramatically during recent centuries. In the Dutch part of the estuary, the total area has been reduced by half since 1800. The area decreased from 15,000 hectares to 7000 hectares during this period, mainly as result of land reclamation. Straightening dykes has also eliminated backwaters in the estuary. In Flanders, the total area of salt marshes has decreased by nearly 25 percent since 1900, from almost 700 to 550 hectares. The estuary has too little space and too much tidal influence to allow such areas to develop or allow existing areas to be maintained. An unrestricted deepening of the channel will lead to a further serious decline in biodiversity in the area.

Water quality. The water quality is moderate to bad, although improvements have been made over the recent years. About three millions households drain off their untreated domestic wastewater in the Scheldt or in its tributaries. Industry has made important efforts, but pollution with heavy metals and organic micropollutants is still significant. Agriculture is mainly responsible for the large nutrient load, particularly of nitrogen, into the Scheldt estuary.

Safety. In 1953, there was a disastrous flooding in the south-west part of the Netherlands, at which more than 1800 people drowned. This disaster formed the stimulus for a large-scale flood protection project called the Delta Plan. Since then, most estuaries in the Netherlands have been isolated from the sea by barrages and flood barriers. The only estuaries that have not been blocked off are the Nieuwe Waterweg and the Westerscheldt, in order to provide access to the port of Rotterdam and Antwerp. Dykes along these estuaries were made higher.
The region was again struck by a storm tide in 1976. This time the Netherlands remained unscathed, but major floods occurred along the Scheldt in Flanders. Shortly after this, Flanders instigated the Sigma Plan whose most important elements are the reinforcing of all dykes along the Scheldt and establishing controlled flooding areas. However, the Sigma plan has not been completely implemented yet and consequently there is still a risk for flooding. Moreover, sea level rise due to climate change will eventually influence the safety against flooding in both Belgium and the Netherlands.

Institutional framework

Historical background

The Scheldt estuary has long been a source of conflict between the southern Netherlands (Belgium) and the northern Netherlands, which mainly had to do with the competition between the port of Antwerp and the ports of Amsterdam and Rotterdam. A number of treaties have been

made and joint bodies have been established to deal with this conflict. The table below presents an overview of main historical events.

Fig. 35: The Scheldt estuary: Overview of conflict and cooperation between Belgium and the Netherlands from 1585 till present

Year	Event	
1585	Blockade of the Scheldt	Separation of the Northern Netherlands from Spain (independent war) Republic of the Netherlands Capture of Antwerp by the Spanish Occupation of the southern Netherlands Growth of the port of Amsterdam
1648	Treaty of Munster	Peace treaty between Spain and the Northern Netherlands (republic) Schelde remains closed
1795	French occupation of the Netherlands	Lifting of the blockade
1815	General act of Vienna congres	Southern and northern Netherlands united into one Kingdom Regulation of freedom of navigation on international rivers
1839	Separation treaty (including Scheldt statute)	Separation between southern and northern Netherlands. The state Belgium Application of articles of act of Vienna to rivers and waterways that form or cross the Belgian-Dutch border permanent committee for supervision on the Scheldt navigation
1863	Redemption of Scheldt toll	Unconditional freedom of navigation to Antwerp
1906	Issuing of first dredging	Belgium needs permission for dredging activities on Dutch territory
1948	Installation of Technical Scheldt Committee (TSC)	Permanent consultation on technical Scheldt issues
1961	Treaty concerning the improvement of the canal Ghent-Terneuzen	First Belgian-Dutch agreement concerning technical Scheldt issues
1963	Treaty concerning the connection between Scheldt and Rhine	Issue of inland navigation between Scheldt and Rhine is settled
1963-1994	Several consultations and agreements	
1994	Treaty of Charleville-Mezieres corcerning the protection of the Scheldt	Establishment of International Commission for the Protection of the Scheldt (ICPS)
1995	Treaty on deepening of the Western Scheldt	
1999	Initiative for a long-term vision by both countries	Assignment to TSC
2001	Treaty of Liege	Appointment of an international basin according to the EU framework directive
2001	Memorandum of Kallo	
2002	Memorandum of Vlissingen	Agreement on objectives long-term vision for 2030 establishment of project organization ProSes
2004	Development Outline Scheldt Estuary 2010	
2005	Outline approved by both countries start of implementation	

The Technical Scheldt Committee (TSC)

In 1948 the Technical Scheldt Committee (TSC) was established. It is directed by a Flemish and Dutch chairman and its primary task is to advice Flemish and Dutch politicians on technical

issues such as water infrastructure and general management. The present tasks result from the treaty concerning the deepening and widening of the navigation route that was drafted in 1995. In 2001, Flanders and the Netherlands reached agreement on the development of a long-term vision for the Scheldt estuary (respectively the memorandum of Kallo 2001 and that of Vlissingen 2002). For the elaboration of this plan TSC established the project organization ProSes (www.proses.nl), which operates in an 'triangle' with TSC and the multi stakeholders' platform OAP ('Consultative Committee of Advisory Parties). The latter represents the participating governments, official bodies and interested parties. The figure below illustrates the institutional framework and relationships between the different actors.

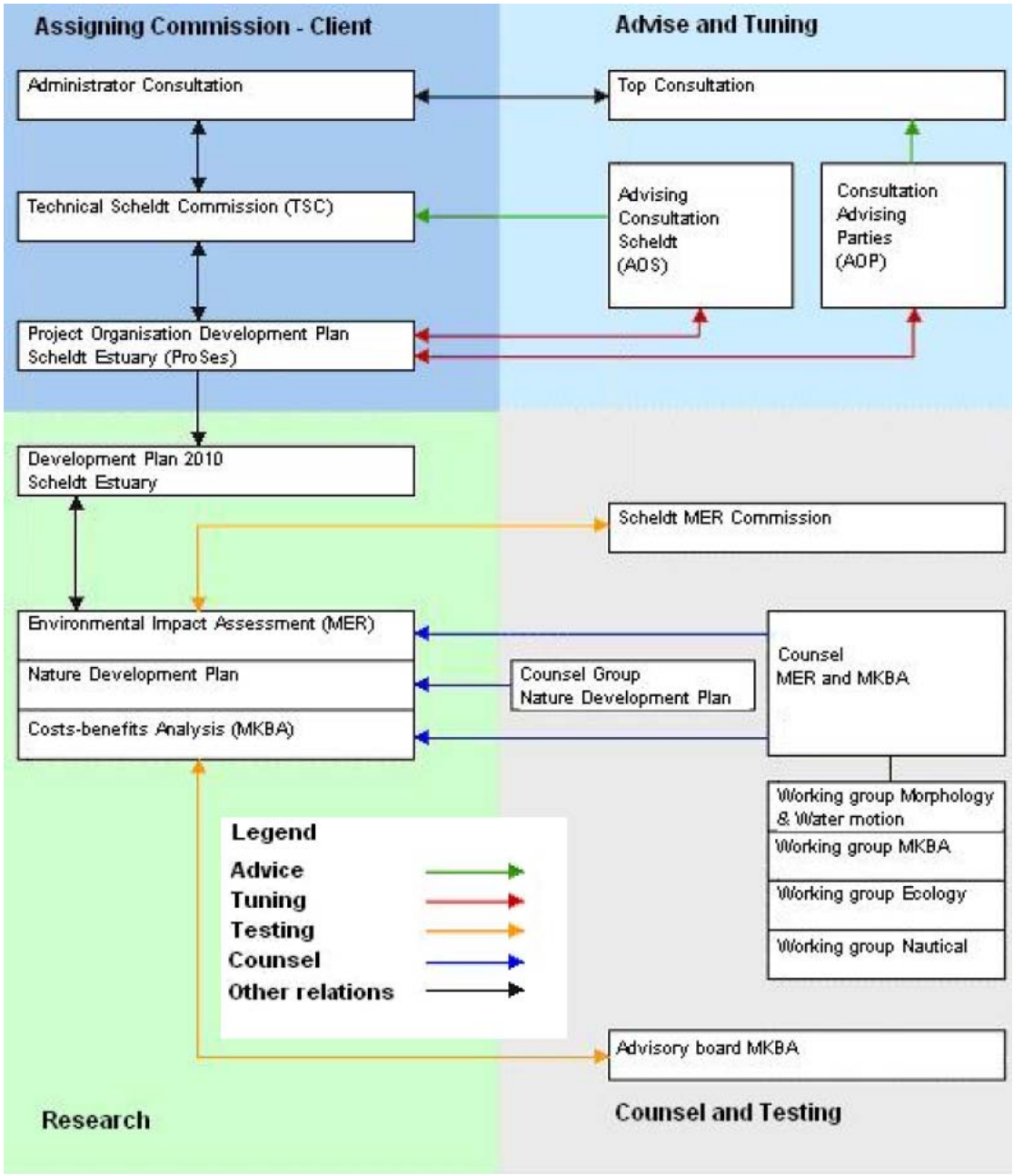


Fig. 5 The institutional framework for the development of the Scheldt Estuary Development Outline 2010.

ProSes and ProSes2010

The first task of ProSes was to make a solid, broadly supported Draft Development Outline aiming at a sustainable development in the Scheldt estuary till 2030. Several studies were

carried out during recent years: a strategic environmental impact study, social cost/benefit analysis, a study on measures for developing the natural environment. During the preparation of the Development Outline, interested parties made contributions during e.g. workshops. They were regularly informed on the state of affaires via brochures, newsletters and the website. Furthermore, public hearings were held, in which draft versions of the Development Outline were presented. The responses were compiled and published, and used in formulating the final version. The 'Scheldt Estuary Development Outline 2010' (ProSes2010) was presented by the end of 2004 and approved by both governments in March 2005. It has three main foci:

- **Safety:** maximum protection against flooding in the region
- **Accessibility:** optimum accessibility to the harbors on the Scheldt estuary
- **Natural environment:** a dynamic, healthy natural environment.

The Development Outline does not deal with all of the problems in the Scheldt estuary. For instance, it does not address the issue of improving water quality. This issue is already being dealt with jointly by Flanders and the Netherlands, along with other Belgian regions and France, in the International Commission for the Protection of the Scheldt (www.isc-cie.com).

Implementation

At present, the first steps are made for the implementation of the resolutions made by ProSes2010. Table 3 gives an overview of the different project plans. A new joint project management team has been established to coordinate this process. In 2006 the governments are to sign the new treaties on financing of the resolutions, the order of significance of the resolutions to be implemented and on how they will further proceed to attain the target situation in 2030.

Concluding observations

The establishment of the Technical Scheldt Committee was a first important step in the normalization in the relationship between Flanders and the Netherlands with respect to water control and management of the Scheldt estuary. From 1995, the decision making process developed slowly, from a situation of conflict, distrust and contra-productivity to a situation of interactive policy making by co-operation between different actors of both countries. The triangle formed by ProSes, the Technical Scheldt Committee and the multi-stakeholders' platform (OAP) proved to be a successful concept for process directed decision making. 'Joint fact finding' plays a prominent role in this. In this way commitment of the different actors can be obtained, that helps keeping the decision making process under way.

Of course, there were tensions, particularly with respect to participation and communication. The interests of the port of Anwerp are different from those of nature conservation organizations or those of agriculture. A number of representatives of the port of Antwerp threatened with juridical steps. Similar contrasts exist with respect to the safety measures to be taken in the area. In Flanders safety projects are conducted by another organization which operates separately from ProSes. Large areas of agricultural land are claimed by ProSes in order to be transformed into flooding areas. As a protest, agricultural organizations in the Netherlands refused to become a full member of the multi-stakeholders' platform. The Dutch province of Zeeland felt that the advantages of the Development Outline 2010 do not outweigh the disadvantages for its province and, therefore had large objections against the Outline. Flemish agricultural organizations and Dutch industry felt under represented. Groups of citizens were unsatisfied with the communication about The Development Outline because it was not quite clear who was responsible. However, despite all these difficulties the objectives of the ProSes2010 were obtained and the Proses organisation is seen as highly successful.

Fig. 37:6 Overview of resolutions and project plans until 2030.

Resolutions	***Projects***
Safety	
Increasing dyke heights and establishing controlled flooding areas along the Zeeschelde	Flanders aims to establish 280 ha of controlled flooding areas by 2010.
Common approach to safety	Flanders and the Netherlands calculate the required level of safety in different ways. The Netherlands is presently examining whether the risk approach such as that used in Flanders is also desirable and possible in the Netherlands
Accessibility	
Deepening and widening the shipping channel	Flanders and the Netherlands have decided that ships with a draught of 13.1 meters must be able to sail as far as the harbour of Antwerp regardless of the tide. For this purpose, the authorities will lower the level of sills in the channel by 1,4 meters. At the border of both countries, the Scheldt will be widened from 250 to 370 meters over a length of 5 kilometers
Flexible dumping locations	All maintenance dredgings will be dumped back into the estuary. Careful selection of dumping locations is necessary to avoid silting-up of side channels and erosion salt marches and mud flats. The selection of dumping locations will be made more flexible in order to allow dumping to take place where it is most favourable for the vitality of the estuary.
Monitoring	A monitoring program will be established during and after deepening
Acceptable risks	The governments will improve the provision of information regarding safety policy to lower-level governments and the general public
Natural Environment	
More room for estuarine developments	In total, at least 1000 hectares of new estuarine environment will be added to the Scheldt
Increased vitality	To restore natural vitality where possible. For example, by alternative dredging and dumping strategies, constructing or removing breakwaters, excavating old marshes, and increasing or decreasing the depths of the channels.
Multifunctional environment	Combining natural environments with other objectives such as safety, agriculture, marine aquaculture, recreation and residential/employment initiatives

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D3 REPORT ABBREVIATIONS

BESTUFS	Best Urban Freight Solutions
BBC-	Bogardi/Birkmann and Cardona Approach
BfG	German Federal Institute of Hydrology
DRI	Disaster Risk Index
DSS	Decision Support System
EFAS	European Flood Alert System
EFFS	European Flood Forecasting System
EG	Expert Group
EMERCOM	RF Ministry for Emergency Situations
ESDP	European Spatial Development Perspective
FTP	Federal target programme
GIS	Geographical Information System
GP	Good practices
GDP	Gross Domestic Product
GNP	Gross National Product
GP	Good Practices
GTZ	German Technical Cooperation
IUE	Institute for Urban Economics (Moscow)
IWM	Integrated Water Management
IKoNE	Integrating Conception for the Catchment Area of the Neckar River
LAWA	Joint State Working Group for Water Resources
NGO	Non-governmental organization
OANAK	Organisation for Eastern Crete Development
PPP	Polluter-pay- principle
RAO UES	Russian Joint-stock company United Energy Systems
RBM	River Basin Management
RF	Russian Federation
SEA	Strategic Environmental Assessment
UNDP	United Nations Development Programme
WCDR	World Conference on Disaster Reduction

ANNEXES

Annex 1. The State Programme for Flood Risk Reduction, Baden-Wurttemberg, Germany

"11 - Point Program for Flood Damage Mitigation"

1. Sustainable interdisciplinary co-operation and State-wide development of flood hazard maps

Flood hazard maps are to be created across the State to show locations threatened by flood. Information about the hazards to flood-prone areas contained in flood hazard maps should appear in an easy-to-understand form and be presented, distributed and maintained for the long term for the general public. Setting the limits and future procedures for flood-threatened areas should involve the participation of all hazard map users:

- risk defence / disaster control
- municipal and community planning
- regional planning
- insurance industry
- water resources management

The maps show flood hazards for different recurrence probabilities and the flood depths for a 100-year flood event. This information forms the basis for flood prevention measures to be taken within the framework of:

- regional and development planning
- warning and action planning
- the insurance industry
- creating awareness among people affected

The development of flood hazard maps is to take place over eight years by way of a comprehensive plan co-ordinated on a State-wide basis under control of the water management administration. Costs are estimated to be approximately EUR 20 million.

2. Joint regulations and information from the State government

All regulations for flood damage prevention in endangered areas will be combined and introduced in an interdisciplinary manner by a joint decree on flood protection and non structural flood plain management by the Ministry for the Environment and Transport, the Ministry for Economics and the Ministry for the Interior.

3. Regulations on handling water-endangering substances in flood-prone areas

The regulations will be improved, especially in housing areas.

4. Determination of area categories concerning regional planning and criteria and methods for their definition

Within the regional plans, the following area categories concerning regional planning are set:

- "Priority areas for preventive flood protection", for
  - avoiding of new risks of damage,
  - preserving and activating of natural overflow areas,
  - river development and flood plain re-naturalisation
- "Reservation areas for preventive flood protection" to minimise damage risks
- Reference areas

5. Adoption of water management information in developing and modifying municipal development plans

Suitable agreements must be met to avoid new risks of damage. Loss of retention areas must be compensated.

6. Inclusion of hazard maps in municipal planning

Water management information (hazard maps) should be considered during municipal planning (existing development plans, sector planning) in order to minimise damage risks.

7. Integration of essential regionally planning features into the State Development Plan

- The new State Development Plan ("Landesentwicklungsplan"), April 2002 underlines the need for preventive flood damage protection within the regional development framework. The plan sets the focus in a compulsory classification of priority and reservation areas within the regional plans and strengthens thereby the possibilities available for regional associations in securing natural flood plains through proper planning.
- The regional plans must set out the priority and reservation areas for preventive flood damage protection to serve as a guideline for development planning. Overflow surfaces in open areas can be secured through the use of priority areas. In order to prevent further flood risk, additional housing development should not take place in priority areas.
- Non-priority flood plains in open areas should be classified as reservation areas in regional plans. Special importance has to be attached to preventive flood damage protection for reservation areas when considering other important plans and measures which are foreseen for the area.
- Open areas located behind and downstream flood protected facilities should be marked as reservation areas for preventive flood protection, so long as these areas are necessary for effective flood damage prevention, or unusual damage could arise which is not preventable through structural measures involving normal expenditures.

8. Development and maintenance of warning and action plans, regular practice exercises for risk defence

In the event of a flood, the responsible authorities and staff of risk defence and disaster control normally only have a short time to react. Should they not already exist, warning and action plans should be developed immediately and regularly updated and maintained.

Action plans in the event of a flood are to be prepared at the municipal level and at the civil defence authority level. In each case, responsibility lies with the municipality or the district authority in charge of civil defence. In this context, a catalogue of risks is to be prepared depending on the specific flood hazard situation.

To ensure that warning and action plans are effective in an emergency, regular practice exercises should be performed.

9. Risk Prevention through Insurance

It is important to have various insurance quotes available relating to danger situations and existing flood prevention.

10. Public Relations – Development of Flood Partnerships

The Ministry for the Environment and Transport together with the Water Management Association of Baden-Württemberg has started in 2003 form “Flood Partnerships”. Its objective is to establish an exchange of experiences between cities, municipalities and water associations on the topic of “Preventive Flood damage Protection”. Core focus lays on creating flood danger awareness among decision-makers and the general public. This sustainable exchange of knowledge should help fulfil the guidelines set out in legislation.

In particular, the following topics are being discussed:

- Flood protected oil storage (experience has shown that spilled fuel oil and its consequential damage to buildings, for instance, is the largest source of damage.)
- Storage and handling of other water-endangering substances (industry)
- Flood-adapted land use and construction
- Flood preparedness

- Flood proofing measures / private provision for actions
- Risk defence / disaster control (flood alarming and action plans etc.)
- Building long-term awareness among citizens, industry and business
- Information about flood hazard maps / endangerment
- Flood predictions
- Risk protection / insurance coverage
- Regional planning / development planning / building permit procedure
- Endangerment from surface water, slope water
- Erosion protection measures
- Information for research and education

11. Interdisciplinary action plans on flood defence in the catchment areas in Baden-Württemberg

Long-term and sustainable consensus is needed among the responsible authorities and those affected in order to ensure acceptance of comprehensive flood management and the necessary measures and resources used. An Action Plan on Flood Defence will combine the goals of all parties involved with flood protection and prevention within a catchment area and describe the measures to be taken by all responsible and affected parties.

The basis of this plan is the LAWA (Joint State Working Group for Water Resources) action instructions of 1999. The action instructions contain points to be observed by decision-makers within affected special administrations, associations, cities and municipalities; points should be equally understandable to citizens affected by flooding. When all points have been worked through and implemented, it should be possible to reach the objectives contained in the action plan on flood defence:

- Reduction of damage risks,
- Reduction of flood water levels,
- Increase flood awareness and
- Improvement of flood information

Annex 2. The Po Basin Water Board: List of Programme Agreements

- "Protocol of understanding for the development of tourist navigation on the River Po in the province of Pavia", signed on 10/07/2003 by the Lombardy Region, the Po Basi Water Board, the Inter-Regional Agency for the River Po, the Province of Pavia, ARNI, The Lombardy Park Consortium for the Ticino Valley, River Councils of the River Po, the Regional Agency for the ports of Cremona and Mantua, Associazione Acqua Benessere e Sicurezza (Water, Well-being and Security), Associazione Amici del Po (Friends of the Po) and the Western Po Navigation Company;
- "Agreement for the performing of activities aimed at increasing awareness and security of citizens in the Middle Po Valley in relation to the threat of flooding and to the sustainability and integrated conservation of the fluvial areas" signed on 3/06/2004, by the Water Board for the River Po Basin, the Associazione Acqua Benessere Sicurezza and the Arena Po Local Council;
- "Agreement for the management of sediments from the Po riverbed from the confluence with the Tanaro to the sea" signed on 5/10/2004 by the Water Board for the River Po Basin, the Emilia-Romagna, Lombardy and Veneto Regions, and the Inter-Regional Agency for the River Po;
- "Agreement aimed at conducting activities preparatory to the formulation of a directive for reducing the vulnerability of sports and tourist-recreational complexes in the fluvial areas defined by the P.A.I." signed

on 6/11/2004 by the Water Board for the River Po Basin, the Department of Territorial Ecology and the Department of Hydraulic and Environmental Engineering of the University of Pavia and the Canoeing Association;

- "Convention for the creation of a system of hydraulic modelling for flood forecasting and control in the main branch of the Po" signed on 16/02/2005 by the National Department for Civil Protection, the Water Board for the River Po Basin, the Inter-Regional Authority for the River Po, the Emilia-Romagna Region, A.R.P.A.- Emilia-Romagna, Lombardy Region, Piedmont Region, A.R.P.A. – Piedmont, the Autonomous Region of the Aosta Valley and the Veneto Region.
- "Agreement for the improvement of the Po", stipulated in 1999 by the Po Provinces, the Padana Regions, the Ministry for Industry, Commerce and Crafts, and the Department of Toursim so as to share, activate and support overall projects aimed at enhancing the historical-artistic and environmental patrimony of the fluvial territories and identifying interventions to be made in relation to tourist services that function in line with international standards, as well as creating a strong "brand" image for the River Po;
- The area programme, Po European River, which involves the Emilia-Romagna Region and the provinces of Piacenza, Parma and Reggio Emilia;
- The "Po of Lombardia" Convention between the provinces of Pavia, Lodi, Cremona and Mantova for improving and unifying at the same level tourist opportunities;
- "The River Po Work Group", coordinated by the Province of Mantua and consisting of representatives from the Water Board for the River Po Basin, A.I.Po, A.R.N.I., Unione Regionale Consorzi di Bonifica, Irrigazione e Miglioramento Fondiario (U.R.B.I.M.) Lombardy (Regional Union of Consortiums for reclamation, irrigation and improvement), the Lombardy Region (U.O. Navigable Routes) and the provinces of Parma, Reggio Emilia and Cremona;
- Strategic Project "Territorial Maintenance", begun by the Province of Turin with the aim of establishing the means of programming, realising and managing ordinary territorial maintenance activities.