

Report on IWRM in Transboundary Basins

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Executive summary

This report examines implementation of Integrated Water Resources Management (IWRM) in transboundary basins. The term ‘transboundary waters’ refers to any surface or ground waters which mark, cross or are located on boundaries between two or more States; wherever transboundary waters flow directly into the sea, these transboundary waters end at a straight line across their respective mouths between points on the low-water line of their banks. The report draws information on IWRM implementation from a survey of transboundary basins and previous studies of IWRM in transboundary basin situations.

IWRM practices reported here focus on implementation of transboundary and environmental management practices. The project found that some IWRM practices were well developed (for example, stakeholder participation and some aspects of coordination), while others were quite limited (e.g., those addressing the impacts of potential climate change in basin management, water quality management, environmental flow provisions and environmental assessments). The comprehensive discussion of the results used the survey findings and lessons learnt from previous IWRM transboundary basin studies.

Although the 19 transboundary basin organizations that were surveyed to produce this report are insufficient as a basis for making generalizations, when combined with the findings from other studies they do provide the basis for some tentative recommendations aimed at supporting IWRM and ecosystems management in transboundary basins. The recommendations made are as follows:

1) Define, elaborate and apply a key set of management attributes for the transboundary basin organization to help promote good management.

Such attributes could include clear and strong institutional arrangements; good water-related data, information, systems, and models; a suite or package of basin-wide policies, procedures, and strategies; an appropriate form of communication and participation; basin sustainability performance indicators and an agreed approach to monitor and report outcomes.

2) Learn from the experiences of other basin organizations that are in, or have completed, the same development phase.

IWRM implementation by transboundary basin organizations can be seen as a process with many variations according to the basin in question. While there is no linear pathway upon which all basin organizations should travel, there is scope for basin organizations to learn from one another. One possibility would be to establish a database of transboundary IWRM case studies and an international system for exchanging good practices and learning experiences.

3) Recognise that building confidence and organizational skills is a long term process for transboundary organizations, and that some results may take decades to achieve.

Transboundary basin organizations can serve as a reference organization for natural resources management in their riparian states. Such a transboundary basin organization provides overarching, coordinating functions for its constituent organizations and gives it regional credibility, advocacy and leadership for basin scale natural resources management.

4) Use a combination of governance and technical indicators to provide evidence of outcomes of IWRM.

Performance indicators should take into account coordination, environmental management,

agreement on water allocations and environmental low flows, conflict resolution, stakeholder engagement and the use to international protocols for benefit sharing.

5) Promote the role and potential value of functioning transboundary organizations in order to increase support from riparian states.

This could be achieved in some instances by advocacy and awareness raising campaigns and a programme of action for environmental management in transboundary basins, focusing on environmental asset valuation, environmental flow assessments, water quality management, information collection and operating plans (including water allocations) for environmental management across international boundaries.

6) Promote joint environmental monitoring in order to strengthen the basis for decision-making, and promote increased cooperation and the value of ecosystem services. Evidence indicates an urgent need for specific actions to increase environmental management in all transboundary basins. One way to do this is to strengthen environmental management actions of member countries, specifically and perhaps initially by strengthening environmental monitoring. Such an activity can help to promote cooperation between riparian states and also provide a basis for negotiation

1.0 INTRODUCTION

1.1 Background

This report examines the practical aspects of the implementation of Integrated Water Resources Management (IWRM) in transboundary basins. The term 'transboundary waters' refers to any surface or ground waters which mark, cross or are located on boundaries between two or more States; wherever transboundary waters flow directly into the sea, these transboundary waters end at a straight line across their respective mouths between points on the low-water line of their banks (UNECE, 1992). A total of 40% of the world's population and 47% of the world's land can be found within its 263¹ transboundary basins.

The efficient and effective management of transboundary water bodies is critical for social, political and economic stability, as well as for sustainable development. Water which crosses political boundaries has well-documented additional complexities brought on by strains in riparian relations and institutional limitations. For example, there may be differences of opinion between riparian states regarding economic development, infrastructure capacity, political orientation and cultural values. Additional complexities are brought about by a general increase in demand for water and ongoing climatic changes which will alter flow characteristics in basins lakes and aquifers. Furthermore, in our globalized world, it is not uncommon for non-riparian countries, geographically far removed, to have a keen interest in the goods and services produced by riparian states; these externalities impact both global and more localized trading patterns.



¹ The number of transboundary basins varies according to definition and scale. For the purposes of this study, the nomenclature and count of transboundary basins corresponds to those developed by the Transboundary Freshwater Disputes Database (<http://www.transboundarywaters.orst.edu/>) which lists 263 transboundary basins).

IWRM has become the internationally accepted approach for achieving sustainable water resources management. Given the important nature of transboundary water bodies, combined with the fact that pressures on resources are increasing, a clear understanding of the achievements, gaps and challenges in transboundary IWRM is desirable, with a view to achieving sustainable water resources management.

Ecosystem management in transboundary water contexts and transboundary water resources management practices are two critical dimensions of IWRM. In this report, they are used as the basis of development of a list of best practices based on substantial experiences in water resources management from around the world.

1.2 Objectives

The objectives of the study reported here were:

1. to establish the status of the implementation of IWRM in transboundary water bodies (river basins, lakes and aquifers), with an emphasis on the extent to which both transboundary water resources management and ecosystem management considerations play a part in the management approach; and
2. to gain a better understanding of the achievements, gaps and challenges in transboundary water resources management, with a view to making recommendations that advance the adoption and implementation of IWRM.

1.3 Target audience

The target audience of this study includes stakeholders in multiple sectors such as water, agriculture, energy, transport and industry and urban development. More specifically, the audience groups can be defined as, but not necessarily limited to:

- Transboundary water organizations
- National governments
- Local authorities
- Policy makers
- Resource managers
- Non-governmental organizations
- Researchers/scientists

2.0 METHODS

This report is based upon two main information sources to establish the status of the implementation of IWRM in transboundary water bodies and to gain a better understanding of the achievements, gaps and challenges in transboundary water resources management. They were:

1. A survey of transboundary basin organizations. Data collected in the survey were analysed to identify experiences and lessons learned in two core areas: transboundary water resources management and environmental management.
2. Previous studies of IWRM in transboundary and national basins.



2.1 Survey of transboundary basin organizations.

2.1.1 Survey development

The content of the survey instrument used in this report was designed initially from known best practices in IWRM and environmental management at the basin scale (UCC-Water, undated; UN-Water and Global Water Partnership, undated). These practices were reviewed in terms of their application to transboundary situations, after which a survey form was constructed for pilot testing. The pilot survey was reviewed by an external expert in environmental management in transboundary basins and by UNEP. Eleven basin organizations were contacted to review the pilot survey instrument with three useful responses. Results of the pilot testing were then used to develop the final survey instrument (Annex 1).

There were five parts to the survey form:

1. Information about the respondents' transboundary water organization and agreement
2. Existence of transboundary water management practices
3. Existence of environmental management practices

4. Any further information
5. Glossary of IWRM words

2.1.2 Selection of survey population

The survey population was developed from transboundary basins with existing structures which have a physical or virtual address for the management of water resources (i.e., a bi- or multinational organization). The first step in identifying these organizations involved the use of the Transboundary Freshwater Disputes Database (TFDD) which was freely provided to this study by Oregon State University. There are 263 international river basins in that database. Some of these basins have transboundary treaties, some do not. The TFDD also records the following numbers of transboundary treaties: Africa (38), Asia (24), Europe (58), North America (41) and South America (36), providing a total of 197 basins. The treaties refer to formal, government-based institutional arrangements specifically designed for international river basins.

There are 41 North American basins which can be collapsed into the jurisdiction of the International Joint Commission, or the International Boundary and Water Commission or the Pacific Salmon Commission (three commissions). However, the North American experience was limited to one basin organization in the survey – the International Joint Commission. So the effective total of number of basins with transboundary arrangements is approximately 157 (197-40). While preference was given to transboundary basins of developing and emerging economies in the study, European basins were retained as they span both transitional and highly developed economies.

The second step was to investigate these 157 basins in the TFDD list further. The investigation identified **58 basin organizations**, where ‘basin organization’ refers to an existing entity with a physical or virtual address and which could be contacted. These entities formed the survey population for this study. There were 14 basin organizations in Africa, 18 in Asia, 20 in Europe, 5 in South America and, for reasons discussed above, one chosen from North America (Table 1).

2.1.3 Survey distribution

Distribution of the survey to target entities of the 58 basins involved:

1. promotion at two international conferences with a call for participation in the survey²; direct email distribution to known contacts in the basin organizations;
2. enlisting assistance of the Global Water Partnership to expedite survey delivery to regional committees for forward distribution to their contacts in the African, Asian and European basin organizations;
3. voluntary assistance provided by a senior water professional familiar with the five South and Latin American basins.

² High-Level Ministerial Conference on Strengthening Transboundary Freshwater Governance - the Environmental Sustainability Challenge Bangkok, Thailand, 20 – 22 May 2009 and the World Water Week, Stockholm, August 16-20, 2009.

Table 1. Survey population³

AFRICA	ASIA	EUROPE	SOUTH & LATIN AMERICA	NORTH AMERICA*
Congo	Amur	Danube	Amazon	Alsek
Corubal	Aral Sea	Dnieper	La Plata	Chilkat
Incomati	Fenney	Dniester	Lagoon Mirim	Colorado
Kunene [Cunene]	Ganges	Elbe	Lake Titicaca-Poopo	Columbia
Lake Chad	General**	Kemi	Lempa	Firth
Lake Victoria	Golok	Lake Prespa		Fraser
Limpopo	Har Us Nur	Naatamo		Great Lakes/IJC*
Niger	Helmand	Oder		Mississippi
Nile	Ili	Olanga		Nelson-Saskatchewan
Okavango	Indus	Oulu		Rio Bravo/Rio Grande
Orange	Jordan	Pasvik		Skagit
Senegal	Karnaphuli	Rhine		St. Croix
Volta	Mekong	Rhone		St. John
Zambezi	Ob	Sava		St. Lawrence
	Pu Lun T'o	Schelde		Stikine
	Tarim	Tana		Taku
	Tigris	Torne		Tijuana
	Tumen	Tuloma		Whiting
	Yula	Vistula		Yaqui
		Volga		Yukon
		Vuoksa		
Count:	14	18	5	1 (chosen)
Total:	58			

Source: *Transboundary Freshwater Disputes Database*, Oregon State University, USA; data provided 4/2009 from 2005+ resources

* In this table the International Joint Commission applies to several, but not all, of these above US-Canada-Mexico basins; only the Great Lakes Basin is used in this study and the survey response refers primarily to the work of the International Joint Commission.

** Includes the Ili/Kunes He and Tarim basins.

These activities occurred over a six month period and resulted in:

- nineteen useful returns (about one third of the target population) (Table 2);
- the development of a database of survey responses; and
- a catalogue folder of returned surveys and respondents' contacts.

³ The survey population refers to international transboundary basins which have organizations. They include basin commissions, committees, authorities, associations or other entities with a recognizable organization and staff.

Table 2. Basin organizations responding to survey

	Basin	Continent	Basin organization	Respondent's position
1	Aral Sea	Asia	Interstate Commission for Water Coordination	Deputy Director ICWC/GWP Regional Coordinator
2	Chad [Lake]	Africa	Lake Chad Basin Commission	Chair, Technical Committee of Global Water Partnership West Africa
3	Danube	Europe	International Commission for Protection of the Danube River Basin	Chair, Monitoring & Assessment, ICPDR
4	Dneister	Europe	Eco-Tiras International Environmental Association of Dneister River Keepers	Exec Director, Eco-Tiras
5	Dnipro (Dnieper) - Dneister	Europe	UA-RF Agreement, 1992 and UA-BY, 2001; UA-MD Agreement, 1994	Dty Head, State Committee for Water Management
6	Elbe	Europe	International Commission for the Protection of the Elbe River (ICPER)	Not stated
7	Great Lakes	North America	International Joint Commission	Adviser & Professor Emeritus
8	Indus (lower)	Asia	Lower Indus River Basin Organisation	Patron
9	La Plata	South America	Intergovernmental Coordinating Committee (CIC) for the la Plata Basin	General Secretary
10	Mekong	Asia	Mekong River Commission	Programme Officer
11	Niger	Africa	Autorité du Bassin du Fleuve Niger (ABN) [Niger Basin Authority]	Chair, Technical Committee of Global Water Partnership West Africa
12	Nile	Africa	Nile Basin Initiative	Senior Economist
13	Oder	Europe	International Commission for the Protection of the Odra River against Pollution (ICPO)	Head of Steering Group G1 (WFD)
14	Orange	Africa	Orange-Senqu River Commission	Executive Secretary
15	Sava	Europe	International Sava River Basin Commission	Secretary General
16	Senegal	Africa	Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS) [Senegal River Basin Development Organisation]	Chair, Technical Committee of Global Water Partnership West Africa
17	Tarim	Asia	Tarim Basin Commission	Adviser
18	Volta	Africa	Volta Basin Authority	Ag. Exec. Director
19	Yalu	Asia	Song-Liao River Basin Commission	Senior Engineer

2.2 Reviews of previous studies of IWRM in transboundary basins.

The limited response rate to the survey presents a challenge to recognising the survey data as a comprehensive narrative of existing experiences. It suggests that the discussion of survey results should be informed by a range of other experiences in transboundary basin water management. Consequently, a parallel activity was used to capture known experiences in transboundary and environmental management in transboundary basins. This included a review of previous studies and the results are listed in Annex 2. These studies were used to assist the interpretation of the survey results by placing them in the context of other experiences in transboundary water management and environmental management at the basin scale.

Overall the studies found that:

- There are five main attributes or features crucial for good integrated river basin management: (a) clear and strong institutional arrangements, supported by clear regulations, decrees, or agreements and with well-defined implementing procedures; (b) good water-related data, information, systems, and models readily available to the river basin partners and those agencies and bureaus operating within the basin; (c) a complete and clear suite or package of basin-wide policies, procedures, and strategies to guide water and natural resource planning, management, and administration; (d) an appropriate form of communication and participation for all basin stakeholders and partners; and (e) basin sustainability performance indicators and an agreed approach to monitor and report on how the basin is being managed and the resources consumed and protected. However, these attributes require trained staff, making capacity building programmes essential for the implementation of IWRM.
- Evidence-based outcomes can inform the effectiveness of IWRM in transboundary basins, and 29 governance indicators and 32 technical indicators can be used to chart progress in IWRM.
- There is the need for an international effort to harness lessons learned in implementing IWRM in basins using regional databases and case histories; developing tools for IWRM to link social and economic development with the protection of natural ecosystems; enhancing Institutional arrangements; promoting broader recognition that the 'integrated' approach is feasible and beneficial; illustrating the implementation of IWRM at the basin level; and building partnerships to take this message forward prominently and in plain view.

These findings were used to inform the discussion of the results of the survey and develop ways forward and recommendations for action.



3.0 SURVEY RESULTS AND DISCUSSION

This section presents the results of the nineteen responses to the transboundary basin organization survey. The results presented below represent 19 unique trajectories of IWRM experiences in transboundary basins. Each basin houses its time- and place-stamped IWRM formulation and experience, the impact of unique economic conditions in each basin and the results of institutional arrangements established over, for some, a considerable time period. For example, the management of the Nile Basin has its origins in governance decisions made in the early twentieth century, while others, such as the Orange-Senqu are far more recent. They reflect very different trajectories and must be understood within their own evolution of IWRM.

To address the first objective of the project, the following discussion synthesises similarities and differences between the 19 basin organization trajectories of the status of IWRM implementation.

3.1 Status of implementation of IWRM in transboundary basins

3.1.1 Types of basin organizations

First, it is important to understand the different types of transboundary basin organizations which exist in the world today and which responded to the survey. In this study the following definitions were used for different types of transboundary basin organizations (Hooper, B. P., 2005):

An **advisory committee** generally refers to:

A formalized or quasi-formal organization in which individuals take responsibility for undertaking action planning and provide advice; governments may 'hand over' strategic planning to such organizations; they frequently have no or limited legal jurisdiction.

An **association** (or initiative) generally refers to:

an organization of like-minded individuals and groups with a common interest, similar to an Advisory Committee. In a river basin they have varying roles: providing advice, stimulating basin awareness, education and ownership of basin natural resources management issues; and fulfilling educational functions and information exchange.

An **authority** generally refers to:

an organization which makes planning decisions at a central or regional government level. It may set and enact regulations, or have development consent authority. Authorities are founded on democratic principles and a framework of law to which all relevant individuals and institutions are subject in a basin setting.

A **commission** generally refers to:

an organization which is delegated to consider natural resources management matters and/or take action on those matters. A basin commission's powers vary, and include advisory/education roles, monitoring roles, undertaking works, fulfilling goals of a specific government's charter or an international agreement. Commissions normally are instituted by a formal statement of a command or injunction by government to manage land and water resources; commissions may also have regulatory powers.

The 19 responses revealed various types of basin organizations. Table 3 lists the range of basin organizations reported in the survey, their functions and information on basin management agreements, where agreements exist. As one would expect, the agreements on water resources management which are the foundation for many basin organizations also vary. Consequently, each basin organization's management practices reflect the purpose of underlying transboundary agreements.

Table 3. Types of basin organizations and transboundary agreements

Type of basin organization	Basin	Name of basin organization	Purpose of basin agreement
COMMISSIONS			
Commission with regulatory functions	Aral Sea	Interstate Commission for Water Coordination	Regulation of water allocations; definition of common water policy; determination of rational use, annual consumption limits and water allocation; organizing ecological programmes for desiccation and determination of Aral Sea requirements; producing recommendations for common price policies and compensations for losses; coordinating large scale projects; creating an information base; coordinating joint research; establishing cooperative technical links.
Commission	Chad [Lake]	Lake Chad Basin Commission	Overseeing the sustainable and coordinated development, conservation and use of Lake Chad basin water and associated natural resources. Note: The Lake Chad Basin Commission is an intergovernmental organization of the countries nearest to Lake Chad which coordinates actions that might affect the waters of Lake Chad. It was established May 22, 1964 by Niger, Nigeria, Chad and Cameroon. In the late 1990s, the Central African Republic joined.
Commission	Danube	International Commission for Protection of the Danube River Basin	Ensuring that surface waters and groundwater within the Danube River Basin are managed and used sustainably and equitably. This involves: <ul style="list-style-type: none"> • the conservation, improvement and rational use of surface waters and groundwater; • preventive measures to control hazards originating from accidents involving floods, ice or hazardous substances; and • measures to reduce the pollution loads entering the Black Sea from sources in the Danube River Basin. Water quality management
Commission	Elbe	International Commission for the Protection of the Elbe River (ICPER)	Water quality management
Commission	Great Lakes	International Joint Commission	Advising US and Canadian Governments and (for some) implementing regulations on consumptive and non consumptive uses.
Commission/Advisory	Mekong	Mekong River Commission	Cooperating in a constructive and mutually beneficial manner for sustainable development, utilization, conservation and management of the Mekong River Basin water and related resources.
Commission	Odra	International Commission for the Protection of the Odra River against Pollution (ICPO)	Preventing the pollution of the Odra and Baltic sea by contaminants and achieving a reduction in the pollution thereof; and coordinating the implementation of the Water Framework Directive in the Odra river basin.
Commission/Advisory	Orange-Senqu	Orange-Senqu River Commission	Establishment of a Commission that advises basin States on development, utilisation and conservation of the water resources of the Orange-Senqu River Basin.
Commission with cooperation and advisory functions	Sava	International Sava River Basin Commission	Transboundary cooperation in the water sector for sustainable development of the region.

Commission with development functions	Senegal	Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS) [Senegal River Basin Development Organisation]	Acceleration of economic development through intense regional cooperation; safeguarding the basin environment by maintaining an ecological balance; and allocation of water and management of dams efficiently.
Commission with regulatory functions	Tarim	Tarim Basin Commission	Formulating regulations for the purpose of rational development, utilization, protection and management of the water resources of the Tarim Basin; control of water disasters; fully deriving the comprehensive social, economic and ecological/environmental benefits of water resources; ensuring the sustainable development of the national economy in the basin; and improving the livelihood of the people and the environment, in accordance with the Water Law of the People's Republic of China and other related laws and regulations, and in light of the actual local conditions of the Tarim Basin.
Intra-government basin commission	Yalu	Song-Liao River Basin Commission	No agreement reported. The formulation of Chinese riparian administrative functions is under the Ministry of Water Resources.
ADVISORY COMMITTEES			
Advisory Committee	Indus (lower)	Lower Indus River Basin Organisation	Sharing waters of the transboundary rivers of the Indus Basin System.
Advisory Committee	La Plata	Intergovernmental Coordinating Committee (CIC) for the la Plata Basin	Promotion of the harmonious development and physical integration of the River Plate Basin and its zones of direct and measurable influence; promoting, in the region of the Basin, the identification of areas of mutual interest; carrying out studies, plans and works; and formulating such operating arrangements and legal instruments as are deemed necessary to achieve the following objectives: (a) facilitating and assisting navigation; (b) rational utilization of water resources, in particular by the regulation of watercourses and their multipurpose and equitable development; (c) conservation and development of animal and plant life; (d) improvement of road, rail, river, air, electrical and telecommunications interconnections (e) regional complementarity, by promoting and establishing industries for the development of the Basin; (f) economic complementarity of areas bordering on the Basin; (g) cooperation with respect to education, health and disease control; (h) the promotion of other projects of mutual interest, in particular those relating to the surveying, evaluation and development of the natural resources of the area; and (i) a comprehensive knowledge of the River Plate Basin.

ASSOCIATIONS

Association	Dneister	Eco-Tiras International Environmental Association of Dneister River Keepers	To manage border (not transboundary) waters.
Association/Advisory Committee	Dnipro (Dnieper) – Dneister	UA-RF Agreement, 1992 and UA-BY, 2001; UA-MD Agreement, 1994	Various: regulating water supply; qualitative and quantitative protection of water resources; prevention, control and reduction of inputs of hazardous substances from point and non-point sources; flood control; control of ice hazards; construction and operation of hydrotechnical works, hydropower plants, etc; research and exchange of data and information; qualitative and quantitative protection of water resources; regulating water supply; flood and other water management activities; irrigation.
Association	Nile	Nile Basin Initiative	No agreement reported. The Nile Basin Initiative aims to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.

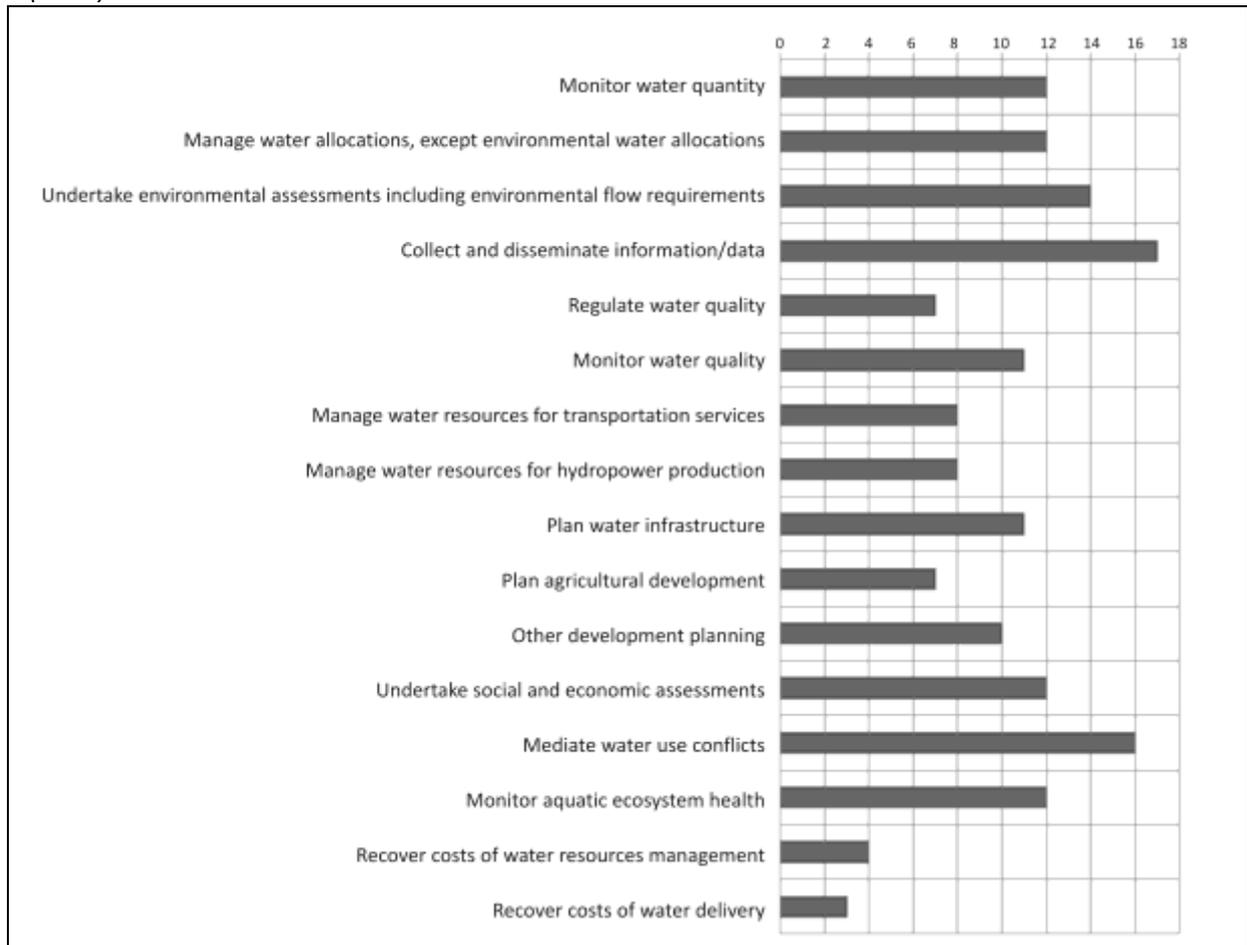
AUTHORITIES

Authority	Niger	Autorité du Bassin du Fleuve Niger (ABN) [Niger Basin Authority]	Integrated development of the basin notably energy, water resources, agriculture, animal rearing, fish breeding, silviculture, transportation and communications, and industry; and equitable sharing in the development, conservation and use of Niger basin water resources.
Authority with cooperation functions	Volta	Volta Basin Authority	Ensuring international cooperation for the rational and sustainable management of the water resources of the Volta basin and for socio-economic integration among the parties.

3.1.2 Functions performed by transboundary basin organizations and agreements

The next step was to determine the status of achievement in transboundary water management. Using 16 key functions (Figure 1), the survey revealed quite different functions for each basin. As for 3.1.1, the functions varied according to the agreements and/or the institutional arrangements whereby the basin organizations were established. The survey revealed the most common functions of transboundary basin organizations were collecting and disseminating information and data, and the mediation of water use conflicts. There was limited experience in recovering the costs of water delivery and management (these tend to be the role of national governments, if at all). Some environmental management functions (monitoring and assessment), however, were reported for several basin organizations.

Figure 1. Experiences in basin functions
(n=19)



This range of functions suggests that environmental management is not necessarily core business for many transboundary basin organizations. From an historical perspective, development-oriented basin organizations probably reached their zenith in the dam building era of the 1940s-1970s, when emphasis was on resource development for hydro-electric power, irrigation, flood control and the provision of potable water supplies. Today, new and reformed basin organizations such as the Mekong River Basin Commission, the Murray-Darling Basin Commission and the Delaware River Basin Commission have emerged, motivated by sustainable development imperatives. These 'new' entities often derived from former basin organizations or national water agencies and international water organizations, continually 'retool' their business towards a broader mandate of social and ecological sustainability. This activity is becoming more widespread, especially with the emergence of the European Water Framework which recommends basin organizations as an implementation tool on that continent.

Many nations are experiencing challenges in implementing environmental management in basin governance in both developed and developing countries. These challenges frequently centre around the conflict between water resources development and natural resource conservation, a fundamental issue in sustainable development which has been and continues to be worked out in many different river basins. (Jasper, F.G., 2003)

3.1.3 Transboundary management practices

The survey also revealed quite different perceptions by respondents of the use of transboundary management principles. Figure 2 shows that, at least for the 19 basin organizations reported in this study, there was quite limited use (0-50%) of the principles of:

- subsidiarity (management at the lowest level),
- user pays,
- demand management,
- self financing, and
- polluter pays.

There was some use (51-70%) of:

- capacity building and staff training,
- external financing,
- integrated management of land and water resources,
- disaster adaptation,
- good governance and strong leadership,
- monitoring,
- climate change adaptation,
- conflict resolution,
- gender equity,
- water use efficiency,
- benefit sharing, and
- legal training of staff.

There was frequent use (71-100%) of:

- riparian member financial support for the transboundary organization,
- cross-sectoral integration,
- stakeholder involvement, and
- political linkages (being close to power increases the effectiveness of the basin organization).



These results show that while principles may have been articulated in many forums, the reality of the use of principles of subsidiarity (management at the lowest level), user pays, demand management, self financing, and polluter pays remain very challenging. This echoes another global investigation – analysing achievements towards a short term target of sustainable development, the development of IWRM and water efficiency plans by 2005. The study by UN Water and GWP (2008) found that,

“Since 2002, many countries have progressed towards this target, as reported by the Global Water Partnership (GWP), UNEP, UNDP and the Japan Water Forum in survey reports presented at the 4th World Water Forum in 2006. By the end of 2005, 25% of the 90 countries surveyed had made ‘good progress’, while 50% had made ‘some progress’ and 25% had made limited or no progress towards the IWRM Target. Although the surveys recognized that considerable progress had been made, it was clear that many countries still had a long way to go in achieving the target, and most countries still faced considerable challenges in implementation. Experience to date suggests that the problems encountered by developing countries in both planning and implementation of IWRM approaches include the lack of political will to seriously engage in water policy change, financing and national resource allocation for water related development , awareness of water issues, weaknesses related to human and institutional capacity, and discontinued support programmes.”

The results of the transboundary IWRM survey reported here also suggest that many transboundary basin organizations are still in the start-up phase of IWRM. Table 4 illustrates the type of functions typical of start-up basin organizations. As these organizations mature and develop their capacity, they become more ‘auto-adaptive’; that is, they can respond to new information and situations as they emerge. Three stages of development can be recognized: ‘start-up’, ‘emerging auto-adaptive’, and ‘mature auto-adaptive’. Each stage has specific functions. There is a sequence of development implied by this pattern and functions will overlap through time. The peak stage, the mature auto-adaptive basin organization, has clearly identified roles and responsibilities; implements basin management plans in response to changing conditions; operates effectively within established institutional arrangements; uses transparent reporting mechanisms; and uses an IWRM approach. A mature basin organization undertakes all Group 1-5 activities in Table 4 with the ability to adapt to new conditions in its basin, commences new projects and modifies past basin management plans in response to changing conditions (e.g., new science, improved modelling and data, changing community demands, responding to political imperatives). In this way the basin entity operates as a learning organization. There has been a transition from a focus on efficiency and effectiveness towards ‘learning by doing’. This stage will take many years to accomplish.

Figure 2. Respondents' perceptions of the use of transboundary management practices by basin organizations (n=19)

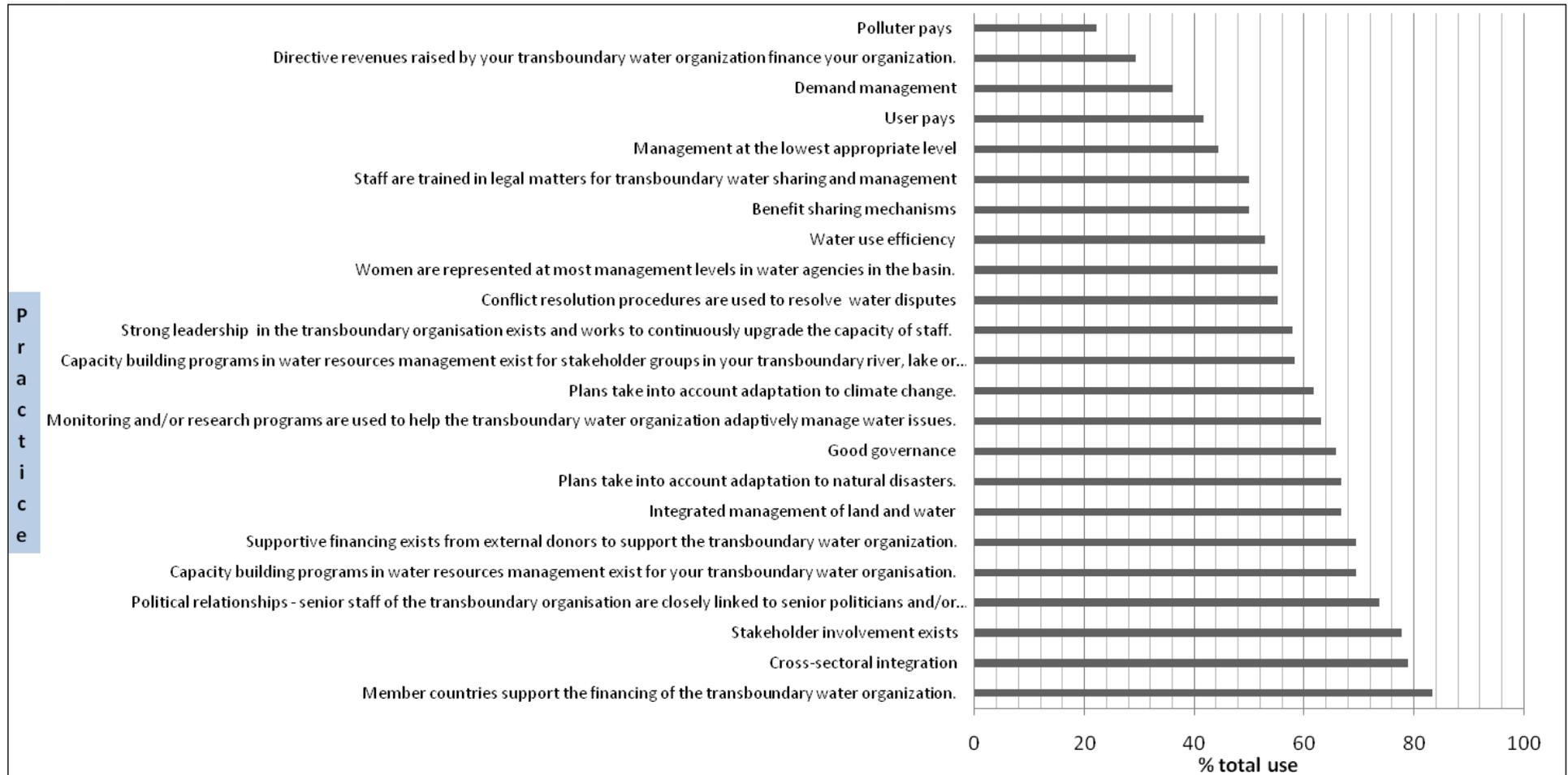


Table 4. Functional stages in the evolution of an adaptive basin organization

Functions	Start-up RBO	Emerging Auto-adaptive RBO	Mature Auto-adaptive RBO
Group 1: Water (and natural resource) data collection and processing, systems modeling, water and natural resources planning, stakeholder consultation & issue clarification	X	X	X
Group 2: Project feasibility, design, implementation, operation and maintenance, raising funds, ongoing community consultation and awareness raising	X	X	X
Group 3: Allocating and monitoring water shares (quality and quantity and possible natural resources sharing), cost sharing principles		X	X
Group 4: Policy and strategy development for economic, social and environmental issues, community awareness and participation			X
Group 5: Monitoring water use and shares, monitoring pollution and environmental conditions, oversight and review role for projects promoted by RBO partners, monitoring and assessing the health of the basin's natural resources, monitoring the sustainability of resource management, review of strategic planning and implementation of modified plans			X

Source: modified from (Comfort, L., 1999)

3.1.4 Environmental management practices

Figure 3 shows ranked mean scores for survey respondents' perceptions of the use of environmental management practices by transboundary basin organizations. The results indicate there was frequent use of:

- the hydrological basins as the unit of management,
- data and information to inform decision-making,
- impact assessment procedures, and
- monitoring and evaluation.

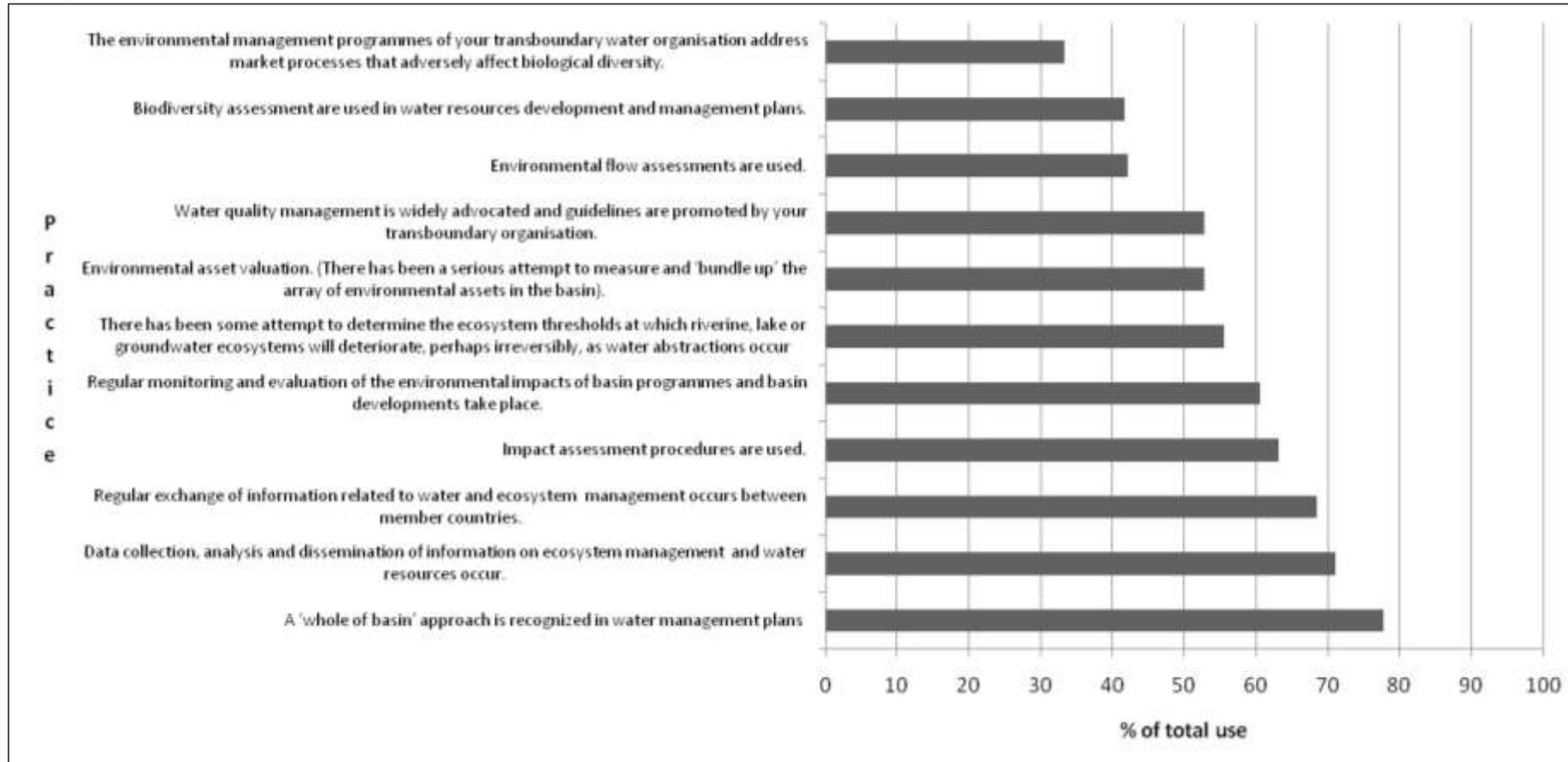
There was some use of:

- ecosystem threshold assessments,
- environmental asset valuation,
- water quality management, and
- environmental flows assessment

There was quite limited use of biodiversity assessment and management.

As for the use of transboundary management practices, the results indicate the transboundary basin organizations reported in this study reflect mainly start-up functions. There is limited experience in more highly developed functions such as environmental evaluation.

Figure 3. Respondents' perceptions of the use of environmental management practices by basin organizations (n=19)



3.2 Achievements, gaps, and challenges in transboundary water resources management

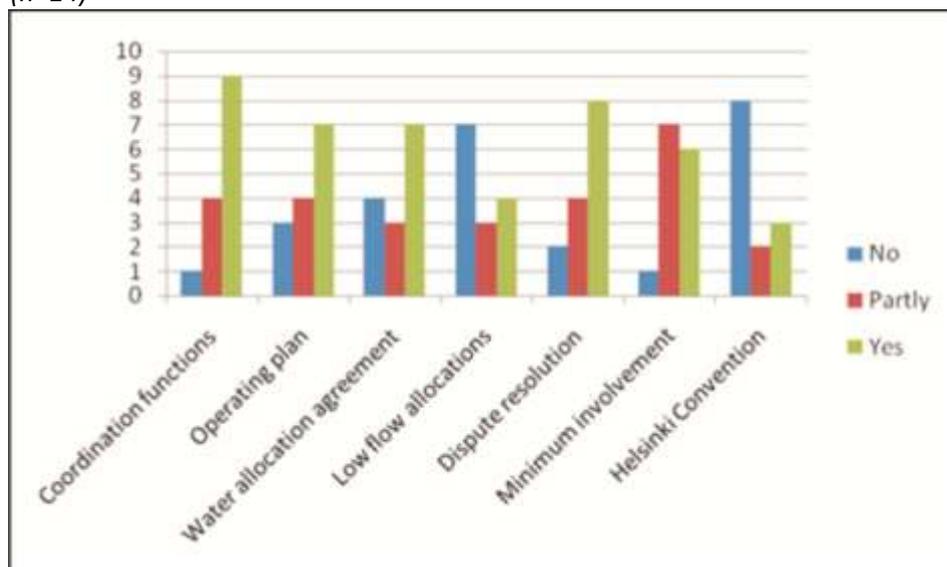
The following discussion reports survey responses to various water resources management practices and emphasises better understanding of achievements, gaps and challenges, with a view to making recommendations that advance the adoption and implementation of IWRM.

3.2.1 Achievements in seven elements of transboundary IWRM

Survey participants were asked for their opinion on seven elements of transboundary IWRM. There were 14 responses. Figure 4 shows the perceived existence or lack of each action. The responses revealed:

- strong existence of coordination functions, dispute resolution and stakeholder involvement,
- some use of dispute resolution, the use of operating plans and water allocation agreements (where this is their function of the transboundary organization),
- quite limited sign-up to the Helsinki Convention, and
- quite limited use of environmental flow assessments.

Figure 4. Perceived achievements in seven key elements of transboundary water management. (n=14)



Key: These are the meanings of action items in Figure 4 above:

Action	Survey question
Coordination functions	Does the transboundary organization manage specific transboundary coordination functions?
Operating plan	Does the transboundary organization have an operating plan for environmental management across the international boundary?
Water allocation agreement	Is there a workable water allocation agreement between riparians, specifically with respect to low flow/drought experiences?
Low flow allocations	In water resources management across the boundary, is the natural environment treated as a user by making explicit provisions for low flows?
Dispute resolution	Is there evidence of disputes being resolved in amicable ways?
Minimum involvement	Regarding stakeholder involvement, is the minimum involvement a public advisory group, and are there obligations to take account of its advice in decision-making?
Helsinki Convention	Is the transboundary basin organization a signatory to the 1997 Helsinki Convention (for non-navigational waters), as this convention has principles similar to IWRM?

These results indicate strong existence or at least support for coordination activities by basin organizations. This suggests that basin organization activities have focused on coordinating actions, yet they have not drilled down into effective planning, even within their own riparians. This is discussed also in the following section. The number of responses indicating that the natural environment is not treated as a user (low flow allocations) indicates the importance of this issue in the management of transboundary waters and that basin organizations are attempting to solve it. Perhaps this could be solved through a workable water allocation agreement and there is some evidence that the basin organizations are moving towards establishing this.

3.2.2 Gaps and challenges

Survey respondents identified several gaps and challenges to IWRM in transboundary basins (in rank order of frequency of response):

1. The need to improve organizational and professional staff capacity (14 responses)
2. The need to strengthen integration and coordination practices (12 responses)
3. The need to build improved information management procedures (11 responses)
4. The need to strengthen planning tools (11 responses)
5. The authority and area of responsibility of the basin organization (6 responses)
6. The need for greater awareness and education (4 responses)
7. The impact of changing natural resource conditions, including the impact of predicted climate changes (4 responses)
8. The role of legislation (3 responses)
9. The need to improve participation procedures (3 responses)
10. The financing of transboundary basin organizations and basin management plans (2 responses)
11. The need to manage conflicts better (1 response)

These challenges may be elaborated as follows:

The need to improve organizational and professional staff capacity (14 responses)

The widespread need to build capacity in transboundary IWRM by basin organizations stands out as a clear issue from survey responses. The respondent on the Niger Basin Authority, for example, saw the need for legal and institutional strengthening and to broaden the mandate of the organization to manage the basin's natural resources. Several respondents noted the transboundary basin organization was not able to carry out proper coordination of joint research activities, undertake water resources management and development, nor cover basic education (only training) and there was a pressing need for capacity building on water resources and management to reduce flood and drought vulnerability.

In the Volta basin, there is insufficient relevant national institutions and national IWRM practices (that is, within its riparians) for the transboundary organization to call upon. The asymmetry between capacity and resources of riparians was mentioned many times; even within the same category of stakeholders there are vast differences in capacities among the basin states and this

could hamper effective participation, especially within a basin-wide forum. This comes down to the basic issue of the need for a common language for communication and the ability to comprehend each other in meetings.



The evolutionary nature of growth of the river basin organization was seen as important. It requires patience, especially to ensure that even states with limited capacity have full ownership of the process of developing their transboundary basin organization. Allied to this is the need to build confidence (Lower Indus Basin) and organizational skills (Senegal and Lake Chad). The respondent for the Orange – Senqu basin maintained it takes time to develop this capacity,

“In establishment of the Commission, basin States designed an affordable institution that serves the primary purpose and is demand driven in the sense that it complements the existing bilateral arrangements that already exist occupying the space between SADC and the bilateral. Countries then committed to full ownership of all structures of the institution including the Secretariat by bearing the full operational costs of them hence ensuring sustainability. The evolutionary nature of growth of the river basin organization does require patience especially to ensure that even states with limited capacity have full ownership of the basin organization’s development process.”

Sometimes competing functions of a transboundary basin organization cause management challenges. In the Sava basin, it was reported, there is a need (1) for balance between navigation and water management, (2) to build the legal capacity of the basin organization in these two fields (i.e. for making decisions in the field of navigation and providing recommendations on all other issues), as well as (3) the strengthening of Secretariat structure (i.e., there is a need for equal staff capacity in the fields of navigation and water management, although the latter is much more demanding).

The need to strengthen integration and coordination practices (12 responses)

The need for more effective coordination also stands out as an important issue in transboundary water management. Several examples of a lack of coordination were reported, including:

- an over-emphasis on irrigation with limited coordination with hydropower, water quality and ecosystems protection;
- inadequate linkages between land uses, including plantations, efficient irrigation systems, safe drinking-water, water for cattle and water harvesting;

- lack of clarity in financial relations between riparian countries;
- limited integration of water and soil management on a catchment basis;
- weak regional integration within existing projects for economic development;
- disharmony among the policies and legal mechanisms of member states;
- weakly coordinated development of groundwater resources with surface water resources (i.e., poor conjunctive water schemes);
- a lack of clarity in bilateral relations especially beyond the basin-wide IWRM plan;
- within Europe, limited links between the implementation of the Water Framework Directive and Flood Directive; and
- the narrowness of existing mandates, which should be broadened to include, e.g., groundwater management.

Several respondents highlighted problems with the complexities of coordination efforts . In the Aral basin, for example:

- the financial relations between riparian organizations are unclear;
- there is a need to follow up the delegation of larger decision-making authority to the founders of the basin commission;
- the mechanisms for inter-sectoral coordination between water, energy and environment are unclear;
- there is a need to develop key strategic documents to resolve these issues – on general principles for water allocation/distribution, on financial mechanisms for transboundary water infrastructure, on a strategy for returning water to rivers after use so as to maintain water quality in the rivers, and on efficient water consumption as agreed by the five riparians.

In the Sava basin, the differences between the status of riparians in the European Union and their respective eligibility for funds, as well as their different levels of economic development (financial resources), impact their level of implementation of the EU Water Framework Directive. This is compounded by riparians’ organizational structures for decision-making in water resources management and the overall limited environmental awareness of the public in each country.

The need to build improved information management procedures (11 responses)

Several issues related to information use in IWRM were recorded in survey responses. There is an important role for a transboundary basin organization to play here and this is happening in the Niger Basin Authority, using information systems including GIS with and regional databases of basin documents. However, experiences vary, and in the Lake Chad basin, for example, monitoring and databases are country specific with little information sharing between riparians.

The survey respondents to the Dneiper, Indus, and Niger basins listed gaps in information management and exchange:

- irregular data analysis, interpretation, sharing and feeding results into water resources management of the basin,

- weak monitoring and data collection on a basin level: information on groundwater recharge, groundwater abstractions and declining levels is inconclusive because of lack of monitoring networks,
- non-standardized data collection within the basin riparian countries and fully agreed data sharing procedures, and
- weak consolidation and integration of water knowledge, especially with regard to adaptation to climate variability.

The need to strengthen planning tools (11 responses)

Several respondents highlighted the weakness of water resources planning in riparians and the lack of transboundary planning activities. There is a need to develop key strategic documents, including general principles for water allocation/distribution across the boundaries. Other weaknesses were identified in the financial mechanisms for transboundary water infrastructure. In the Senegal basin, there is a need to optimize the returns/revenues from investments in dam construction while mitigating the adverse environmental impacts of the dams.



Water planning strategies are needed for return water management – to maintain water quality in the rivers – and for instituting pollution monitoring and mitigation measures at the basin level so as to ensure that no precious water resources are lost to pollution. Other planning tools are needed to cover land management through developing basin policies and action plans by riparian governments, coupled with a need to increase efficiency of water consumption. In the Danube, progress had been made in realizing the ultimate goal of the first EU Water Framework Directive, namely, good ecological status by 2015.

In the Senegal basin, there is high water demand for domestic water, irrigation and hydropower generation, against a backdrop of dwindling water supplies. IWRM by all the riparian countries is seen as an adaptation and mitigation procedure, focusing on demand management in each water use sector. The approach of the Organisation pour la Mise en Valeur du Fleuve Sénégal [Senegal River Basin Development Organisation](OMVS) has been to work in a coordinated manner with riparians, aiming to achieve a balance between all land uses, including plantations, efficient irrigation systems, safe drinking-water, water for cattle, and water harvesting. There is also a need, however,

for instituting pollution monitoring and mitigation measures at the basin level. OMVS sees the best way to do this is to strengthen its capacity and to cajole Guinea to become a member, extending its brief to cover land management by developing new basin-wide policies.

The authority and area of responsibility of the basin organization (6 responses)

Several basin organizations experience gaps in their authority. In the Dneister, there is limited political will to make a difference across the basin and to involve all stakeholders, as well as no overall river basin approach. In the Lake Chad basin, there is a need to strengthen the Lake Chad Basin Commission which represents all the riparian countries, yet does not effectively manage groundwater in the basin. In the Niger basin, there is a need to strengthen and broaden the mandate of the basin organization to include land management in development policies in the riparian governments. In the Nile, there is – despite the Nile Basin Initiative – still a need for more financial resources, better data sharing procedures and more harmonized legal and institutional policies, as well as increased capacity in water resources management and development. In the Orange-Senqu, the bilateral agreements need further clarification, especially beyond the formulation of a basin wide IWRM plan.

There were many gaps and challenges identified in the Aral basin organization:

- There is a lack of a Transboundary Agreement and hence no authority for strategic policy decisions – only recommendations for the governments.
- Special interests should not stand in the way of transparency in transboundary water management.
- Delegation of bigger decision-making authority to the founders of the basin commission.
- Lack of a designated authority in relation to hydropower, water quality and ecosystems protection, just a focus on irrigation.
- The area of jurisdiction covers only the Aral Sea Basin, while the biggest part of Kazakhstan and Northern part of Kyrgyzstan are left out of the authority.
- Proper coordination of joint research activities is lacking.

The need for greater awareness and education (4 responses)

Four survey respondents highlighted the need to promote a basin-wide approach through awareness and education campaigns. The focus should be on campaigns about environmental preservation of threatened ecosystems and capacity building of educators and publicists on common issues. One suggested way to do this is through pilot demonstration projects of ecosystem restoration. In the Volta basin, a lack of awareness in the general populace extended to a broad ignorance of the importance of an integrated, transboundary approach to water resources management and ecosystem restoration.

The impact of changing natural resource conditions, including the impact of predicted climate change (4 responses)

This issue was identified by about one-fifth of the survey respondents, which suggests that there is an awareness of water scarcity as a result of high demand in some basins. This is expected to become even more acute as the impact of climate change becomes more pronounced, for example, in the Orange-Senqu basin and the Great Lakes basin. There are as well several ongoing issues to deal with in the Great Lakes: toxic waste disposal (e.g., pharmaceuticals) and nearshore pollution, despite years of cleanup efforts.

The role of legislation (3 responses)

The use of legislation as an enabling tool for transboundary basin management varies amongst the basins. Three respondents suggested that experience in their basin was weak and revealed a need to develop and disseminate appropriate legislative and regulatory frameworks. These legal tools should be used to ensure the effective development and management of each basin's natural resources. The Niger Basin Authority and the Lake Chad Basin Commission are charged with the management of the basin's water resources but individual countries have their own setup for managing water resources in their own sections of the basin through government departments and ministries. There is no appropriate legislation for the effective management of water resources across entire basins. Nor is there 'appropriate' common international law to do this, but basin authorities have the opportunity to ratify the Helsinki Convention on management of transboundary waters. Basin organizations could promote this tool. As reported earlier, there has been only limited ratification of this protocol.

The need to improve participation (3 responses)

Three respondents called for increased promotion of stakeholder participation and lifting the level of communication amongst stakeholders. This was aimed at improving consistency in riparian participation in the basin organization. Where there are different levels of economic development in transboundary basins, there are different capacities within the countries to participate.

In the Senegal basin, the lack of active involvement of an upstream riparian limited the development opportunities and the sharing of benefits. There is a need for the other riparian countries to cajole Guinea to become a member of OMVS. In the Orange-Senqu (ORASECOM) there are vast differences in the capacities and resources of stakeholders; even within the same category of stakeholders the differences among the basin States hampers effective participation, especially in basin-wide forums. Maintaining consistency in the participation of delegates to ORASECOM is also a challenge.

Financing of transboundary basin organizations and basin management plans (2 responses)

The ongoing need for financial resources was mentioned. In the Sava basin, for example, financing projects and establishment of integrated systems of basin management are critical to the function of basin initiatives. However, the low number of responses for this item does not allow for any overall conclusion on external funding .

The need to manage conflicts (2 responses)

Conflict management was not a concern of the majority of basin organizations. Only the respondents for the Sava and Indus basins highlighted a need for this. Water management involves resolving conflicts of interests between different water users, and requires expansion of a river basin management plan structure to cover all aspects of the water use.

4.0 CONCLUDING DISCUSSION AND RECOMMENDATIONS

Although the 19 transboundary basin organizations that were surveyed to produce this report are insufficient as a basis for making generalizations, when combined with the findings from other studies they do provide the basis for some tentative recommendations aimed at supporting IWRM and ecosystems management in transboundary basins. These recommendations are included in the text below.

The overall conclusion from this study of 19 transboundary basin organizations is that experiences in IWRM varied considerably. For some, an integrated approach was apparent and well established. For others, IWRM is still at an initial stage and substantial constraints hinder further progress. The observed variation is due to the different roles and responsibilities of transboundary basin organizations, and this is reflected in the interpretation and emphasis on certain aspects of IWRM more than others. This result is not surprising and reflects the fact that the transboundary organizations themselves are used for different purposes. These include:

- monitoring, investigating and coordinating actions of river committees (i.e., overseeing conditions and trends in the use and quality of basin resources and suggesting methods to coordinate management for improved governance);
- planning and management of commissions (more prescriptive than the first), and
- development and regulation of authorities (such as regulatory bodies and enforcement agencies) (World Bank 2006).

Transboundary water organizations' use of IWRM depends on the reasons for their establishment (the institutional context) and is related to political and administrative leadership, organizational capacity and financing. Consequently, it is not possible to find common IWRM characteristics that have developed over a given period of time on a clear pathway. This does not, however, negate the need for improving water management, for which there exist multiple attributes from multiple sources.

Recommendation 1: Define, elaborate and apply a key set of management attributes for the transboundary basin organization to help promote good management.

For example, the international water advisor, Peter Millington, suggests five main attributes or features as crucial for good integrated river basin management, including management at the transboundary level:

1. clear and strong institutional arrangements, supported by clear regulations, decrees, or agreements and with well-defined implementing procedures;
2. good water-related data, information, systems, and models readily available to the river basin partners and those agencies and bureaus operating within the basin;
3. a complete and clear suite or package of national policies, procedures, and strategies to guide water and natural resource planning, management, and administration;
4. an appropriate form of communication and participation for all basin stakeholders and partners; and

5. basin sustainability performance indicators and an agreed approach to monitoring and reporting on how the basin is being managed and the resources consumed and protected (ibid).

Some of the earliest transboundary basin initiatives focussed on multi-objective planning for poverty reduction, navigation, irrigation development, hydropower development and flood management. More recent basin initiatives, such as the current practices of the Mekong River Commission, engage their respective basin communities in processes to harness ownership and incorporate stakeholders in integrated approaches to natural resources management. These contexts must be remembered when considering the use of IWRM by the 19 basin organizations in this study, and may also help to explain why environmental management is not necessarily considered as “core business” for many transboundary organizations.

IWRM – always a stepped approach in transboundary basins

There is no standard IWRM plan that can be applied in all circumstances. Consequently, IWRM implementation by transboundary basin organizations can be seen as process with many variations according to the basin in question. The practices relevant to each transboundary basin organization vary according to the context of each basin. That context includes differences in the physical features, critical water management issues (river pollution, water sharing, etc.), levels of economic development, institutional arrangements and natural resources management arrangements in each of the member countries (the ‘riparians’), and of course the reason for the existence of the organization. However, while there is no linear pathway upon which all basin organizations should travel, there is scope for basin organizations to learn from each other. One possibility would be to establish a database of transboundary IWRM case studies and an international system for exchanging good practices and learning experiences.

Recommendation 2: Learn from the experiences of other basin organizations that are in, or have completed, the same development phase.

While IWRM implementation varies according to the basin in question, certain common steps or stages of development in basin organization development can be observed, as was illustrated in Table 4 (Hooper, B.P., 2005; World Bank 2006).

The three stages in Table 4 illustrate how a transboundary basin organization becomes more ‘auto-adaptive’ that is, it becomes more able to respond to new conditions and situations, new knowledge gained from science and new economic imperatives through time.

An obvious point of note is that highly developed transboundary basin organizations in wealthy economies sometimes have more capacity to develop these functions than those in comparatively poorer economies that are less developed. A further dimension is the degree of political and legal complexity of different transboundary arrangements for river basin management, which impacts on the ease by which coordination can occur across borders.

Each of the three stages of development in Table 4 (Initial/Functionary, Emerging Auto-adaptive, and Mature Auto-adaptive) have specific functions. There is a sequence implied by this pattern and functions will overlap through time. At the peak stage, the mature auto-adaptive transboundary basin organization has clearly identified roles and responsibilities; coordinates action across boundaries; is driven by stakeholder engagement; implements transboundary river basin management plans in response to changing conditions; operates effectively within established institutional arrangements; and uses transparent reporting mechanisms.

A mature transboundary basin organization undertakes all the Group 1-5 activities noted in Table 4 (for example, from collecting data on water volume to strategic planning and implementation), commences new projects and modifies past river basin management plans in response to changing conditions. In this way the transboundary basin organization operates as a learning organization. There has been a transition from a focus on efficiency and effectiveness towards 'learning by doing'.

Transboundary basin organizations can act as a reference organization for natural resources management to their riparian states. Such a transboundary basin organization provides overarching, coordinating functions for its constituent organizations and gives it regional credibility, advocacy and leadership for basin scale natural resources management.

Recommendation 3: Recognise that building confidence and organizational skills is a long term process for transboundary organizations, and that some results may take decades to achieve.

Overall -- seven key questions

Another way of looking at IWRM maturity in transboundary basin organizations was suggested for this study by Stakhiv (2009). He recommended the following seven key questions to help galvanise action for transboundary water resource management:

1. Does the transboundary organization manage **specific transboundary coordination functions**?
2. Does the transboundary organization have an **operating plan for environmental management** across the international boundary?
3. Is there a **workable water allocation** agreement between riparian states, specifically with respect to low flow/drought experiences?
4. In water resources management across the boundary, is the natural environment treated as a user by making explicit **provisions for low flows**?
5. Is there evidence of **disputes being resolved** in amicable ways?
6. Regarding **stakeholder involvement**, is the minimum involvement a public advisory group, and are there obligations to take account of its advice in decision-making?
7. Is the transboundary basin organization a **signatory to the 1997 Helsinki Convention** (for non-navigational waters), as this convention has principles similar to IWRM?

These questions suggest that functional excellence in transboundary cooperation is built around coordination, environmental management, agreement on water allocations and environmental low flows, conflict resolution, stakeholder engagement and the use to international protocols for benefit sharing.

The following supplementary question to the above could be added:

8. Did the transboundary basin organization emerge by **reforming an existing transboundary relationship**, and if so, what has been learnt from reform and **have these lessons been incorporated in current management practices**? (River basin organizations tend to succeed by reforming existing organizations rather than creating entirely new organizations.)

Recommendation 4: Use a combination of governance and technical indicators to provide evidence of outcomes of IWRM.

Transboundary coordination and stakeholder involvement

In the survey reported here, there was strong evidence of coordination and stakeholder involvement in management processes. This could be taken as tantamount to emerging IWRM in most of the basin organizations reporting in this study. However, significant challenges remain including the need for more:

- coordination across boundaries,
- information exchange,
- joint planning,
- conflict resolution,
- determining jurisdictional area and authority, and
- overall awareness and education of basin residents.

For effective transboundary basin management, one would expect to see evidence of international, cross-portfolio arrangements between agencies with similar roles in neighbouring countries which address natural resources management, health, population and economic development. Specifically, one would expect to see the national water agencies striving to adopt an integrated approach within their own countries and using this as a point of dialogue for transboundary management with riparians.

Recommendation 5: Promote the role and potential value of functioning transboundary organizations in order to increase support from riparian states.

Promoting the role and potential value of transboundary organizations could be achieved in some instances by advocacy and awareness raising campaigns and a programme of action for environmental management in transboundary basins, focusing on environmental asset valuation, environmental flow assessments, water quality management, information collection and operating plans (including water allocations) for environmental management across international boundaries.

Two ways to increase transboundary IWRM effectiveness are to strengthen the role of national commitment and to strengthen the role of stakeholder involvement. In an earlier international workshop on this topic (Danish Water Forum and Ministry of Foreign Affairs of Denmark, 2007), the following were lessons learned:

- Cooperation not conflict is becoming the norm in transboundary water management, but basic problems remain.
- The critical first step is to get parties to the table to cooperate on joint water management where no agreement exists. This takes time: sixteen years in the case of the Tigris-Euphrates.
- A real problem is to hold countries that have agreements, treaties or other coordinating mechanisms accountable for implementing those agreements.

- There are different types of enforcement mechanisms which can be used to promote compliance, but international law, such as the UN Convention on the Law of the Non-Navigational Uses of International Watercourses can be a useful starting point.
- Measuring performance in water sharing is difficult due to poor data and information availability.
- Indicators of water sharing provide a valuable tool to show evidence of progress or lack of it, but they are poorly developed.
- New regional approaches based on IWRM need to focus on both river basin and groundwater province management (conjunctive use), and emphasize both social needs and environmental sustainability.
- Calculating equitable water sharing requires coordination of water demand management with supply management, and coordination between different sectors.
- Sharing can be perceived as a threat to sovereignty, so mechanisms which include tradeoffs and which respect a nation's right to manage its own water are needed.
- Water policies and programmes will need to focus on interdependency at a basin scale to meet environmental challenges which are bigger than local issues and solutions.
- New water sharing models should not imply that only optimal solutions are acceptable.
- Transboundary water sharing should be realistic, not part of a 'wish-list' of vague objectives or motherhood statements.
- Trust, as reflected in data sharing and joint planning, is a hallmark of effective transboundary water cooperation.
- Most transboundary river basins are marked by economic and political asymmetries among riparians, shaping the nature of cooperative possibilities and constraints.

Environmental management in transboundary basin management

In contrast to the emergence of IWRM, there was only limited evidence of environmental management practices by the transboundary basin organizations in this study, and few attempts to address the impacts of potential climate change in basin management, environmental management processes across boundaries, actions in water quality management, environmental flow assessments, or environmental assessments in general.

This indicates an urgent need for specific actions to increase environmental management in all transboundary basins. One way to do this is to strengthen environmental management actions of member countries, specifically and perhaps initially, by strengthening environmental monitoring. McIntyre (Earle, A. et al., 2010) reports that in the case of the Gabčíkovo-Nagymaros Project (shared over the Hungary-Czechoslovakian portion of the Danube River), joint environmental monitoring systems provided a politically neutral platform for negotiation. This was valuable as it “served the political and technical aspects of the water dispute and provided a basis for negotiation” (Earle, A. et al., 2010:299).

Recommendation 6: Promote joint environmental monitoring in order to strengthen the basis for decision-making and promote increased cooperation and the value of ecosystem services.

Joint monitoring systems can (and for some, do) lever cooperation for the 19 basin organizations reported in this study. This reflects the practices in Table 4 for the establishment of “water (and natural resource) data collection and processing” as part of Group 1 activities which also include “systems modelling, water and natural resources planning, stakeholder consultation & issue clarification”.

In spite of the limitations revealed by this study – one of which is the impossibility of developing a single detailed approach to transboundary IWRM in every region and situation – a number of observations have been made from which lessons in the form of general recommendations were drawn. It is hoped that these recommendations can complement the growing body of knowledge aimed at improving the management of transboundary water bodies that are critical for social, political and economic stability, as well as for sustainable development.

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ANNEX 1. SURVEY INSTRUMENT

Please answer the following questions or provide information in the spaces provided.

About your transboundary water organization and agreement

#

[office use]

1	Name of transboundary water organization:	
2	Name of the transboundary water agreement:	
3	Purpose of the transboundary water agreement:	
4	Year of formation of the transboundary water agreement and/or organization:	Agreement: Organization:
6	Member states of the transboundary water agreement	
7	Contact person who filled in this survey:	Name: Position: Email:
13	Functions of your transboundary water organization. Please say which apply:	Your answer: Yes or No?
13a	Monitor water quantity	
13b	Manage water allocations, except environmental water allocations	
13c	Undertake environmental assessments including environmental flow requirements	
13d	Collect and disseminate information/data	
13e	Regulate water quality	
13f	Monitor water quality	
13g	Manage water resources for transportation services	
13h	Manage water resources for hydropower production	
13i	Plan water infrastructure	
13j	Plan agricultural development	
13k	Other development planning	
13l	Undertake social and economic assessments	
13m	Mediate water use conflicts	
13n	Monitor aquatic ecosystem health	
13o	Recover costs of water resources management	
13p	Recover costs of water delivery	
13q	Other :	If yes, please specify:

Transboundary water management

Are the following activities **practised** by your basin organization?

# [office use]	Practices	Practised? Answer: Yes, No or Partly
14	Cross-sectoral integration	
15	Integrated management of land and water	
16	Management at the lowest appropriate level	
17	Demand management	
18	Water use efficiency	
19	User pays	
20	Polluter pays	
21	Benefit sharing mechanisms	
22	Staff are trained in legal matters for transboundary water sharing and management	
23	Conflict resolution procedures are used to resolve water disputes	
24	Good governance	
25	Stakeholder involvement exists	
26	Plans take into account adaptation to natural disasters.	
27	Plans take into account adaptation to climate change.	
28	Women are represented at most management levels in water agencies in the basin.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Partly
29	Capacity building programs in water resources management exist for your transboundary water organization.	
30	Capacity building programs in water resources management exist for stakeholder groups in your transboundary river, lake or aquifer (or combined) basin.	
31	Strong leadership in the transboundary organization exists and works to continuously upgrade the capacity of staff.	
32	Political relationships – senior staff of the transboundary organization are closely linked to senior politicians and/or administrators of each basin state	
33	Monitoring and/or research programs are used to help the transboundary water organization adaptively manage water issues.	
34	Member countries support the financing of the transboundary water organization.	
35	Directive revenues raised by your transboundary water organization finance your organization.	
36	Supportive financing exists from external donors to support the transboundary water organization.	

Environmental management

Are the following activities **practised** by your basin organization?

# [office use]	Practices	Practised? Answer: Yes, No or Partly
37	Environmental asset valuation. (There has been a serious attempt to measure and 'bundle up' the array of environmental assets in the basin ⁴).	
38	Regular monitoring and evaluation of the environmental impacts of basin programmes and basin developments take place.	
39	Data collection, analysis and dissemination of information on ecosystem management and water resources occur.	
40	Regular exchange of information related to water and ecosystem management occurs between member countries.	
41	The environmental management programmes of your transboundary water organization address market processes that adversely affect biological diversity.	
42	Water quality management is widely advocated and guidelines are promoted by your transboundary organization.	
43	Impact assessment procedures are used.	
44	Environmental flow assessments are used.	
45	Biodiversity assessment are used in water resources development and management plans.	
46	There has been some attempt to determine the ecosystem thresholds at which riverine, lake or groundwater ecosystems will deteriorate, perhaps irreversibly, as water abstractions occur.	
47	A 'whole of basin' approach is recognized in water management plans	

Seven key questions

Please answer the following summary questions for your basin organization.

# [office use]	Practices	Practised? Answer: Yes, No or Partly
48	Does the transboundary organization manage specific transboundary coordination functions?	
49	Does the transboundary organization have an operating plan for environmental management across the international boundary?	
50	Is there a workable water allocation agreement between riparians, specifically with respect to low flow/drought experiences?	
51	In water resources management across the boundary, is the natural environment treated as a user by making explicit provisions for low flows?	
52	Is there evidence of disputes being resolved in amicable ways?	
53	Regarding stakeholder involvement, is the minimum involvement a public advisory group, and are there obligations to take account of its advice in decision-making?	
54	Is the transboundary basin organization a signatory to the 1997 Helsinki Convention (for non-navigational waters), as this convention has principles similar to IWRM?	

Other Information

What challenges do you see to transboundary water management in your basin?

Is there any other information you would like to add? If so please include it here:

THANK YOU FOR COMPLETING THIS SURVEY.

ANNEX 2. GLOSSARY

The following definitions are suggested for use in this survey and are included for illustrative purposes only. Others will exist. Sources include: Florida Department of State, Global Water Partnership, Wikipedia, New Mexico State University, UNWater, UNEP-DHI Centre for Water and Environment.

Adaptive management: a structured, iterative (ongoing through a sequence of rounds) approach that recognizes that the information used in making decisions is imperfect and that, as decisions are made, a process is in place to gain better information and adjust the implemented action accordingly.

Benefit sharing mechanisms: the mechanisms specify equitable water shares

Capacity building: the development of an organization's core skills and capabilities, such as leadership, management, finance and fund-raising, programs and evaluation, in order to build the organization's effectiveness and sustainability.

Demand management: reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, reduce waste of water, alter land management practices, and/or alter land uses. [State of Florida]

Ecosystem thresholds: The level of magnitude of a system process at which sudden or rapid change occurs.

Environmental asset valuation: measures which quantify the ecological, economic and societal value of environmental assets which include goods (e.g. potable water, irrigation water and fish) and services (e.g. waste disposal, flood regulation and recreation). These assets depend on the characteristics of the ecosystem, whether it is an upstream catchment, a floodplain or a river delta. Some assets are directly related to aquatic ecosystems (such as to water supply and to fish), whereas others are indirect input to terrestrial ecosystems (such as soil moisture and land erosion). Source: UCC-Water, undated. Addressing Environmental Aspects of IWRM. Concepts and Issues Paper No. 1. Hørsholm, Denmark.

Environmental flow assessment methods: these refer to a number of different techniques used to the amount of water needed in a watercourse to maintain healthy ecosystems. Various methods are available: hydrology-based, hydraulic ratings, habitat simulation, holistic (assessment of whole ecosystems); downstream response to imposed flow transformations (DRIFT); flow stress/response (FSR); and benchmarking.

Environmental flow: is the amount of water needed in a watercourse to maintain healthy ecosystems. The term is used in the context of rivers which have been dammed, with most or all of the flow trapped by the dam — the failure to provide an environmental flow can have serious ecological consequences [Global Environmental Flows Network]

Good governance: procedures are in place to ensure your transboundary water organization is free of corrupt practices in fiscal management, reporting and water sharing.

Impact assessment procedures: studies of the potential future effects of resource development on other resources and on social, economic and/or environmental conditions. Tools such as Environmental Impact Assessment, Strategic Environmental Assessment, Cost Benefit Analyses and Operational Assessments support the management of threats to sustainable water use (e.g. from infrastructure construction, over-abstraction, point-source and diffuse pollution and habitat loss/degradation).

Institutional arrangements: mechanisms of social order and cooperation governing the behaviour of a set of

individuals or organizations in the water sector

Integrated water resources management: has been defined by the Technical Committee of the Global Water Partnership (GWP) as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." Operationally, IWRM approaches involve applying knowledge from various disciplines as well as the insights from diverse stakeholders to devise and implement efficient, equitable and sustainable solutions to water and development problems. As such, IWRM is a *comprehensive, participatory planning and implementation tool* for managing and developing water resources in a way that balances social and economic needs, and that ensures the protection of ecosystems for future generations.

Lowest appropriate level (principle of subsidiarity): an organizing principle which maintains that matters ought to be handled by the smallest, lowest or least centralized competent authority; for example, in the water sector this could be a local water user district.

Riparian: in the case of transboundary water management, this refers to a country which contains an international river, lake or aquifer

Sectoral: pertaining to a distinct subset of a market, society, industry, or economy, whose components share similar characteristics; examples include the water sector, the food sector, the environmental sector, the energy sector.

Transboundary basin organization: a social arrangement (group of people) which pursues collective goals, which controls its own performance, which has a boundary separating it from its environment and which manages/influences/monitors or advises on water resources management across the international boundaries between countries which comprise its membership; includes committees and commissions.

Transboundary water agreement: a written understanding between sovereign nations to follow a specific course of conduct regarding water resources management, planning, sharing or monitoring or all these actions; agreements are often legally binding and/or statements of intent.

Transboundary: across an international border (between two or more sovereign nations)

Water allocation: an institutional device (policy, agreement, programme) used to share water between riparians

Whole of basin approach: a procedure which recognizes the river/lake or aquifer basin as an integrated ecological system in water management plans; specifically, this approach recognises that supplying adequate flows will not achieve environmental objectives unless water quality, catchment land use, riparian over-grazing and other problems are addressed at the same time.

ANNEX 3. OTHER STUDIES

1. Key Performance Indicators of IWRM in African Transboundary Basins. International Network of Basin Organizations , 2007-2010.

Project website: <http://www.aquacoope.org/PITB>

The project is managed by the International Network of Basin Organizations (INBO). Working with its regional branch in Africa (the African Network of BO – ANBO) the project proposed to develop and field-test Performance Indicators adapted to the design and monitoring of the implementation of Integrated Water Resources Management (IWRM) in African Transboundary basins.

The project aims to develop an appropriate method for developing a common understanding based on Key Performance Indicators (KPI) to build the capacity of basin organizations. These indicators have several uses, including:

- helping Basin Committees to define appropriate objectives, thanks to the check-list side of the PI ;
- assisting BO management to design (River or Lake) Basin Management Plans (BMP), and the associated Programmes of Measures (PoM), by providing guidelines and benchmarking ;
- encouraging active public participation, by highlighting what is expected in terms of involvement ;
- assisting BO stakeholders to monitor the BMP / PoM process ;
- helping donors to assess the quality of work and the use of their funds.

In Africa, BOs at different development stages can be found, but for the most part they are at the initial or emerging stages. It is then necessary to go step-by-step, to apply KPI to selected pilot basins, to analyse collected data, and to share the related knowledge to other BOs through a learning process. This approach is conceptualized for the long-term. The proposed activities for the three-year project are to pave the way for the use of KPI. The aim is to demonstrate how they can be useful, to secure a sustainable scheme for the future, and to strengthen the implementation capacity of RBOs. Activities include:

- discussions on the “Africa compliance” of the existing list of indicators;
- pilot implementation in 5 African Transboundary basins;
- dissemination of PI practices and tools adapted to different usages / levels of development, with a support for new BOs in the implementation process; and
- participatory design of a long-run model for the scheme in order to assure its long-term acceptability.

The indicators discussed in section 5.2.2 are drawn from this study.

The project developed a Handbook for using the indicators and this is found at:

http://www.aquacoope.org/PITB/documents/key_documents/fo1740388/jeu-dindicateurs-revu-2009/EN_Handbook_KPI_Indicators.pdf

The indicators developed in the INBO project were drawn from previous work developed by B. Hooper at the Institute of Water Resources, US Army Corps of Engineers, Virginia, USA in 2005. The report of that work is found at: www.iwr.usace.army.mil/inside/products/pub/iwrreports/2006-VSP-01.pdf

2. IWRM Implementation in Basins, Sub-basin and Aquifers

The review by UNESCO's IHP World Water Assessment Programme of IWRM in both transboundary and national basins found that (i) there are few publicly available detailed references on this topic and (ii) coordination of global – and in some cases regional – efforts to collect case histories of integrated water resources management in basins, sub-basins and aquifers (BSA) can be improved, through such means as:

- adequate documentation, collection and dissemination of case histories, using an electronic library and a case history model;
- better coordination of information on current IWRM actions through building regional databases of BSAs, and distinguishing the scale of the efforts as to basins, sub-basins and aquifers;
- developing tools for IWRM, including the establishing an appropriate scale for problem description, providing support for linking social and economic development with the protection of natural ecosystems, and involving all stakeholders.
- Enhancing institutional arrangements to facilitate the IWRM approach at BSA level, by clarifying the difference between institutions and organizations, and providing guidelines for the development of institutions for IWRM implementation at BSA level.
- promoting broader recognition that the 'integrated' approach is feasible and beneficial, by organizing an 'IWRM Works' campaign in cooperation with those committed to carry forth the message related to IWRM needs at BSA stakeholder levels; preparing guidelines for operational implementation of IWRM; illustrating the implementation of IWRM at BSA level; and building partnerships to take this message forward prominently and in plain view.

The publication is found at: www.unesdoc.unesco.org/images/0018/001817/181790e.pdf

3. World Bank Briefing Notes on IWRM in Basins

This series of briefing notes, listed in the box below, describes aspects of effective IWRM in both transboundary and national basins. The notes summarise the five main attributes or features crucial for good integrated river basin management. These are: (a) clear and strong institutional arrangements, supported by clear regulations, decrees, or agreements and with well-defined implementing procedures; (b) good water-related data, information, systems, and models readily available to the river basin partners and those agencies and bureaus operating within the basin; (c) a complete and clear suite or package of basin-wide policies, procedures, and strategies to guide water and natural resource planning, management, and administration; (d) an appropriate form of communication and participation for all basin stakeholders and partners; and (e) basin sustainability performance indicators and an agreed approach to monitor and report on how the basin is being managed and the resources consumed and protected.

Note 1. Background, which scopes the need for integrated river basin management; types of river basin organizations; the need to separate roles and functions (of resource managers, from those of pollution monitors and regulators, and from service providers) for the clarification of responsibilities in basin management.

Note 2. Creating and Empowering a Basin Organization, which focuses on the role of ‘mutual benefit’ and doing the right thing’ by customary law to establish international basin organizations.

Note 3. Organizational Strategic Planning for a River Basin Organization, which sets the direction, defining the priorities, planning the actions, monitoring the results.

Note 4. Water Related Data and Information Management, in which transparent, open information exchange is advocated.

Note 5. Water Related Resource Inventory, which includes good data and information on the condition of the natural resources bas, a well developed set of simulation models for testing policies, development options and projects, and a set of decision support tools to present the modelling information in a way which helps decision makers.

Note 6. Systems Modelling, which simulates the behaviour of the basin’s resources in response to new policies and development options and the use of a package of decision support tools by working groups and the use of continuous staff training to maintain decision support capability.

Note 7. Notification and Evaluation of Projects, which outlines the requirement to establish notification of new projects to all basin stakeholders and evaluation techniques, including environmental impact assessment.

Note 8. Sharing and Managing a Basin’s Water Resources, which outlines methods of reasonable and equitable water allocation drawing on case study experiences, the use of water accounting mechanisms, quotas, transfers and audits.

Note 9. Licensing/permitting of Water Diversions and Use, which involves setting the rules for water licensing, issuing the licenses, monitoring who uses how much water and how efficiently.

Note 10. Modern Approaches to River Basin Planning and Management, which focuses on engaging basin communities, the role of bottom-up planning and participation in local land and water management plans

Note 11. Pricing and Charging for Water Resource Management, which outlines the role of efficient water pricing structures for both supply and distribution, and for managing and monitoring the resource base itself, and the role of independent pricing tribunals.

Note 12. Stakeholder Partnerships, Participation and Funding, which outlines partnership building methods with peak bodies and at lower levels.

Note 13. Raising the Awareness of the Basin Community, which outlines the contents of a basin package of communication initiatives spanning education on IRBM for schools, villages, towns and the community in general.

Note 14. Setting and Managing Basin Sustainability Performance Indicators which outline the need for sustainability benchmarks and performance indicators of river basin management, and the contents of a river basin ‘status report’.

Note 15. Setting directions, informing and motivating staff, creating a vibrant, respectful organization, which outlines the project management cycle for river basin management, organizational performance enhancement, marketing river basin management to stakeholders, and the role of leadership.



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