



Convention on the Protection and Use of Transboundary Watercourses
and International Lakes

BACKGROUND PAPER ON INFORMATION MANAGEMENT IN TRANSBOUNDARY WATER COOPERATION

Prepared by the UNECE Secretariat with the assistance of the Convention's International Water Assessment Centre (IWAC).



1. Introduction

The present background document has been prepared to provide the participants of the *Workshop on information management and public participation in transboundary water cooperation* (St. Petersburg, 8-1 June 2005) with a general analytical framework for information management as well as an overview of the current situation, progress and remaining problems in countries in Eastern Europe, the Caucasus and Central Asia (EECCA). Chapter 2 will give a framework for information aspects in relation to management of water resources, Chapter 3 focuses on information needs and chapter 4 on the utilization of information. Finally Chapter 5 deals with information management and transboundary water cooperation in the EECCA region and chapter 6 includes conclusions and recommendations. After the workshop, the document will be reviewed to include further details on information management in EECCA, material from other workshop's documents and presentations, as well as the workshop's conclusions and recommendations.

The workshop is organized within the framework of the project Capacity for Water Cooperation (CWC) in Eastern Europe, the Caucasus and Central Asia, developed under the work programme of the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention). The workshop is also part of a series of regional workshops that the Global Environment Facility (GEF) International Waters Learning Exchange and Resource Network (IW:LEARN) co-hosts around the world on information management and public participation. Hence, experiences and lessons from EECCA will be transferred to other regions through subsequent workshops.

The overall objectives of the CWC project are to:

- Strengthen the capacity of transboundary water management in EECCA;
- Facilitate exchange of experience and improve cooperation and coordination within and between river basins, countries and ongoing projects;
- Establish, maintain and strengthen a network of EECCA experts;
- Identify issues at the regional, national, local or river basin level and make recommendations for future action.

The St Petersburg workshop has two main themes: information management and public participation. A background paper on public participation is also available.

The workshop aims to improve information management, and in particular information exchange on the transboundary level; facilitate exchange of experience of information management between EECCA national authorities, NGOs and other stakeholders (e.g. the private sector); assess the current state of information management and public participation in EECCA transboundary waters; and make recommendations, at the regional, national, local and river basin level (general recommendations as well as specific proposals for follow-up activities).

The approach to information management promoted in the document is mostly based on the experience under the UNECE Water Convention, in particular under its Working Group on Monitoring and Assessment. More details are available in the UNECE Guidelines on monitoring and assessment of transboundary rivers, lakes and groundwaters.¹

The document introduces the general framework for information management deriving from the need for integrated management of water resources. It illustrates how to define information needs, in particular needs for transboundary water cooperation, and how to tailor information to its

¹ The three sets of guidelines are available in English and in Russian at <http://www.unece.org/env/water/publications/pub74.htm>.

different uses. The document also reviews the latest progress on information management in EECCA and the major problems, and provides a number of recommendations in different fields.

2. Framework for information management

2.1 Need for reliable data and trusted information

Sustainable water management is based upon appropriate use of reliable data and trusted information.

Reliable data and information are key to understanding water resources and thus important tools for:

- preventing damage to the environment;
- ensuring the conservation and, where necessary, the restoration of water-related ecosystems;
- preventing damage by waters (including river regulation, drainage, floods, droughts and erosion);
- promoting the ecosystem approach in water management; and
- fostering water-demand management measures (including water-supply services and the rational use of water).

Reliable data and trusted information are preconditions to handling inter-sectoral water management issues to prevent, control and reduce transboundary impacts. The work of joint bodies relies on quality data and acceptable information derived from those data. As cooperation for shared waters first develops, joint fact-finding about and baseline assessment of water-related ecological and socio-economic systems are critical to designating appropriate targets for protecting sensitive areas, such as drinking water recharge zones, and remediating so-called “hot spots” of pollution. By bringing clarity and evidence to guide early waters decisions, accurate data and information are thus essential to drafting, revision, adaptation and implementation of bilateral and multilateral agreements on transboundary waters.

After adoption of such agreements, from reliable data are derived meaningful indicators of progress towards nation’s shared political, socio-economic and ecological objectives for water management. Such indicators are often in themselves trusted information regarding changes in policies, environmental and social impacts and ecological and socio-economic quality resulting from transboundary coordination of water management. Thus, in the context of GEF international waters projects, these tools are fundamental to both Transboundary Diagnostic Assessment (TDA) and the overall Strategic Action Programmes to jointly realize adaptive management of shared waters. In fact, all GEF-supported International Waters agreements either implicitly or explicitly rely on mutually-agreed upon data and information regarding problems, solutions and indicators of progress; so do related conventions, such as the Ramsar Convention on Wetlands, the UNECE Water Convention and the Law of the Sea (LOS) Convention.

Reliable data and trusted information are also needed for compliance review, according to the provisions of the Water Convention and its protocols, other UNECE environmental agreements such as the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, the EU Water Framework Directive and other applicable European and Asian legislation.

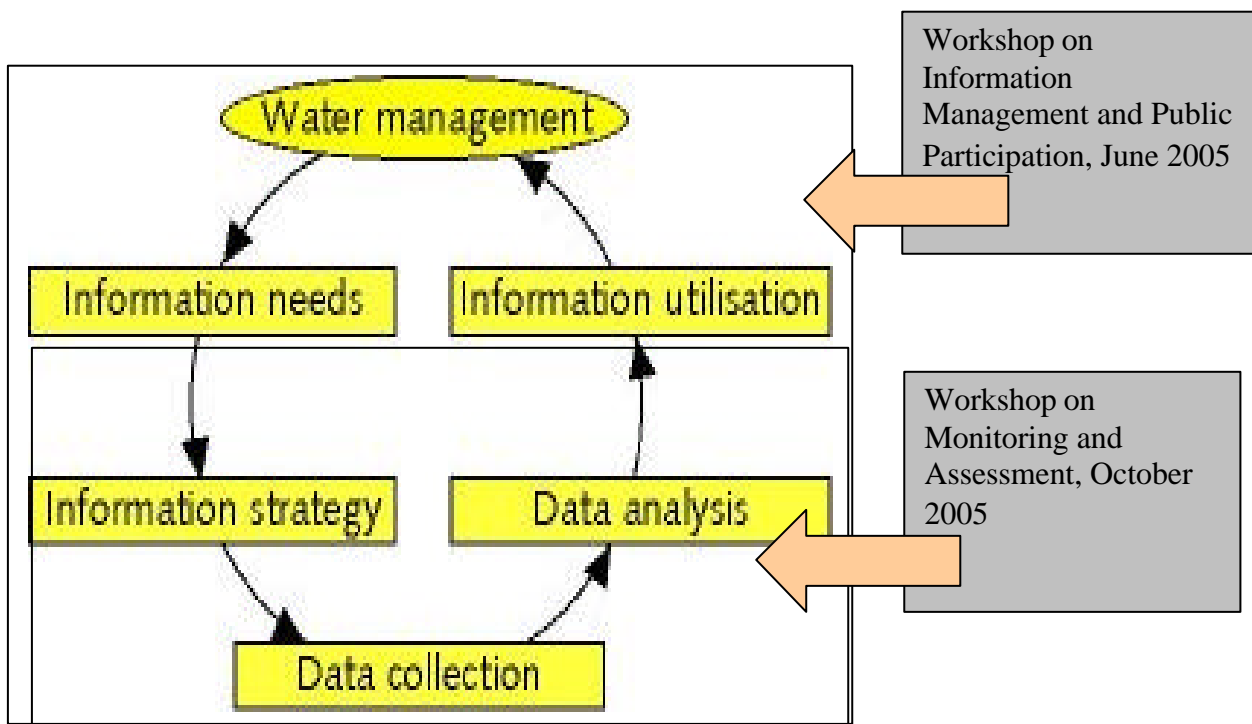
National reporting on achieving targets set at high-level global summits, most notably the Millennium Development Goals (MDGs) require reliable data and information to measure increased

access to freshwater resources, restoration of fisheries, decline in water-related diseases, as well as poverty alleviation resulting in part from these actions.

Last but certainly not least, citizens’ understanding of and public participation in water management activities is rooted in public access to reliable data and trusted information.

2.2. Information cycle model

An information cycle model is often used to show the link between water management, assessment of associated data and information needs, generation of the such data and information, and their use to water management (Timmerman, et al., 2000). For the purpose of this background paper, this cycle can be drawn as follows:



For the current Workshop on Information Management and Public Participation, two elements of the above cycle are important to address: (a) information needs and (b) information utilization. Both elements must be seen in the context of recent water policies, strategies and actions, collectively referred to in the above cycle as “water management”. Therefore, this background document will briefly reflect on the recent approach to water management, as this is essential to understand these elements of the information cycle.²

2.3. Integrated Water Resources Management (IWRM)

The transition from a command-and-control driven management of water resources to a new approach to water resources management that calls for integration and broader participation of stakeholders poses new requirements on the provision and management of information. This new approach is usually described as Integrated Water Resources Management (IWRM).

² Except “information needs” and “information utilization”, the other elements of the information cycle model, most notable those linked to monitoring and other forms of data generation will become part of the Workshop on Monitoring and Assessment scheduled for October 2005.

Water management based on the command-and-control approach	Integrated water resources management (IWRM)
Technocratic	Societal
Reactive	Anticipative and adaptive
Sectoral water policy	Integrated policies

There are at least four key elements of new water policies, strategies and actions based on the IWRM approach:

1. **Balancing values:** Recognise that water has social, economic and environmental values and should therefore be managed so as to realize the most acceptable and sustainable combination of those values (see, for example, the UNECE Protocol on Water and Health and the EU Water Framework Directive);
2. **Coordinated management of interconnected waters:** Stipulate that water resources should, as far as possible, be managed in an integrated manner on the basis of basins or catchment areas. Such an integrated approach should apply across the whole of a trans-jurisdictional catchment area, whether transboundary or not, from its aquifer or groundwater sources through associated coastal waters (see, for example, the UNECE Protocol on Water and Health and the EU Water Framework Directive);
3. **Holistic approach to environmentally sound management of inland water resources and riparian vegetation, riverine floodplains and associated wildlife and habitats.** Aims include linking social and economic development to the protection of natural ecosystems and relating water-resource management to regulatory measures concerning other environmental mediums and taking into account the role and functions of water-related ecosystems (forests, wetlands, soils) in the water cycle (see, for example, the 1971 Ramsar Convention on Wetlands, the UNECE Water Convention, the UNECE 1993 Guidelines on the ecosystem approach in water management as well as the EU Water Framework Directive);
4. **Apply to the integrated management of surface freshwater (rivers, lakes, reservoirs), groundwater, estuaries and coastal waters (e.g. waters used for recreation or for the production or harvesting of fish and shellfish).** They deal with water in the course of extraction, transport, treatment or supply; and they cover wastewater throughout the course of collection, transport, treatment and discharge or reuse (see, for example, the UNECE Protocol on Water and Health).

2.4. Integrated approaches to water management and information needs

The recently developed water policies, strategies and action entail a new level of national and international awareness and responsibility in solving complex and interrelated problems of the environment. All four key elements above are strongly related to information management as described in chapter 3. Given the above key elements, the table below provides examples of some items that are related to IWRM and the corresponding information needs. As shown in section 3.1.2, information needs identified in this table has to be further specified, for example, to derive measurable characteristics.

Selected items related to an integrated approach	Some examples of information needed
Integration of environmental objectives	Information on water-quality, water-quantity and ecological status as well as objectives/targets for protecting highly valuable aquatic ecosystems and ensuring a general good status of other waters.
Integration of all water resources	Inventories of fresh surface water and groundwater bodies, wetlands, coastal water resources at the river basin scale and their interactions.
Integration of all water uses, functions and values	Knowledge on the links between functions and uses in a specific river basins (e.g. water for the environment, role of ecosystems such as forests and wetlands in the water cycle, water for health and human consumption, water for industry, transport, leisure (see table section 3.4) and their societal valuation.
Integration of disciplines, analyses and expertise	Uses of resources, hazardous activities (e.g. manufacturing industries), water-construction works and other economic activities to assess current pressures and impacts on water and water-related ecosystems by combined knowledge on hydrology, hydraulics, morphology, ecology, chemistry, soil sciences, technology, engineering, social and political sciences, and economics.
Integration of all significant management and ecological aspects	Knowledge on the extent of floodplains; inventories of land use (e.g. forests, agricultural areas, urban areas); inventories of protected areas and their relationship with, or influence on, the ecological situation; link between policy measures and ecology to assess effectiveness of measures.
Involvement of stakeholders and the civil society in decision-making	Local experience and traditional knowledge on water issues; identification of stakeholders and their information needs; reporting requirements/information needs of the stakeholders and general public (e.g. level of detail, frequency of reports).
Integration of different decision-making levels that influence water resources and water status	National legislation; transboundary agreements; decisions taken at international forums (e.g. MDGs); functions and mandates of local, provincial, national and transboundary authorities and other bodies

3. Information needs

The analysis of information needs is well documented in recently published guidelines on the monitoring and assessment of transboundary rivers, lakes and groundwaters.³

Rather than embarking on technical details of the above guidelines, section 3.1 provides practical examples to define and specify information needs through the Driving Forces-Pressures-State-Impact-Responses (DPSIR) framework. This is explained using the United Nations Millennium Development Goals (MDGs) as an example. Sections 3.2 and 3.3 deal with information needs related to the implementation of the UNECE Water Convention and its Protocols and the EU Water Framework Directive, respectively.

Section 3.4 is devoted to the definition and specification of information needs of bilateral and multilateral water agreements. It includes a section on reporting, as reporting has a direct bearing on the specification of the information needs.

3.1 Information needs and global commitments

Global commitments, such as the Millennium Development Goals (MDGs) and the commitments of the Johannesburg Joint Plan of Implementation, are formulated in a general language, either regarding targets and/or target dates.

3.1.1 Definition (or identification) of water management objectives

As the first step, the analysis of information needs requires the “identification of water management goals and objectives”. Information is needed in order to assess whether or not the following water-related MDGs are being achieved:

- Reduce by two thirds, between 1990 and 2015, the under-five mortality rate (MDG 4 - Target 5);
- Halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation (MDG 7 - Target 10);
- Integrate the principles of sustainable development into country policies and programmes and reverse the losses of environmental resources (MDG 7 - Target 9).

3.1.2 Specification of information needs

The second step is the “specification of information needs”, a step during which the generally formulated water management objectives, such as the above MDGs, are being converted into measurable characteristics:

- In the first case, a direct measurement of the under-five mortality is needed. The 1990 data need to be available and the method for measuring must be comparable to the 1990 data. Another measurable characteristic would be the Disability-adjusted Life Year (DALY), widely used by the World Health Organization (WHO) to characterize a lost year of healthy life;

³ Guidelines on Monitoring and Assessment of Transboundary Rivers, 2000, UNECE Task Force on Monitoring and Assessment; Guidelines on Monitoring and Assessment of Transboundary Groundwaters, 2000, UNECE Task Force on Monitoring and Assessment, and Guidelines for the Monitoring and Assessment of Transboundary and International Lakes, 2003, UNECE Working Group on Monitoring and Assessment all available at <http://www.unece.org/env/water/publications/pub74.htm>

- In the second case, measurable characteristics could include: number of people serviced; number of outbreaks of a specific disease (e.g. Viral hepatitis A); performance characteristics of the water supply network (e.g. number of leakages, hours of uninterrupted water supply) and others.⁴ To enable comparison to the 1990 situation as a measure for reduction, these characteristics should be similar to the ones available from 1990.
- In the third case, measurable characteristics could include: percentage of river basins (national or transboundary) for which plans on integrated water resources management exist, area of restored ecosystems (e.g. wetlands) and others.

3.1.3 Applying the Driving Forces-Pressures-State-Impact-Responses (DPSIR) framework

While specifying information needs, one should also clarify whether the statistics or other piece of information describe a “driving force”, a “pressure”, a “state”, an “impact” or a “response”. Such a grouping in easily understandable categories takes into account cause-effect relations.

This grouping under the above five categories, known as the Driving Forces-Pressures-State-Impact-Responses (DPSIR)⁵ framework, assumes that there are interrelated links between social, economic and environmental systems. These links are illustrated conceptually by driving forces of environmental change, causing pressures on the environment, which in turn affects the status of the environment. The subsequent changes of the status are termed impacts and comprise impacts on ecosystems, economy, as well as population. The negative impacts will eventually lead to responses by society, such as the development of policies for river basin protection. If the policy has the intended effect, it will after its implementation influence the driving forces, pressures, status and impacts.

Often the grouping of the measurable characteristics under the five categories of the DPSIR framework is neglected, which gives rise to an unbalanced use of characteristics that describe only one or another component of the DPSIR framework, thus disregarding cause-effect relations.

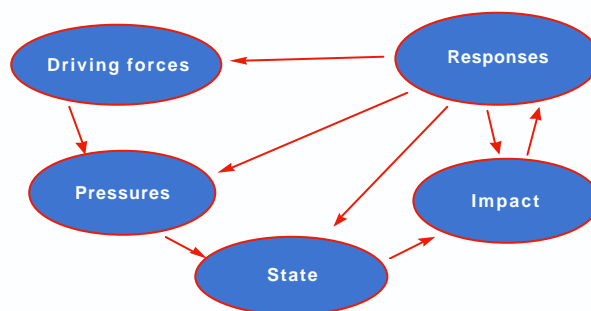


Figure 1: The Driving Forces-Pressures-State-Impact-Responses (DPSIR) framework (EEA)

As regards MDG 7, target 10, the use of the DPSIR framework could result in the following measurable characteristics:

⁴ See also section 3.1.3 on the DPSIR framework.

⁵ The DPSIR framework was drawn up and adopted by the European Environment Agency (EEA) as the causal framework for describing the interactions between society and the environment.

- “Driving forces” are the sources of the problem (e.g. number of households or population density);
- The resulting “pressures” may be the wastewater quantity and composition of the wastewater (e.g. BOD) that is discharged into the surface water, treated or untreated, and the amount of water abstraction for sanitary and drinking-water purposes relative to the available water resources;
- The “state” of the surface water may be characterized by concentrations of nutrients or organic matter. The “state” of the sanitary situation can be characterized by the availability of safe drinking water and basic sanitation, e.g. as percentage of the population that has access to it;
- The “impact” can be seen in changes in the water use patterns, such as an increasing or decreasing number of drinking-water companies that have to apply extra treatment. The impact in societal terms can be described in terms of number of people with diseases related to bad sanitary situation. (e.g. reduced number of outbreaks of a given water-related disease);
- The societal “response” finally is the policies and measures taken: a response measures that aims at “driving forces” is the promotion of better hygienic behavior (e.g. location of waste and/or wastewater disposal separated from location of drinking-water abstraction). Response measures that aim at “pressures” is the application of improved wastewater treatment (e.g. number of facilities with primary, secondary etc. treatment). An example of a response measure to change the “status” is subsidizing improvements and maintenance of sewage water systems. Remediation of “impacts” is done by, for instance, improvements in medical support for sick people or vaccination against water-related diseases

3.2 Information needs under the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) and its Protocols

3.2.1 UNECE Water Convention

The 1992 Water Convention is the most advanced legal instrument for the management of transboundary waters (transboundary rivers, transboundary groundwaters, transboundary and international lakes) in the UNECE region. Several bilateral and multilateral agreements⁶ among UNECE countries support action required by the Water Convention. The Convention’s main goal is to prevent, control and reduce any transboundary impact (see articles 1 (2) and 2 (1)).

When defining and specifying information needs related to the “prevention, control and reduction of transboundary impact”, one should note that the Convention requires the setting of emission limits for discharges from point sources on the basis of the best available technology (BAT)⁷. It also requires authorizations for wastewater discharges and the application of at least biological or equivalent processes to treat municipal wastewater. The implementation of best environmental

⁶ Information on existing bilateral and multilateral agreements on transboundary waters as well as main joint bodies in the UNECE region is available at <http://www.unece.org/env/water/partnership/part.htm>

⁷ The definition of BAT in the Convention contained in its annex I (see <http://www.unece.org/env/water/pdf/watercon.pdf>) differs from other definitions (e.g. <http://waste.eionet.eu.int/definitions/bat>) as far as the «economic feasibility of such technology » is also requested.

practices (BEP)⁸ is needed to reduce the input of nutrients and hazardous substances from agriculture and other diffuse sources.⁹

Monitoring the status of transboundary waters will reveal important data and pieces of information needed to assess progress in reducing transboundary impact. Supplementary information is needed, based, for example, on emission-monitoring (either by government authorities or through the so-called self-monitoring of enterprises), modelling of the behaviour of non-point pollution sources, expert judgments and information on water use.

Joint bodies, i.e. any bilateral or multilateral commission or other appropriate institutional arrangements for cooperation between Riparian Parties have a specific role in information management as well as monitoring and assessment under the Convention (see, for example, article 9), which includes the following tasks:

- To collect, compile and evaluate data in order to identify pollution sources likely to cause transboundary impact;
- To elaborate joint monitoring programmes concerning water quality and quantity;
- To draw up inventories and exchange information on the pollution sources;
- To elaborate emission limits for waste water and evaluate the effectiveness of control programmes;
- To elaborate joint water-quality objectives and criteria and to propose relevant measures for maintaining and, where necessary, improving the existing water quality;
- To develop concerted action programmes for the reduction of pollution loads from both point sources (e.g. municipal and industrial sources) and diffuse sources (particularly from agriculture);
- To establish warning and alarm procedures;
- To serve as a forum for the exchange of information on existing and planned uses of water and related installations that are likely to cause transboundary impact;
- To promote cooperation and exchange of information on the best available technology in accordance with the provisions of article 13 of this Convention, as well as to encourage cooperation in scientific research programmes;
- To participate in the implementation of environmental impact assessments relating to transboundary waters, in accordance with appropriate international regulations.

⁸ As with BAT, the definition of BEP included in annex II of the Convention is different from definitions by other organizations, such as the Oslo-and-Paris Commission (OSPARCOM), see http://www.ospar.org/documents/dbase/publications/p00023_BEP-E.pdf

⁹ Currently, the Convention's Working Group on Monitoring and Assessment is preparing an assessment of the status of transboundary waters in the UNECE region. It is to be expected that this group at its meeting in mid-May 2005 will finally identify and specify information needs for this assessment so that the participants in St. Petersburg workshop can be briefed on most recent developments.

3.2.2 Protocol on Water and Health to the 1992 Water Convention

When defining and specifying information needs, the Protocol on Water and Health¹⁰ has to be taken into account. Under this Protocol effective systems for monitoring and assessing situations likely to result in outbreaks or incidents of water-related disease and for responding to them or preventing them are to be established. This will include inventories of pollution sources, surveys on high-risk areas for microbiological contamination and toxic substances, and reporting on infectious and other water-related diseases. The Parties shall also develop integrated information systems to handle information about long-term trends in water and health, current concerns and past problems and successful solutions and the provision of such information to the authorities. Moreover, comprehensive national and/or local early-warning systems are to be established, improved or maintained.¹¹

3.2.3 Protocol on Civil Liability and Compensation for Damage caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters (Civil Liability Protocol)

The Civil Liability Protocol¹² is a joint Protocol to the Water Convention and the UNECE Convention on the Transboundary Effects of Industrial Accidents (Industrial Accidents Convention). It contains provisions on measures to reinstate or restore damaged or destroyed components of transboundary waters. For this purpose, it is important to know the conditions of the transboundary waters that would have existed had the industrial accident not occurred. This requires appropriate data and information on the status of transboundary waters and their components¹³.

3.3 **Information needs under the EU Water Framework Directive (WFD)**

The WFD provides the framework for the protection of surface waters, transitional waters, coastal waters and groundwaters in the EU area. The main aims of the WFD are to prevent further deterioration and protect and enhance the status of aquatic ecosystems, promote sustainable water use, and mitigate the effects of floods and droughts. The environmental objective is to achieve good status, ecological and chemical, of water by 2015 at the latest.

Within a river basin where use of water may have transboundary effects, the requirements for the achievement of the environmental objectives established under this Directive, and in particular all programmes of measures, should be coordinated for the whole river basin. For river basins extending beyond the boundaries of the Community, Member States should endeavour to ensure the appropriate coordination with the relevant non-member States. This Directive is to contribute to the implementation of Community obligations under international conventions on water protection and management, notably the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, approved by Council Decision 95/308/EC (15) and any succeeding agreements on its application.

One of the core activities under the WFD is the drawing up and implementation of River Basin Management Plans (RBMPs) which will include the information below.

¹⁰ Available at <http://www.unece.org/env/documents/2000/wat/mp.wat.2000.1.e.pdf>

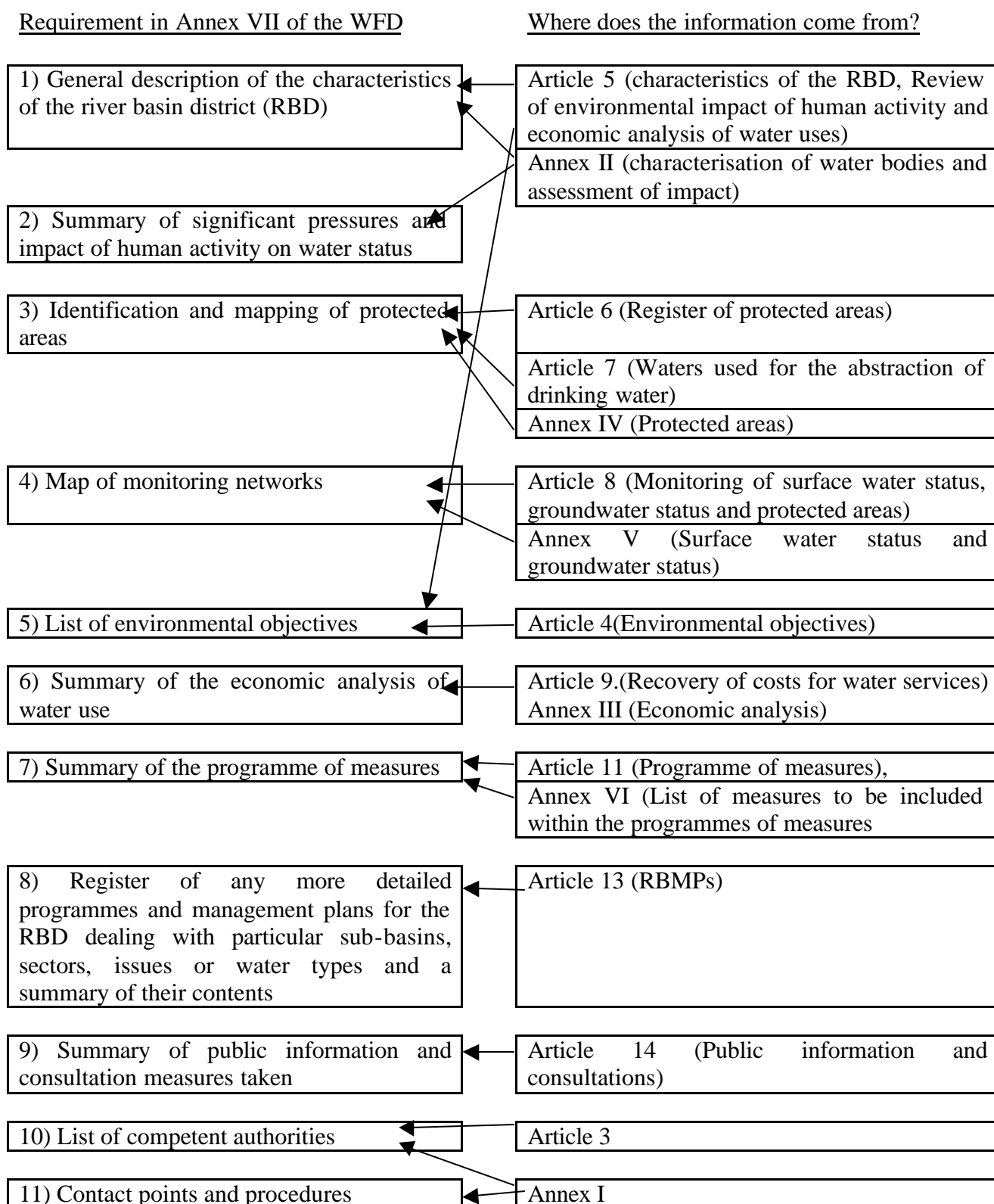
¹¹ A specific ad hoc group has been entrusted to define and specify the information needs under the Protocol and come up with such measurable characteristics to review the compliance with this instrument.

¹² Available at <http://www.unece.org/env/civil-liability/welcome.html>

¹³ The term “components” was not defined under the Protocol; obviously it refers to fauna, flora, sediments, etc.

Category according to DPSIR framework	Information to be included in river basin management plans
D/P	<ul style="list-style-type: none"> - A summary of the economic analysis of water use - A summary of significant pressures and impacts of human activity on the status of surface water and groundwater
S	- State of surface water, ground water and protected areas
I	- State of protected water bodies used for drinking water supply
R	<ul style="list-style-type: none"> - Identification and mapping of protected areas - A list of the environmental objectives established under article 4 for surface waters, groundwaters and protected areas - A summary of the programme of measures - A register of programmes and management plans dealing with sub-basins, sectors, issues or water types - A summary of the measures taken for public information and consultation, their results and changes to the plan - A list of competent authorities - Contact points and procedures for obtaining background documentation and information

Information needs for the preparation of river basin management plans (RBMP) under the EU Water Framework Directive (WFD)



3.4 Information needs under bilateral and multilateral water agreements

In the UNECE region, some 150 bilateral and multilateral water agreements have been drawn up. They all contain provisions on reporting and the utilization of information for water management purposes (e.g. assessment of the state of the aquatic environment).

State-of-the-aquatic-environment reporting

Ideally, these reports provide concise information for decision-making in water management. These reports typically provide information on the functions of the water body, describe the existing problems and the pressure they put on the water body, and give insight into the impacts of corrective measures. Their decision-making value strongly increases by the introduction of indicators and visualization tools. Ideally, all this will be reflected through measurable characteristics of the river basins.

Before embarking on the identification and specification of information needs as explained in sections 3.1.1-3.1.3, it is of outmost importance to:

- *Draw up of an inventory of reporting obligations* laid down in the respective transboundary water agreements as well as reporting obligations arising from decisions of the Meetings of the Parties to these agreements.
- *Decide on the reporting formats and audiences.* One should note that the level of detail of the report, its contents and frequency of compilation depend on the recipient. For example, a report on the state of the aquatic environment, to be made under a bilateral agreement, will differ if it is to be presented to the Meeting of the Parties, a national water agency, a research institution or the general public. Depending on these target groups, the report contains aggregated information (e.g. indicators or indexes) and/or detailed information in tables, statistically processed data, graphs and geographically presented information;
- *Agree between the riparian countries on the form of the joint report for the purposes of water management in the basin;*
- *Involve the public and stakeholders in the design of the reporting scheme,* while traditionally, authorities have been very cautious in presenting environmental information and data to the public because of the risk of misinterpretation of information by laymen.

Thereafter, one should follow the procedure explained in sections 3.1.1-3.1.3. The table below also illustrates the relations between functions/uses and management issues in a river basin and therefore the corresponding information needs.

FUNCTIONS/USES → ISSUES ↓	Human health	Ecosystem functioning	Fisheries	Recreation	Drinking water	Irrigation	Industrial use	Hydro power	Transport	Navigation
	Flooding	x	X		X					x
Scarcity	x	X	X	X	x	x	x	x	x	x
Erosion / sedimentation	x	X			x			x	x	x
Biodiversity loss		X	X	X						
River continuity decrease		X	X	X				x	x	x
Salinisation		X			x	x	x			
Acidification²		X	X		x					
Organic pollution³	x	X	X	X	x					
Eutrophication	x	X	X	X	x	x	x			
Pollution with hazardous substances⁴	x	X	X	X	x	x	x			

X Main impact on functions/uses (problem).

¹ Transport of water, ice, sediments and waste-water.

² Dry/wet acid deposition

³ Organic matter and bacteriological pollution by waste-water discharge

⁴ Specific substances, e.g. radio-nuclides, heavy metals, pesticides.

A practical example – work undertaken jointly by Belarus, Ukraine and Poland on the river Bug – will be examined in detail at the workshop.

Identification of information needs for the Bug River

The first step of joint activities of the three riparian countries (Belarus, Poland, Ukraine) was the identification of potential users of water management information. Apart from the joint Polish-Ukrainian commission, around 15-20 other ministries/institutions/organizations (including NGOs) were identified in each of the riparian countries.

Thereafter, a comprehensive examination of water uses and issues was jointly undertaken, using the table above. It revealed the relative importance of pollution by nutrients and eutrophication, microbiological pollution, organic pollution, accidental pollution, high variability of flow, flood hazards, river regulation and pollution by hazardous substances in relation to the ecological functions, supply of drinking water, agriculture, recreation and angling and other uses/functions.

On the basis of this examination, seven major management goals have been derived: good status of water ecosystems, securing supply of drinking water, water use for recreation, securing surface water abstraction for agriculture, securing water for fish breeding, securing water supply for industry and protection against floods.

For each of these major management goals, specific water management targets were drawn up. An example is the good status of water ecosystems, which requires such targets as eutrophication control, control of organic pollution, maintenance/enhancement of biodiversity, control of accidental pollution, flood management and decrease of river fragmentation.

Based on these targets, indicators for water uses and management issues have been established, grouped under the various categories of the DPSIR framework.

The next step was the evaluation of the capacity of present monitoring and other data gathering activities to support the chosen indicators. As it was to be expected, the current monitoring and data gathering activity could not support data requirements for all indicators. Therefore, a specific system for data gathering through improved (and tailor-made) monitoring as well as other means of data collection (e.g. through the statistical offices) was designed.

4. Information utilization

Experience shows that in many instances policy- and decision-makers who receive data and information, for example, on the state of the aquatic environment criticize that these data and information, provided through monitoring and other forms of data gathering, are of little or no value for their purposes. One important reason for this is that policy and decision-makers have not been properly consulted to specify their information needs and the way information should be reported to them. Another reason is the complexity of water management, where the interests of different groups of water users (e.g. issuing water use permits, compliance with emission standards, communication to the public) and water management organizations (e.g. water agencies, joint bodies) have to be aligned. Thus, the availability, applicability and usability of information to support transboundary water management are a challenge.

Lessons learned by GRID-Arendal, one of UNEP's information centers
(www.grida.no)

“It is no longer enough to focus attention on being an intermediary between one set of producers, say scientists, and decision-makers in government and business. The new key point is to find effective methods of communication of information as well as to include broad-based and proactive public participation in the intermediary functions between producers and final decision-making users of environmental information, without reducing the quality and credibility of such information. ... it is not enough to tell people repeatedly that there are environmental problems. Initially this may catch media interest and political attention. In the longer run information on concrete ideas of what to do in order to resolve environmental problems will also be needed. Many environmental issues cannot be resolved without putting environmental information in a larger context, including economic, social and cultural information. Both the Rio Declaration and the Agenda 21 ... refer to a larger sustainable development context. This important topic needs much further attention and examination.”

Lessons learned from pilot projects on monitoring and assessment of transboundary waters, conducted under the auspices of the UNECE Water Convention (e.g. on the rivers Bug, Kura, Tobol) suggest the following:

- More attention should be given to the specification of information needs to ensure that the information gathered through monitoring and other means of information generation is linked to the needs of the decision-makers or stakeholders;

- All-embracing cooperation is needed among the variety of organizations involved in: (a) monitoring and other forms of information generation; and (b) integrated water resources management to ensure that the right information will be made available. This cooperation will also identify challenges, for example, to seek funding opportunities, enhance political attention, and update legal acts and administrative instructions;
- Dissemination of information should not exclusively rely on "passive" channels, such as reports and newsletters. More active involvement of policy-makers or the public through workshops or meetings should also be explored;
- Reports should be made attractive for decision-makers and other users so that they can find better footing for making their decisions.

The table below indicates the means for communicating information to interest groups and the public used in different EECCA transboundary water basins ("+" indicates use of the information channel while "-" indicates channel not used).

River basin	Workshops/ meetings	Technical reports	Internet	Newsletter	Press conference
Mtkvary / Kura	+	-	-	-	-
Pripyat	+	-?	-	-	-
Tobol	+	+	-	-	-
Aral Sea basin	+	+	+	+	+
Seversky Donets	+	-	-	-	-
Dniester	+	-	+?	-	-
Chu-Talas	+	-	-	-	-

More time should be devoted to agree (within a joint body, for example) on tailor-made presentations of information. The method of presenting the information depends on the target group. Possible presentation techniques, from a detailed presentation to an aggregated overview, are:

- Tables: by listing measurement data in a table, no data are lost. Nevertheless, the reader has to derive the information from the data;
- Statistically processed measurement data: statistical processing will transform the data into values that make changes in time and/or space visible. The information is available to the reader;
- Graphs: graphs provide a view in which, for instance, trends can be recognized at a glance. By showing standards or other references in the graph, the situation is put in perspective. The amoeba-type presentation is an example of this. Graphs can be line graphs, histograms, pie charts, etc.;
- Geographically presented information: quality data from a diversity of sources can be interrelated by means of multiple layers of geographically referenced information. This provides a better understanding of the spatial distribution of the parameters involved;

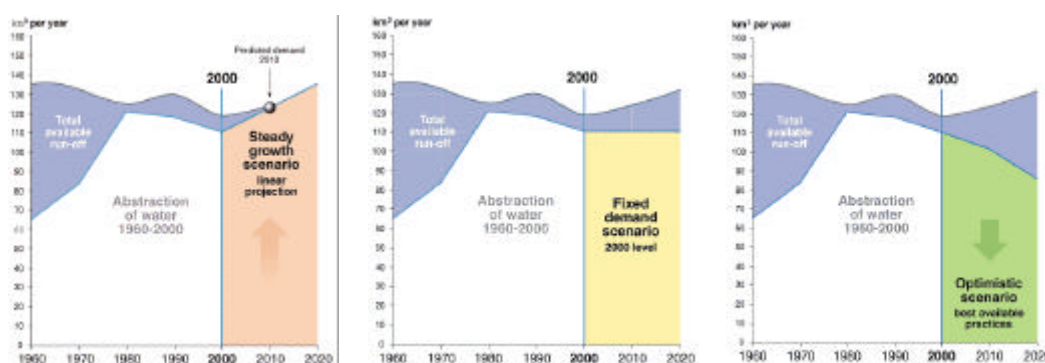
- Aggregated information: for rapid interpretation of large amounts of data, it can be useful to aggregate the data. Indexes are useful methods for this. Quality indices are a well known instrument within biological quality assessment.

Choosing effective communication tools requires a strategy that can be developed by asking and answering the following of questions (Markowitz 2000)¹⁴(WCMC 1998b):

- What is our objective? What do we want to achieve with this information? Do we want to raise or increase awareness, is it meant to change behaviour, or do we want to start a dialogue with the public? Is it relevant to decision-making needs?
- Who is our targeted audience? Are we focusing on experts, on policy-makers, or on lay people? And for what purpose?
- What is the overall message we want to convey? It is generally useful to frame the message in terms of problem and solutions.
- What format are we going to use to convey the message? Will it be a report, a presentation, a video, a conference, or maybe a combination? The message should be easily and quickly understood.
- How will we distribute the message? Will we use the standard mailing list, will we check up with the mass media, or will we dump it all on Internet? The product must be available when the 'window of opportunity' for decision-making arises (that is timely). The information should be sent through channels that the intended audience recognises.
- How will we evaluate the success of this strategy? We can count the number of quotations or maybe the changes in opinions. This is also connected to our initial objectives. The process of producing the information product must be cost-effective in terms of time, money and administrative overheads.

Below, two examples of tailor-made presentations are given.

Example 1: Will there be water left in the Aral Sea Basin - Development choices for the next 20 years

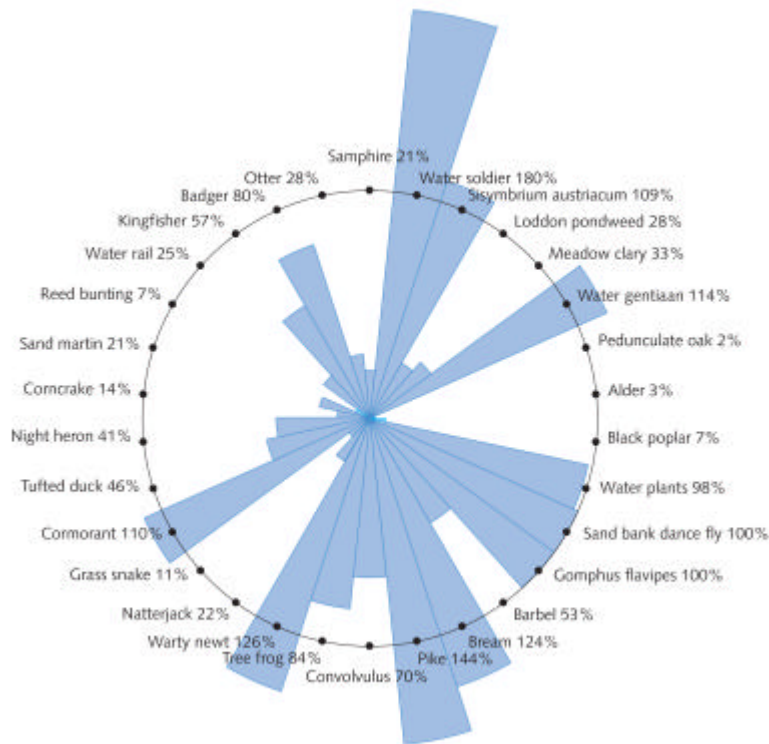


Source: SIC ICWC, IFAS, World Bank

¹⁴ It should be very clear in developing this communication strategy that this is not intended as propagating the views of a particular group. The communication would then take on the form of propaganda. The communication strategy should ideally be a concerted action of the actors in the information production process to reach those that have not directly participated in this process.

Example 2: The Amoeba presentation

The amoeba is a schematic representation of the present condition compared to the "natural" conditions of the past. For the water body under study, a set of parameters that is considered to be representative of the water body's condition is chosen. The reference "system" is represented by plotting the value of the parameters under "natural" conditions on a circle. The present values of the selected parameters are plotted relative to the circle and, for visualization, these points are connected to one another. This provides an amoeba-like figure, representing deviations from the reference state.



5. Transboundary waters in the EECCA region

5.1 The status of information management

Although there are other examples of good intentions and functioning cooperation, overall the challenges with regard to information exchange and management are considerable in EECCA.

The most advanced example involving countries of the EECCA region is the information work under the Danube Convention. Information management and availability in the Danube basin is well developed and can be seen as a model for other river basins. The long history of the cooperation, reasonable levels of funding and a strong Secretariat are contributing factors, as is the on-going process of developing a river basin management plan according to the EU WFD.

It is a bottleneck that production and availability of data and information on the national level is generally not well developed. Monitoring systems are weak, underfinanced and uncoordinated, and cannot contribute efficiently to an information system. Hydrometeorological Services are generally in charge of ambient environmental monitoring including water quantity and quality and the

environmental authorities of information on discharges and pollution levels. Health authorities are responsible for quality of drinking water. Water authorities, if existing as separate authorities, generally are in charge only of the water allocations permits.

The responsibilities for developing national information systems including monitoring and assessment strategies are often unclear. There is limited horizontal integration between different agencies as information flow is largely hierarchical and data is not always freely available. In some countries the water basin is neither the basis for water administration nor for the national monitoring systems.

International projects and funding are important driving forces to develop information management for the national as well transboundary levels. Joint databases, coordinated monitoring programmes, river basin websites and protocols on information exchange are some examples.

In general the issues related to information management in EECCA are closely linked to other aspects of transboundary water management:

Legal framework

- Cooperation agreements have been concluded in most basins, but information exchange and management is not a prominent issue in most of the agreements.
- Agreements between district administrations of riparian countries in the Pripjat basin (on floods prevention and operation of water feeding system) and the Seversky Donets basin (on pollution loads) include protocols on information exchange.
- An agreement on information exchange has been concluded between the five Hydromets of Central Asian countries.

Institutional framework

- Joint bodies (Meeting of the Parties, Commissions or Plenipotentiaries) have been established in most river basins. However, assessments and monitoring strategies have only been developed in a restricted number of cases (e.g. Bug and Tobol).
- In most cases only one state authority, the water management authority is represented in the joint body (eg. ICWC, Ukraine-Moldova plenipotentiaries). This is a negative factor for information management. Exceptions are the Finnish-Russian and Estonian-Russian Commissions. Producing and delivering the information necessary for effective integrated transboundary cooperation is not included in the mandate of national water authorities.
- Joint bodies are dealing with a limited number of water use aspects, the typical example being the focus on irrigation in the Aral Sea basin (water quality, but not water needs of water ecosystems, is formally included in the mandate of ICWC). In the Seversky Donets and Kura basins, the main focus is the protection of the water resources and improvement of the water quality, in the Chu-Talas basins cooperation on the jointly used water facilities. No commission is dealing with groundwater.
- In those cases when the interstate agreements include a broader set of IWRM issues, they are frequently not implemented because of bottlenecks in legislation and institutional setting on the national level. One example is the Ukraine-Moldovan bilateral agreement.
- Commissions for cooperation between neighbouring district administrations seem to have a well-developed information exchange. This may reflect more developed policy integration at the district level than on the national level. For example, district water branches in Seversky Donets basin collect and exchange information on water quality even though it is not formally included in their mandates. Water agencies in Central Asia, for example neighbouring district authorities, sometimes exchange information actively even without any formal agreements.

- The absence of reasonably staffed permanent Secretariats for transboundary water management in the EECCA is a bottleneck for information management.
- The Scientific Information Center of the Aral Sea Basin Interstate Commission for Water Coordination, with a sustained programme of international projects, is important for the development of and access to information. The Water Resources Management Information System (WARMIS) is one example. The recent development of the CAWater-info.net website is another.

Management issues

- Because of the narrow mandates of the joint bodies, information needs are defined from this perspective. In the data collection, physical and chemical parameters (S and I information) dominate. In very few cases the joint body sees a need to collect, use and disseminate D and P type of information to stakeholders and the public.
- Communication of information to the public including stakeholders is generally weak, but where there are active NGOs or active stakeholders (eg. Lake Peipsi/Chudskoye and Irtysh) these are important to drive the development of an improved dissemination of information.
- Most of the basins are well presented on different websites and some (Pripyat, Aral Sea basin, Chu and Talas) also provide GIS based information. Most of this information has been developed within the framework of projects funded by donors. Activities often cease after the end of projects.

On financial issues

- The economic situation of many EECCA countries including lack of staff in the responsible authorities makes it difficult to run transboundary cooperation efficiently. Only in Central Asia joint (but weakly funded) institutions have been established outside donor-funded programmes.

6. Conclusions and recommendations

6.1 Conclusions

- Information management is weak and insufficient in most of the transboundary basins in EECCA. Financial constraints are one concern. It is a specific problem that different authorities deal with different aspects of information, with little which makes it difficult to establish an overall picture of the situation.
- Information needs tend to be defined with a narrow perspective without direct involvement of policy and decision makers from member governments, stakeholders or other interest groups.
- Data collection is dominated by state and impact information (S and I).
- Joint bodies mainly use passive channels for communicating with stakeholder groups and the public.
- Funding from the outside or active involvement by the public or stakeholders are important factors for an improved information management.
- As the EECCA countries in most cases can use the same language, Russian, there are significant opportunities to find synergies and improve the access and use of information also on the national level by improving the transboundary cooperation.

6.2 Recommendations

In the development of the cooperation on transboundary waters and ultimately joint IWRM, the following steps to improve information management should be considered by the countries sharing a transboundary watercourse:

Legal framework

- National water legislation should have provisions for free access to information on water in the country and between riparian countries;
- Access to this information should also be free of charge. The UNECE Convention provides only one exception to this rule, namely if the data and information requested by a riparian country is not available (e.g. if it is not part of the existing monitoring or data gathering activities of the country of origin) than the country of origin may condition the payment of reasonable charges for data collection and processing;
- A framework for reporting and exchange of information should be included in the bilateral or multilateral agreements, or in separate protocols.

Institutional framework

- The joint body should consider establishing a working group on monitoring, assessment and information management.
- Where possible, the establishment of permanent Secretariats or at least designated Secretaries of agreements should be considered.

Management issues

- Even if an agreement has not yet been reached, countries sharing a water basin can start joint work on assessment and information management. Development of a joint databases including a basin GIS database, joint assessments, intercalibration of laboratories are examples of activities that can contribute to the development to the cooperation.
- The joint body should, as a basis for their work, at an early stage make a review of information needs and information management. Reporting formats and target audiences should be included in this review. Stakeholder groups and the public should be involved in the review process. See also section 4.
- A more balanced data collection, where not only state and environmental impact information, but also driving forces/pressures and responses information originating from the basin should be used as a basis for joint policy development.
- Participatory fora and mechanisms, such as workshops and scenario planning models, should be used for communication with stakeholder groups and the public.
- A river basin website should be established by the joint body as a means of communication and outreach.
- Ultimately, the focus of the information work should be the development and implementation of a joint river basin management plan. The RBMP would define most aspects of information needs, supply and use.

Financial issues

- National monitoring and information systems should be used and adapted for the purpose of transboundary water management.
- With limited financial resources a stepwise approach should be used when developing monitoring and information management.