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Review of Agriculture in other River Basins

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“THE TROUBLE WITH WATER –
AND THERE IS TROUBLE WITH
WATER – IS THAT THEY’RE NOT
MAKING ANY MORE OF IT.
THEY’RE NOT MAKING ANY LESS,
MIND, BUT NO MORE EITHER.
THERE IS THE SAME AMOUNT OF
WATER ON THE PLANET NOW
AS THERE WAS IN PREHISTORIC
TIMES”

(DE VILLIERS 2000).

Executive Summary

- 1.1 **The Efficient Water Use for Agricultural Production project aimed at bringing together regional and national stakeholders** to develop a common shared vision on increased availability and efficient use of water for agricultural production. The main thrust of EWUAP was to establish a forum to assist stakeholders at regional, national, and community levels to address issues related to efficient use of water for agricultural production in the basin.
- 1.2 **EWUAP commissioned a study on some established river basin organisations in and outside of Africa** to provide some points that could be used in defining modalities for formulating a sustainable framework for the management of agriculture and agricultural water for the future Nile Basin Commission/Organisation.
- 1.3 **A desk study was done to review River Basin Organisations (RBO's) formed since 1870** and which deal with water issues by defining their mandate, institutional and legal structures and their key agricultural activities.
- 2.1 **There are approximately 263 international watersheds** with mandates to handle the different stages of development and management of the river basin including like planning and project design, development and use, and or operation and administration.
- 2.2 **The Mekong River Basin Commission is an RBO formed under the auspices of The Greater Mekong Sub-Regional Economic Program**, with an agricultural sectoral program that plans the basin wide agricultural activities for implementation by the relevant riparian governments.
- 2.3 **The Senegal River Basin Organisation (OMVS), has a joint program for basin wide planning and development.** It is a unique RBO where the riparian nations have ceded the mandate for basin development to the regional organ giving it an avenue to generate its own income. Irrigation, fishing, livestock farming and hydropower generation are the key programs run by the organisation.
- 2.4 **The Indus Water Treaty of 1960** grants India the unrestricted right to use the water of the Eastern Rivers, namely, the Ravi, the Beas and the Sutlej, while permitting it to make domestic non-consumptive uses from the Western Rivers, uses for run-of-the river hydroelectric plants and specified agricultural use and construction of storage works. Pakistan received the right to use the waters of the Indus River and its Western tributaries, the Jhelum and Chenab rivers. Planning and development of the basin is vested in institutions within each country with provisions for a conflict resolving Commission constituted by a representative from each of the riparian countries.
- 2.5 **The Niger Basin Authority** is a development project whose objective is to enhance regional coordination, development and sustainability of water resources management in the Niger River Basin. The authority aims at (i) improving institutional coordination for regional management and development of water resources in the Niger River Basin; (ii) improving the performances of rehabilitated hydroelectric plants in targeted areas; (iii) Improving irrigated agriculture in targeted areas; and; (iv) Improving watershed management.
- 2.6 **The Orange-Senqu and The Zambezi** are managed under a framework developed by Southern Africa Development Cooperation's where the member countries agreed in principle, on integrated and cooperative management of transboundary river basins. Several bi-national and multi-national joint agreements exist for the development and management of specific projects in the basin all operating under the auspices of the basin wide river basin organisation. Extensive irrigation projects and hydropower programs have been co-developed under different frameworks providing a basis for increased agricultural production and adequate power supply in the region.

- 3.1 Three Models and five management styles are reviewed: In model one;** riparian countries reach an agreement on a legal framework that leads to the establishment of river basin organization with a full development mandate. The second type of cooperative arrangement follows the SADC model, where a comprehensive protocol on shared watercourses is agreed at the regional coordination level, providing the legal basis for forming river basin organizations while the third model, riparian countries embark on confidence-building measures through the development and implementation of shared vision programmes, before establishing the legal institutional framework.

The river basin organisations reviewed provide contrasting management styles that were developed on the basis of geo-political, economic and hydrological considerations. The management styles observed operate under five formal principles: **Watershed Management, River Basin Management, International Boundaries and Waters Commissions, Bi-national or tri-national river basin commissions and Regional Cooperation.**

- 3.2 Some key agricultural activities that could be carried out by river basin organisations include;** *provision of an institutional and legal framework for joint planning, development and management of the agricultural sector, planning and development, capacity building through research, training and funding, setting and management of an agricultural information management system and networking, markets and cross border trade.*
- 3.3 The future Nile River Basin can be formulated based on any or a combination of any of the models and management styles reviewed.**

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1. Introduction

1.1 Background

The Nile riparian countries realizing their common concerns and interests over water resources took a major step towards cooperation and established the Nile Basin Initiative (NBI) in 1999. The NBI is guided by a Shared Vision “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile basin water resources.” In order to translate this shared vision into action, the NBI launched a Strategic Action Program (SAP), comprising two complementary parts:

- 1) A basin wide Shared Vision Program (SVP); and
- 2) Subsidiary Action Programs (SAP).

The SVP comprises a series of technical, socio-economic, confidence, and capacity building projects that are being implemented basin-wide to help establish a foundation for trans-boundary regional cooperation and create an enabling environment for investments and action on the ground. The Efficient Water Use for Agricultural Production (EWUAP) project is one of the eight projects of the Nile Basin Initiative’s (NBI) Shared Vision Program (SVP).

Agriculture plays a major role in the lives and livelihoods of households in the Nile basin and contributes significantly to economic growth and Gross Domestic Product (GDP). The riparian countries rely on the Nile waters to meet needs for basic domestic use and for economic growth. The changing climate is causing countries to show greater desire to utilize this water for development purposes. Agriculture is the dominant user of water in the basin but the lavish use cannot be sustained because of the growing and competing demands from other sectors. Hence, the overall productivity of the agricultural sector must be improved meaning more crops per given volume of water and land if the system is to remain viable. Issues of such nature can best be addressed in a comprehensive manner, that is, by finding basin wide solution to the problem.

The Efficient Water Use for Agricultural Production project is a first step in bringing together regional and national stakeholders to develop a common shared vision on increased availability and efficient use of water for agricultural production. The main thrust of EWUAP is to establish a forum to assist stakeholders at regional, national, and community levels to address issues related to efficient use of water for agricultural production in the basin. The project is expected to meet its objectives by bringing regional and national stakeholders together to have a common view and understanding on ways and means of improving water use and develop a shared vision on common issues. The project will create a framework to promote basin-wide cooperation and awareness, and build capacity by focusing on the common and basic issues related to water harvesting and irrigation. The project will help establish forums to discuss development paths; improve an understanding of the relationship between water resources and agricultural development; and enhance basin wide agricultural management capacities. The project intends to:

- Establish regional dialogue on Water Harvesting (WH);
- Strengthen regional consultation on Community-Managed Irrigation (CMI) and enhancement of overall awareness on efficient water-use;
- Strengthen regional consultation on Public and Private-Managed Irrigation (PMI) and the enhancement of awareness on efficient water-use;
- Explore, document and disseminate information on best practices in water harvesting, community and private-public managed irrigation; and

- Build national capacity for a sustainable management and efficient use of water

Some of the challenges that have to be overcome to ensure sustainable management of the water resources within the Nile basin include:

- i. Inadequate structures for promoting a shared understanding of the functioning of the basin system(s) and of the present and future pressures likely to be placed on the system(s)
- ii. Promotion and maintenance of communication and dialogue across the basin, both vertically and horizontally at all different levels
- iii. Building capacity of stakeholders to interact and to speak on behalf of their interests as well as in the basin's interest
- iv. Identifying options and opportunities for sustainable development across the basin
- v. Developing shared agendas and objectives within national borders and across them
- vi. Generating and making available to all stakeholders appropriate information on which planning and strategies can be based
- vii. Harmonizing policies and legislation
- viii. Developing good governance systems at all levels, that ensure the equitable inclusion in decision-making of multiple stakeholders, particularly local resource users
- ix. Addressing root causes of environmental problems such as poverty and inappropriate policy and legislation
- x. Promoting sustainable management and use of resources at local level
- xi. Promoting integrated multi-sectoral approaches to management and development
- xii. Providing appropriate forums and mechanisms for conflict resolution within and across national boundaries, and getting the correct focus

1.1.1 Objectives and Scope of the Review

As one of the eight SVP projects, the EWUAP is working to provide a sound conceptual and practical basis to increase the availability and efficient use of water for agricultural production. It is in this context that analysis and evaluation of the services provided by some established river basin organisations in and outside of Africa was commissioned to provide some points that could be used in defining modalities for formulating a sustainable framework for the management of agriculture and agricultural water for the future Nile Basin Commission/Organisation.

The review evaluated the current existing structures (legal and institutional), the status of agriculture and agricultural water use in some selected basins across the world. A scoping of some of the 263 River Basin Organisations was done from which five River Basin Organisations were selected for a detailed review to provide a framework for proposing feasible structural options that could be adopted by the Nile Basin Initiative to set up the yet to be formed Nile River Basin Commission/Organisation.

The reviewed basins were selected from the two hundred and sixty three international watersheds based on the following criteria;

- Existence or intended development of integrated organisation of water management in the basin.
- Availability of some basic data on the existing resources and the uses of water in the basin particularly on agriculture and agricultural water.
- Extent and complexity of the basin with preference given to basins with diverse political and geographical coverage.

The Five River Basin Organisations selected and reviewed were, Mekong and Indus from Asia, Senegal, Niger, the Zambezi and the Orange-Senque Commissions from Africa (Section 2). A synopsis of some 143 RBO's are provided in A.1 and A.2.

1.1.2 Methodology

A desk study was done to review RBO's formed since 1870 and which deal with water issues. Table 2-4 lists the treaties chronologically providing a summary of the general findings while the selected RBO's were qualitatively and quantitatively assessed for their provisions regarding the following criteria: basin involved; principal focus; number of signatories; method and amount of water division, agricultural water allocation and use, if any; and the date signed. A further section was added to highlight the issues and activities governing the agricultural sector in some of the studied basins.

2. River Basin Organisations

2.1 Introduction

There are approximately 263 international watersheds covering about one-half of the globe's land surfaces with rivers that either demarcate or cross international political boundaries. A total of 145 countries contribute territory to the international basins. Thirty-three nations, including such sizeable countries as Bolivia, Chad, the Democratic Republic of the Congo, Niger, and Zambia, have more than 95% of their territory within the hydrologic boundaries of one or more international basins.

The complex physical, political, and human interactions within international river basins do make the management of these shared water systems difficult. Issues of increasing water scarcity, degrading water quality, rapid population growth, unilateral water development, and uneven levels of economic development are driving many countries to develop co-riparian water relations (Table 2-1). These relations form the basis for the development of River Basin Organisations that among others;

- a. integrates the development of the whole river basin sustainably,
- b. Develops and manages its natural resources, and
- c. Develops and manages the water resources either through a multi-sectoral or a sectoral approach.

The RBO could also handle the different stages of development and management of the river basin including;

- a. planning and project design,
- b. development and use, or
- c. Operation and administration.

The UN Food and Agriculture Organization identified more than 3,600 treaties relating to international water resources dating between AD 805 and 1984, the majority of which deal with some aspect of navigation. Since 1814, states have negotiated a smaller body of treaties which deal with non-navigational issues of water management, flood control, hydropower projects, or allocations for consumptive or non-consumptive uses in international basins.

The Helsinki Rules list eleven hydrographic and socio-political factors which ought to be taken into account as a whole in water allocations; the 1997 Convention lists seven, but does suggest that the "requirements of vital human needs" be given "special regard." However, most treaties focus on hydropower and water supplies: fifty-seven (39%) treaties discuss hydroelectric generation and fifty-three (37%) distribute water for consumption. Nine (6%) mention industrial uses, six (4%) navigation, six (4%) agriculture and six (4%) primarily discuss on pollution. Thirteen of the 145 (9%) focus on flood control. One treaty primarily discusses fishing (less than 1%). Of the twenty-one multilateral treaties/agreements, developing nations are parties to thirteen.

Few treaties allocate water with clearly defined allocations accounting for fifty-four (37%) of the agreements (Table 2-2). Of that number, fifteen (28%) specify equal portions, and thirty-nine (72%) provide a specific means of allocations. All but three multilateral agreements lack definite allotments, although a few establish advisory and governing bodies among states.

There are four general trends in those treaties which specify allocations:

- i. A shift in position often occurs during negotiations from "rights-based" criteria (whether hydrographical or chronological in favour of "needs-based" values (based on irrigable land or population, Table 2-3);
- ii. In the inherent disputes between upstream and downstream riparians over existing and future uses, the needs of the downstream riparian are more often delineated (agreements mention upstream needs only in boundary waters accords in humid regions), and existing uses, when mentioned, are always protected;
- iii. Economic benefits are not explicitly used in allocating water, although economic principles have helped guide definitions of "beneficial" uses and have suggested "baskets" of benefits, including both water and non-water resources, for positive-sum solutions; and
- iv. The uniqueness of each basin is repeatedly suggested, both implicitly and explicitly, in the treaty texts.

Table 2-1: Unique Allocation Practices

PRINCIPLE	PERCENT (NUMBER) OF TREATIES
Half of flow to each of two riparians	6% (9/149)
Absolute sovereignty on tributaries	2% (3/149)
Relinquish prior uses	0.6% (1/149)
Prioritize uses	3% (4/149)
Equal allocations of benefits	1% (2/149)
Compensation for lost benefits	7% (10/149)
Payments for water	3% (4/149)

Table 2-2: Prioritizing Uses

	USA/Mexico Boundary Waters (1906, 1944)	USA/Canada Boundary Waters (1910)	Indus Waters Treaty (1960)	Mekong Agreement (1975)
Order of priorities:	1) domestic	1) domestic and sanitary	1) domestic	1) domestic and urban uses
	2) agriculture	2) navigation	2) non-consumptive	2) other criteria from Helsinki Rules w/out priority
	3) electric power	3) power and irrigation	3) agriculture	
	4) other industry		4) hydro-power	
	5) navigation			
	6) fishing			
	7) other beneficial uses			

Table 2-3: Examples of Needs-Based Criteria

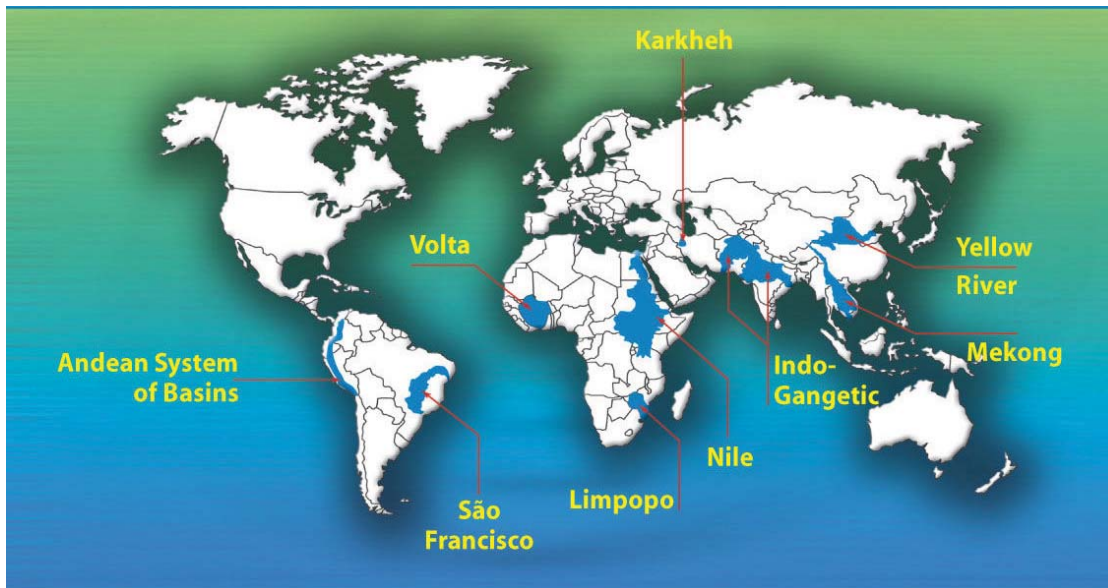
Treaty	Criteria for Allocations
Egypt/Sudan (1929, 1959, Nile)	"Acquired" rights from existing uses, plus even division of any additional water resulting from development projects
Johnston Accord (1956, Jordan)	Amount of irrigable land within the watershed in each State
India/Pakistan (1960, Indus)	Historic and planned use (for Pakistan) plus geographic allocations (western vs. eastern rivers)
South Africa (Southwest Africa)/Portugal (Angola) (1969, Cunene)	Allocations for human and animal needs, and initial irrigation
Israel-Palestinian Interim Agreement (1995, shared aquifers)	Population patterns and irrigation needs

One example of an international cooperation over shared water is the Indus Waters Treaty, signed in 1960 by India and Pakistan. It is an international water treaty signed by two enemies, and that has lasted through two Indo-Pakistani wars to the nuclear era, in 1998, in the Indian Subcontinent. The intervention of the World Bank, as good officer, was critical to the process that finally led to the Treaty.

One explanation for such international cooperation is water rationality. This concept presupposes that cooperation on water use would exist even in time of war because war does not lead to long term national water security. Such security is only possible through good water management at the national and international levels. The need for fresh water is so great that countries will cooperate with their co-riparians whatever the public rhetoric used by the politicians.

The most important factors leading to the Treaty are the fact that the disputants had the space to explore cooperative measures safely and the governments' political will to compromise and reach a settlement. Obviously, if the governments in question are willing to explore ways to cooperate, then cooperation will be more likely. Technical, legal and environmental factors are second to political will.

Furthermore, if direct bilateral negotiations are proving unsuccessful, the intervention of an impartial mediator can assist communication between the disputants. Lastly, even enemy countries are more likely to enact policies that are "water rational" than go to war with their co-riparians in an effort to make their water dispute more manageable



2.2 Mekong River Commission (MRC)

2.2.1 Geography

The Mekong or *Cuu Long* is 4,220 kilometres long and, is one of the 12 great rivers of the world and the longest river in south-east Asia. From its source in the Tibetan plateau, it flows through the Tibetan and Yunnan regions of China, forms the boundary between Laos and Myanmar as well as between Laos and Thailand, divides into two branches - the Hau River and Tien River - below Phnom Penh, and continues through Cambodia and the Mekong basin before draining into the South China Sea through nine river mouths known as the *Cuu long* (nine dragons). The river is heavily silted and is navigable by seagoing craft of shallow draft as far as Kompong Cham in Cambodia. A tributary entering the river at Phnom Penh drains the Tonlé Sap, a shallow freshwater lake that acts as a natural reservoir to stabilise the flow of water through the lower Mekong.

The so-called '*lower basin*' covers some 600,000 km² and includes parts of four countries -Thailand, Laos, Cambodia and Vietnam. While the river carries huge volumes in the wet season, the flows in the dry season are such that the competing needs of all four countries could present both water quantity and quality problems in the future and could well be a limiting factor in the development plans of all the countries.

The Mekong River Commission (MRC) was created in its present form with the signing of the historic 'Agreement on Cooperation for the Sustainable Development of the Mekong River Basin' in April 1995. Signatories were the Kingdoms of Cambodia and Thailand, the Lao People's Democratic Republic and the Socialist Republic of Vietnam. MRC's principal role is to coordinate and promote 'cooperation in all fields of sustainable development, utilisation, management and conservation of the water related resources of the Basin'.

2.2.2 Legal Status of the Commission

In Article 2 of the 1995 Mekong Agreement, the parties agreed : '*to promote, support, cooperate and coordinate in the development of the full potential of sustainable benefits to all riparian States and the prevention of wasteful use of Mekong River Basin waters, with emphasis and preference on joint and/or basin-wide development projects and basin*

programs through the formulation of a basin development plan, that would be used to identify, categorize and prioritize the projects and programs to seek assistance for and to implement at the basin level.

The Agreement represented a milestone in international water resource management treaties due to its emphasis on joint development, ecological protection, and a dynamic process of water allocation. The Agreement established the Mekong River Commission (MRC), articulated the principles of cooperation, and outlined a set of rules for the reasonable and equitable use of the basin's water resources. The upper riparian countries of the Mekong Basin, China and Myanmar, are not members and were designated "dialogue partners" in 1996 and began to participate in various MRC activities. Customary international water law played an important role in the negotiations by providing a framework of principles, which guided the negotiations; the negotiators accepted the basic principles of international water law and then negotiated on how to actualize the principles in the specific context of the Mekong river basin



Figure 2:1: Mekong River

2.2.3 Institutional Structures

Basin Wide Structure

The MRC consists of three permanent bodies:

- **The Ministerial Council**, responsible for policy development and decision-making;
- **The Joint Committee**, responsible for implementing Council's policies and decisions;
- **The Secretariat**, responsible for providing technical advice and administrative services to the council and the Joint Committee

- **The Council**, which meets once a year, consists of one member from each country at ministerial or cabinet level. The Council makes policy decisions and provides other necessary guidance concerning the promotion, support, co-operation and co-ordination of joint activities and programmes in order to implement the 1995 Agreement. The Council has overall governance of the Mekong River Commission.
- **The Joint Committee (JC)** consists of one member from each country at no less than Head of Department level. The Joint Committee is responsible for the implementation of the policies and decisions of the Council and supervises the activities of the Mekong River Commission

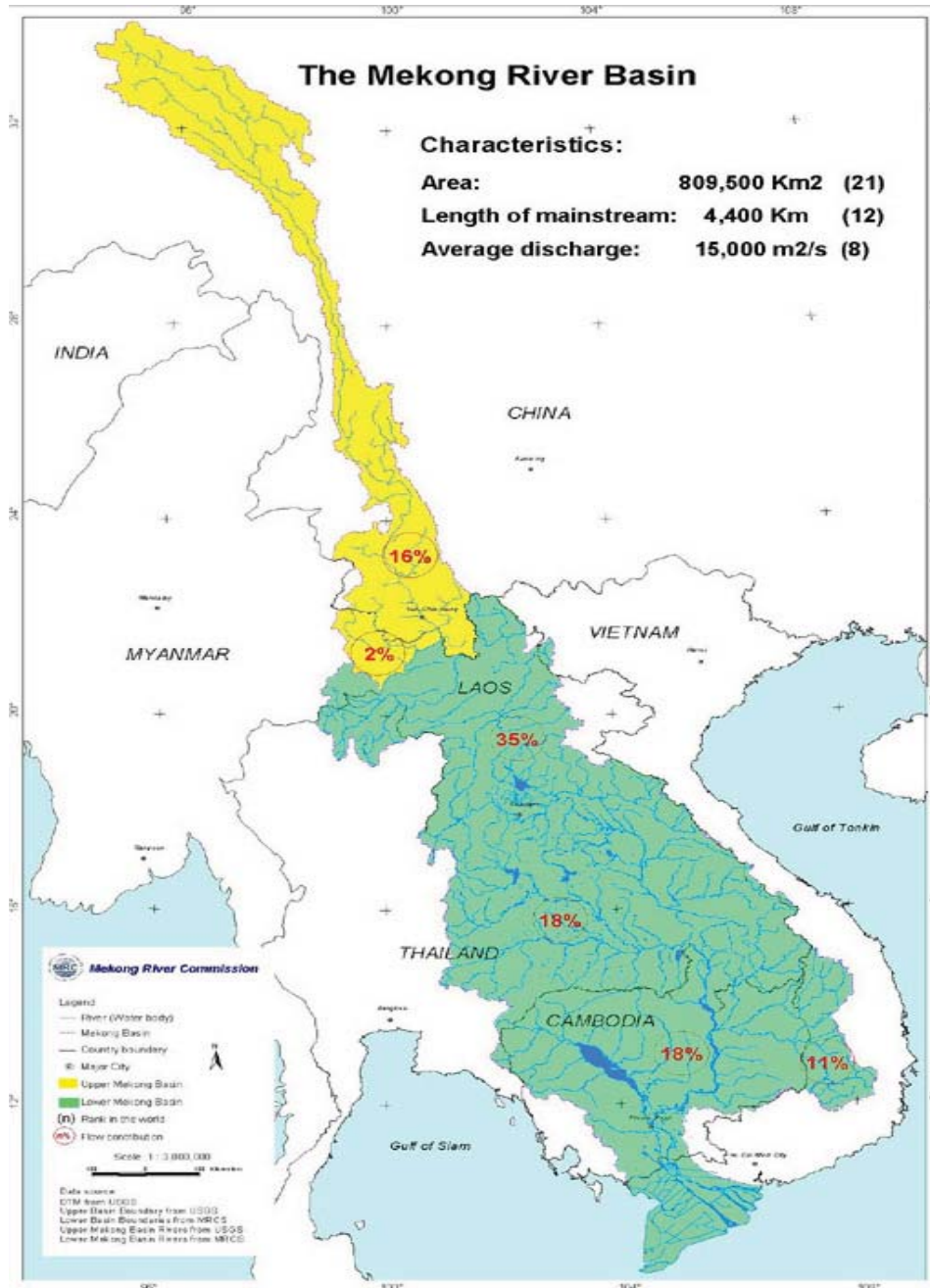


Figure 2:2: Mekong River Basin

- **The Secretariat** (Figure 2:3) which is a body that functions as a board of management. The MRC Secretariat is the operational arm of the MRC. It provides technical and administrative services to the JC and the Council, and is under the direction of a Chief Executive Officer (CEO) who is appointed by the Council under the supervision of the Joint Committee. The CEO is responsible for the day-to-day operations of around 120 professional and general support staff. The main counterparts for MRC activities in the four member countries are the National Mekong Committees (NMCs). The NMCs coordinate MRC programs at the national level and provide links between the MRC Secretariat and the national ministries and line agencies.

The principal implementing agencies of the MRC programs and projects are the line agencies of the riparian countries in the Lower Mekong Basin. They are served by the respective National Mekong Committee Secretariats in each country which though not covered by the agreement, are essential for effective MRC operations in each member country. There are two water utilization sub-committees, dealing with Water Quantity and Water Quality respectively. The MRCS also renders technical and administrative services to the sub-committees

In June 1998, the MRC, with assistance from UNDP, prepared its first “Strategic Plan (1999-2003)”, which sets out visions, goals and strategies both for the Lower Mekong Basin and for the MRC. It, within the broad MRC mandate of the Mekong Agreement, identifies five medium-term goals:

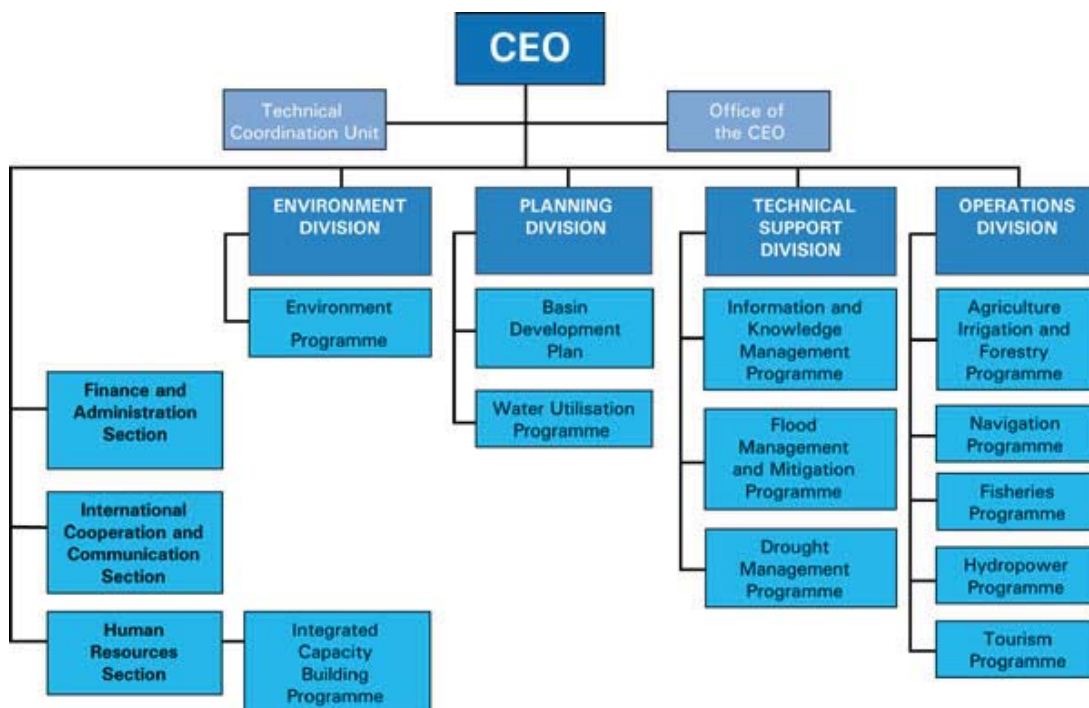


Figure 2:3: MRC Organisational structure

- Establish the “Rules”: this includes, inter alia, establishing minimum flows on the Mekong River and the review of proposed water uses.
- Formulate the Basin Development Plan: To be used as a general planning tool for Sustainable management and development of the Mekong Basin.
- Establish MRC environmental management policies and guidelines.
- Complete on-going programs and projects, and initiate new activities.
- Improve the capacity of the MRC.

The planning is done by the regional Integrated Water Resource Management Support Programme that supports regional cooperation for sustainable development of water and related resources in the Mekong River Basin. The components of the planning process are illustrated in Figure 2:3. The IWRM-based Basin Development Plan comprises three elements (Figure 2:4):

- *Development Scenarios*, which assess the potential and constraints for the further development of some of the water resources in the various parts of the Mekong Basin. The results will guide the formulation of the IWRM-based Basin Strategy and the project portfolio.
- *An IWRM-based Basin Strategy*, which provides a long-term view of how the Mekong Basin may be developed in a sustainable manner for poverty reduction. The strategy will also guide the implementation of the IWRM at basin, national and sub-basin levels, and assist line agencies with preparation of plans and projects that are sensitive to resource protection issues.
- *A project portfolio of structural* (investment) projects and supporting non-structural projects, as envisioned in the 1995 Agreement, to develop some of the Mekong Basin’s water and related resources and minimise harmful effects that might result from natural occurrences and man-made activities.

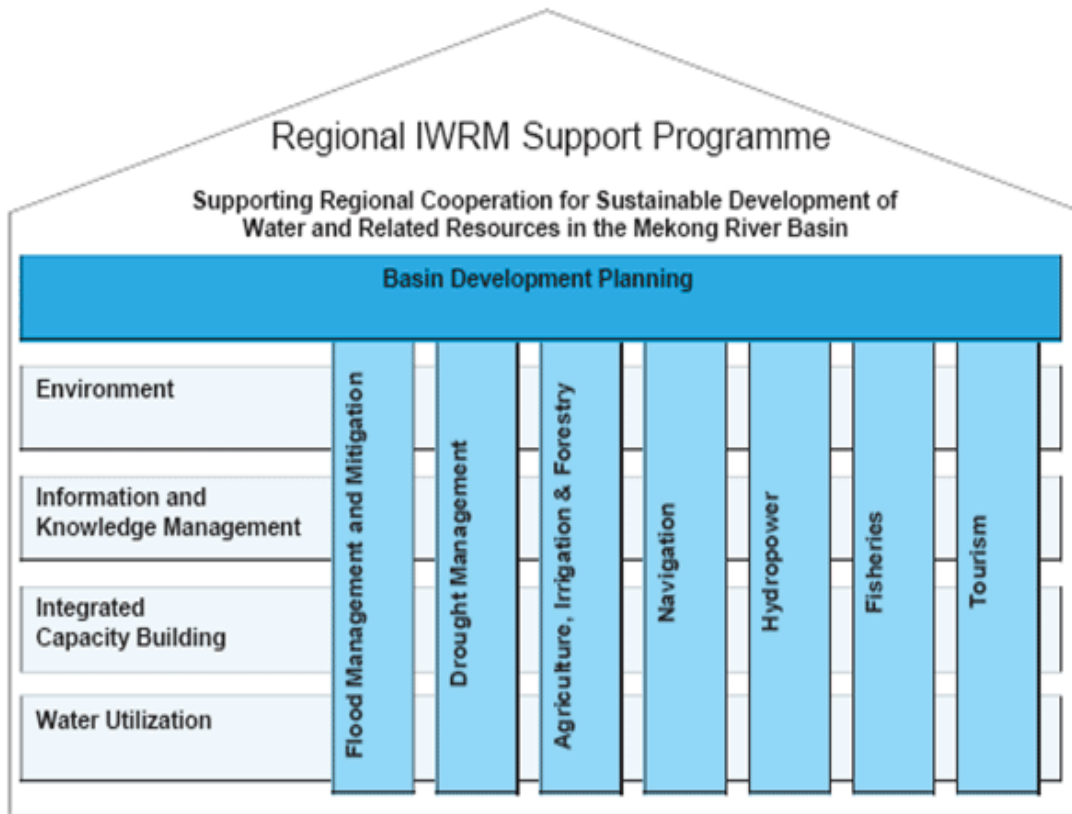


Figure 2:4: IWRM Support Programme

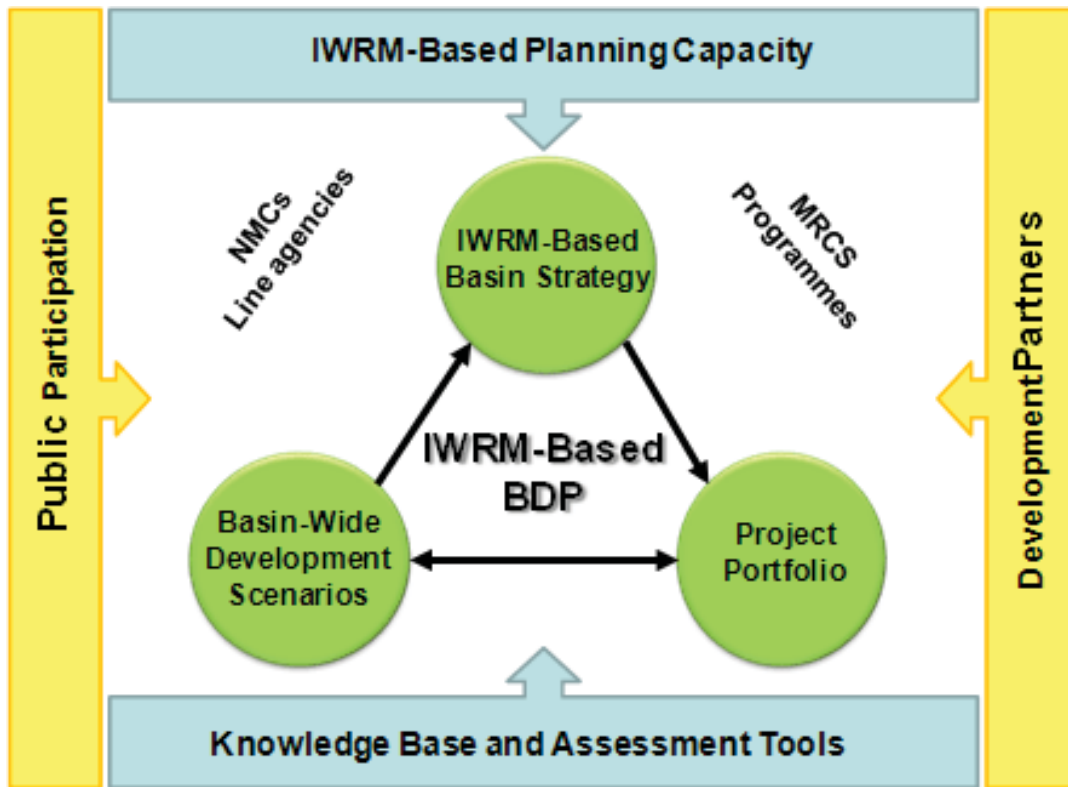


Figure 2.5: IWRM BDP Elements

The Strategic Plan identified four Key Result Areas (KRA) or “Core Business Areas”: (i) Natural Resources Planning and Development; (ii) Environmental Management and Social Considerations; (iii) Database and Information Systems; and (iv) Organization Management and Cooperation. Specific strategies and performance indicators are defined for each KRA, which drives the formulation of the MRC five-year indicative work plan and the 1999 work program. The Strategic Plan and the priority programs were extensively discussed with key stakeholders, including national line agencies. The MRC Council approved, in October, 1998, the Strategic Plan and the work plan, which were then presented at and widely supported by the Consultative Meeting after the Council meeting.

The Mekong River Commission, as mandated by the Mekong Agreement, has initiated two key program areas: formulation of the Basin Development Plan and Rules for Water Utilization. These activities contain the seeds of both conflict and cooperation, and the MRC will attempt to manage these tensions within the framework created by the Mekong Agreement. The ultimate success of the Agreement will depend primarily on the political goodwill of the governments involved. The MRC is also working towards developing a Transboundary EA procedure for the basin. In 2002, the environmental resources management unit of the Mekong River Commission (ERM) proposed a policy on transboundary EIA for the Lower Mekong Basin, based on formats of Draft North American agreements on Transboundary EIA.

2.2.4 Agricultural sector in the institutional framework of the MRC

Since 1992, the countries of the Mekong River basin—Cambodia, People’s Republic of China (PRC), Lao People’s Democratic Republic, Myanmar, Thailand, and Viet Nam—have been pursuing a program of regional cooperation to foster their sustained economic and social development under the auspices of the Greater Mekong Sub-region (GMS) Economic Cooperation Program.

2.2.4.1 *Activities in the agricultural sector of the Mekong*

a) Joint political cooperation and formulation of a strategic focus on agriculture

A Working Group on Agriculture (WGA) was initiated under The GMS' Tenth Ministerial Conference in November 2001 to serve as an advisory body to GMS Ministerial-level Conferences on agricultural issues. An Inception Workshop was held in July 2002 to define the framework and the scope for regional cooperation in agriculture.

The GMS Eleventh Ministerial Conference held in September 2002, confirmed the need to establish a working group on agriculture (WGA). The WGA reports to the Ministerial Conference and the respective governments.

The WGA received clear directions at the 2nd GMS Leaders' Summit in Kunming, PRC, on 4–5 July 2005. GMS leaders pledged to

- (i) accelerate cooperation in the agriculture sector, giving priority to improving farmers' livelihoods and ensuring food security for the poor through technical assistance;
- (ii) focus on collaboration on cross-border dimensions of agriculture; and
- (iii) Take up issues of prevention and control of animal diseases and epidemics among GMS countries. They saw the need for a strategic framework for enhancing sub-regional cooperation in agriculture, exploring new opportunities, and helping overcome constraints to growth and rural poverty reduction in the GMS.

b) Management activities and outcomes of the WGA

✓ **Formulation of WGA's Mission Statement**

"To help poverty reduction in the GMS through partnerships with rural communities to promote agricultural trade, food security, and sustainable livelihoods"

✓ **Formulation of WGA's main objective**

To provide a forum for identifying and realizing opportunities to increase GMS cooperation in the agriculture sector with the aims of:

- reducing poverty;
- promoting equitable economic growth;
- promoting sustainable use of natural resources in GMS agriculture; and
- ensuring that the benefits of other GMS initiatives reach rural communities.

✓ **Formulation of the Strategic Focus of WGA**

- Markets and market institutions
- Transfer of know-how, experiences and technology
- Public-private partnerships in the subsectors of: crops, livestock, fisheries, and forest and water resources.

✓ **Formulation of guidelines that are followed in selecting WGA initiatives which were;**

- Policy, institutional and/or technical issues that contribute to poverty reduction
- Improvements in the sustainability of agriculture
- Benefits accruing to two or more GMS countries, and
- Opportunity to address a given issue on a sub-regional basis.

✓ **Formulation of criteria for prioritizing WGA Projects which were**

- Ownership and commitment
- Potential for reducing poverty and development impact
- Value contribution to agriculture
- Markets/market development
- Capacity building: training and education
- Contribution to regional integration
- Cooperation with private sector
- Information sharing
- Relieving policy constraints
- Linkages to other GMS initiatives

- Avoiding duplication of efforts
- Contribution to sustainable development

✓ **Definition of membership and operations of the WGA management unit**

Membership of the WGA consists of senior GMS government officials from the respective Agriculture Ministries of the GMS countries. Additional representatives may be invited to attend WGA meetings, depending on the issues to be discussed. The private sector, the Consultative Group of International Agriculture Research Institutions (CGIARI), relevant United Nations institutions, other international and bilateral agencies, and civil society may be consulted in planning and implementing WGA activities. GMS countries have designated their respective focal points for WGA activities and have established national committees to coordinate national consultations on WGA issues and priorities. WGA activities are being closely coordinated with other GMS working groups and other regional and international organizations.

The WGA in principle meets at least once a year, but may meet more frequently, depending on its work program. WGA meetings provide opportunities to help:

- Identify and discuss emerging GMS agriculture issues and needs which currently include;
 - new cross-border links;
 - new policies, regulations, and incentives;
 - new capacity needs at all levels;
 - new crop choices;
 - new risks; and
 - new ways of effective engagement with smallholders
- Establish priorities for WGA activities.
- Mobilize resources to implement activities.
- Facilitate implementation of studies.

In line with the overall GMS strategy, a Strategic Framework for Sub-regional Cooperation was developed whose Agricultural goal is a GMS that is more prosperous in agriculture, more integrated in agricultural trade, and more equitable in sharing the gains of agricultural growth.

The objectives of the strategic framework in the agriculture were formulated under these auspices as:

- To accelerate and strengthen sub-regional cooperation in agriculture;
- To contribute to food security and poverty reduction in the sub-region;
- To facilitate cross-border trade and investment in agriculture;
- To facilitate the transfer and adoption of improved agricultural technologies;
- To ensure the protection of the environment and sustainable use of shared natural resources;
- To ensure surveillance and control of transboundary animal diseases to mitigate social and economic impacts and
- To develop human resources and competencies to address cross-border concerns

c) Development of the agricultural support program

In support of strategic framework objectives, the WGA

- developed a Core Agriculture Support Program for the period 2006–2010, consisting of five components
 - Facilitating Cross-border Agricultural Trade and Investment,
 - Promoting Public-private Partnerships in Sharing Agricultural Information,
 - Enhancing Capacity in Agricultural Science and Technology,
 - Establishing Emergency Response Mechanisms for Agricultural and Natural Resource Crises and
 - Strengthening Institutional Linkages and Mechanisms for Cooperation;

And

- Set up a Secretariat to coordinate activities, mobilize resources, and promote participation of development partners, private sector, and civil society,

iii. Defined the objectives, rationale and mission of the agricultural sector. These were defined as;

Safe food production, high value and high employment generated by agricultural water use. The sector features prominently under the operations division of the commission as agriculture, irrigation and forestry programme.

The goal of GMS cooperation in agriculture was to help rural communities in the GMS reduce poverty through partnerships aimed at promoting food security and increased commercial income generating opportunities in agriculture. To this effect the WGA aims to improve sub-regional cooperation in agriculture and serves as an advisory body to GMS Ministerial-level Conferences on agricultural issues.

d) Planning and developing the agricultural sector in the basin

Within the Nam Rom sub basin, the land and climate conditions are well suited for agriculture. WGA conducts studies and uses the results to plan the activities to be carried out by individual country institutions.

For instance, the basin wide present and projected land use distributions have been assessed as presented in Table 2-4. In the assessment, of the forest area, 95 percent is classified as natural forest, while the rest is plantation forest. This assessment formed the basis for the present development that focused on increasing forest cover. Ownership of the developed forests is being transferred to the residents on a pilot basis.

Other basin wide assessments revealed agriculture as the greatest consumer of water in the basin (Table 2-4, Figure 2:6)

Table 2-4: Present and projected demand of water

Sector	2000 Mm ³ /year	2010 Mm ³ /year
Domestic	2	8
Agriculture	67	88
Industry	1	5
Total	70	101

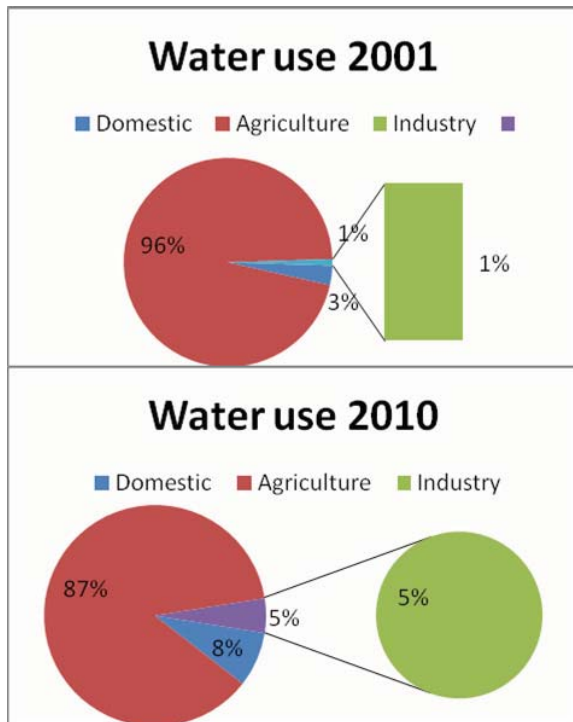


Figure 2:6 : Water use per sector

Agricultural development is carried out by individual country institutions and farmers. Land use varies according to topography. In the upper part of Nam Rom basin paddy rice production is practiced while shifting cultivation is predominant within the hill slopes (Figure 2:7 & Figure 2:8).

e) Agricultural water use and management activities in the basin

The key agricultural water use issues being addressed by the WGA include;

- Increased irrigation water use efficiency
- Land suitability / capability studies to identify the most promising areas for irrigation expansion
- Expansion and development of irrigation in priority areas
- Restoration and modernization of existing irrigation schemes
- Assessment of the feasibility of inter- and intra-basin transfer of water to priority areas
- Higher returns from irrigated and rain-fed agriculture, through improved farming practices, promotion of high quality production (rather than mass production), intensification and diversification of crop types and livestock, and support to processing, distribution and marketing.

f) Funding mechanism

Funding by some donors is directed to the core elements of the Agreement including water utilization planning, basin development planning and environmental safeguards.

2.2.4.2 Current Status

- Irrigated area in the Lower Mekong Basin (LMB) in 2002 was around 2.1 million ha in the dry season, and 5.34 million ha in the wet season.
- Irrigated agriculture is by far the largest water user – total annual withdrawals for agriculture were estimated at around 57,000 MCM, of which over 60% is extracted in the Vietnamese delta.
- Irrigated agriculture in the LMB is estimated to be worth about \$650 - \$700 million annually
- Differences in value extracted, depending on crop grown, market prices and access, labour inputs etc. Estimates vary from around \$6,200 /MCM in Mun Chi, to \$14,600/MCM in Vietnamese delta.

- Dry season withdrawals are at critical levels in NE Thailand, where water shortages occurs in some years; and in the Vietnamese Delta where large irrigation withdrawals in the dry season have resulted in intrusion of sea-water, threatening crops.
- Much of the irrigation infrastructure in the region is old, poorly maintained and inefficient.

2.2.5 Development opportunities and constraints

2.2.5.1 *Concerns and priorities*

- a. At the regional level, it is an important aim to preserve the Mekong Delta as a freshwater regime. This requires maintenance of a certain minimum flow, estimated at 2 l/s/km² (for the entire Mekong Basin)
- b. Other important regional considerations are being addressed via the MRC Programmes: BDP, EP, WUP, etc.
- c. Imminent, general concerns comprise droughts; ordinary low flows; and floods. These effects can be enhanced by global warming, and/or El Niño events, and/or other meso-scale climate fluctuations
- d. Both raw water and agricultural lands are finite, and development should aim at quality and value, as much as quantity. Water allocation should be managed with a view to the value generated by the raw water, within different sectors, and in terms of selection of crops, particularly secondary crops.
- e. There is an urgent scope for (i) forest protection in general; and (ii) protection (against erosion) of headwater areas of reservoirs in particular.
- f. Due consideration should be given to preservation of the groundwater quality, considering the long time required for natural restoration (if once polluted), and the scope for future utilisation for domestic and industrial supplies, as well as for irrigation

2.2.5.2 *Opportunities*

- There is a scope for rehabilitation of existing irrigation structures and networks, and for efficiency improvement (by structural as well as non-structural) means
- There may (possibly) be a scope for review and further adjustments of the cost recovery schemes that have already been implemented in relation to the irrigation services
- There is a scope for development of new multi-purpose reservoirs, and for multi-purpose operation of existing reservoirs
- There is a scope for strengthened monitoring, including monitoring of morphological cause effect relationships
 - Except in the Vietnamese Delta and more mountainous parts of Lao PDR, land suitable for irrigation is not limiting
 - Access to markets is limiting for development in many areas, as well as access to land and water.
 - Construction of both Chinese and LMB dams will result in significantly increased dry season flow, presenting opportunities of increased irrigation.
 - Without offsetting storage, extraction and diversion of water for irrigation development results in a significant decrease in dry season flows and a concomitant increase in the area affected by salinity intrusion
- Major development of irrigation will thus require construction of regulatory storages; but due to very seasonal nature of rainfall, even construction of very large storages will not completely remove risk of water shortages.

- Use of groundwater for irrigation is not highly developed except in Central Highlands of Viet Nam. The groundwater resource is not well studied – there may be significant opportunities for conjunctive use to relieve pressure on surface water supplies in critical periods in some areas. However, groundwater irrigation potential in the Korat Plateau is limited due to salinity and low supplies.

2.2.5.3 Constraints and challenges of the MRC

The Mekong River, which provides livelihoods for a significant majority of the basin's 65 million people, is often taken as a symbol of the Greater Mekong Sub-region's transboundary environmental challenges. There are other major international rivers in the sub-region, e.g., the Red River (People's Republic of China–Viet Nam), and the Irrawaddy River (PRC-Myanmar) with decisions made at many scales of management in many places.

In recent years, a deteriorating environment in the Mekong River basin has led to a greater awareness. Though the transboundary environmental challenges of the Mekong are complex, all the six riparian countries of the sub-region are eager to boost their development by using the Mekong River basin's water and related natural resources effectively. This they desire though they have competing and different perspectives. The MRC has limited authority with member states holding on to individual decision making. There is limited trust among member states with key upstream riparian countries not being members of MRC.



Figure 2:7: Paddy cultivation in the upper part of Nam Rom Basin



Figure 2:8: Shifting cultivation in the upper part of Nam Rom Basin

2.3 Indus Water Treaty

2.3.1 About the Indus Basin

The Indus River is one of the world's great rivers that rise from Mansarovar at an elevation of about 5182 m in the Tibetan plateau of the Himalayas. It flows firstly north westwards and then turns southwards to flow throughout the whole of Pakistan over a distance of about 2880 km to its outfall into the Arabian sea via the Indus Delta, east of Karachi (Figure2:9). The Indus basin extends over an area of 11,650,500 sq. km across the countries of Tibet (China), India, Pakistan and Afghanistan.

It is bounded on the north by the Karakoram and Haramosh ranges, on the east by the Himalayas, on the west by the Sulaiman and Kirthar ranges and on the south by the Arabian Sea. The upper part of the basin lying in Jammu and Kashmir and Himachal Pradesh is mostly mountain ranges with narrow valleys. In Punjab, Haryana and Rajasthan the basin consists of vast plains which are the fertile granary of the country of India and Pakistan.

Snowmelt from seven glaciers feed the Indus providing 80 to 90 percent of its capacity. It is the primary source of water for Pakistan with the Indus Delta covering an area of 5,000 km², of which 2,000 km² is protected. The Indus Delta is the sixth largest delta in the world and supports a population of over 130,000 people, whose livelihoods are directly or indirectly dependent on the Indus River.

In India, its principal tributaries are the Sutlej, the Beas, the Ravi, the Chenab and the Jhelum. The drainage area lying in India is 321289 sq. km. which is nearly 9.8% of the total geographical area of the country. The length of the river in India is 1114 km. The principal soil types found in the Indian part of the basin are submontane, brown hill and alluvial soils with a cultivable area of about 9.6 M.ha equivalent to 4.9% of the total cultivable area of the Indian country.

2.3.2 Status of the Indus Water Treaty

The water resource development in the Indus basin is governed by various provision of the Indus Water Treaty of 1960. According to this Treaty, the water of the Eastern Rivers, namely, the Ravi, the Beas and the Sutlej, shall be available for the unrestricted use by India. India has also been permitted to make from the Western Rivers, domestic non-consumptive uses, uses for run-of-the river hydroelectric plants and specified agricultural use and construction of storage works. Pakistan received use of the waters of the Indus River and its Western tributaries, the Jhelum and Chenab rivers.

No permanent joint institution was set-up for the administration of the treaty but there are provisions and modalities for regular consultations and monitoring of the compliance with the treaty. Under the Indus Waters Treaty 1960, India and Pakistan have created two permanent posts of Commissioner for Indus Waters, one each in India and Pakistan, who are the representatives of the respective Governments for all matters arising out of the treaty and serve as the regular channel of communication with regard to implementation of the Treaty. The two Commissioners together form the Permanent Indus Commission, which holds periodical meetings, and also undertake tours of inspection to projects/ works in India and Pakistan..

2.3.3 Country institutional structures and their functions in managing agriculture

2.3.3.1 India

In India, the Central Water Commission (CWC), an apex organization in the country in the field of Water Resources has the mandate to;

- undertake necessary surveys and investigations as and when required,

- prepare designs and schemes for the development of river valleys in respect of power generation, irrigation by gravity flow or lift, flood management, environmental management, rehabilitation and resettlement, soil conservation, anti-water logging measures, reclamation of alkaline and saline soils, drainage and drinking water supply;
- undertake construction work of any river valley development scheme on behalf of the Government of India or State Government concerned;
- advise and assist, when so required, the State Governments (Commissions, Corporations or Boards that are set up) in the investigation, surveys and preparation of river valley and power development schemes for particular areas and regions;
- advise the Government of India in respect of Water Resources Development, regarding rights and disputes between different States which affect any scheme for the conservation and utilization and any matter that may be referred to the Commission in connection with river valley development;
- advise the Government of India and the concerned State Governments on the basin-wide development of water resources;
- advise the Government of India on all matters relating to the Inter-State water disputes

The Central Water Commission (CWC) is headed by a **Chairman**, with the status of Ex-Officio Secretary to the Government of India. The work of the Commission is divided among 3 wings namely, **Designs and Research Wing (D&R)**, **River Management Wing (RM)** and **Water Planning and Projects Wing (WP&P)**. The Organizations responsible for irrigation is governed under the WP&P Wing (Figure 2:10 and Figure 2:11).

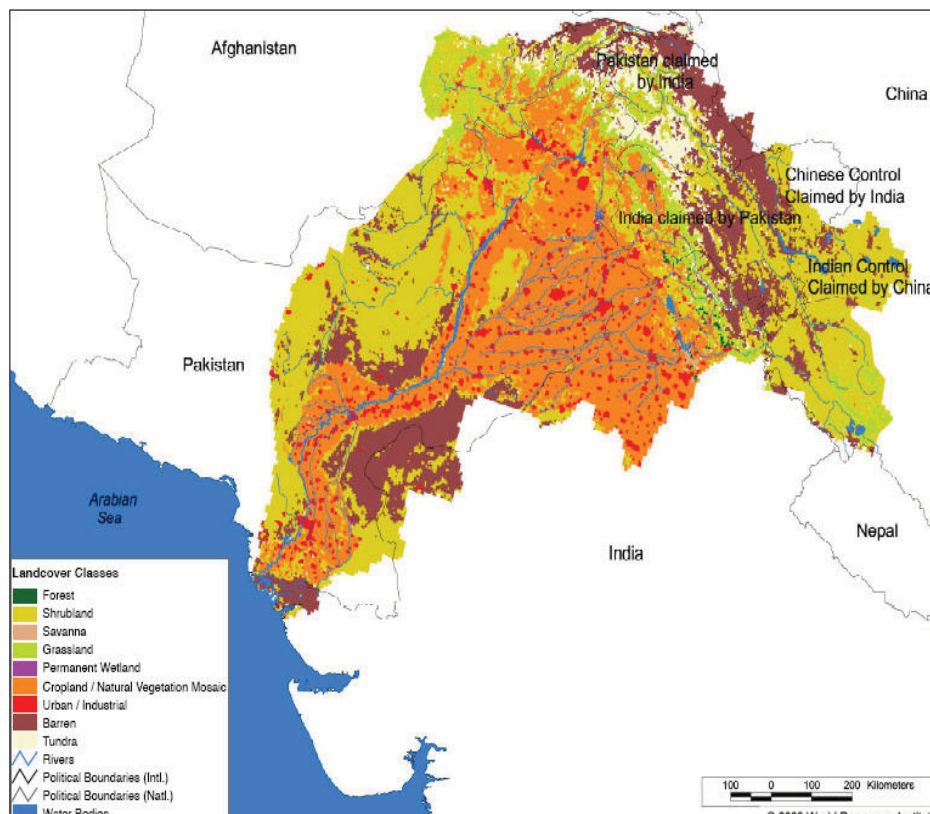


Figure 2:9: Indus catchment area

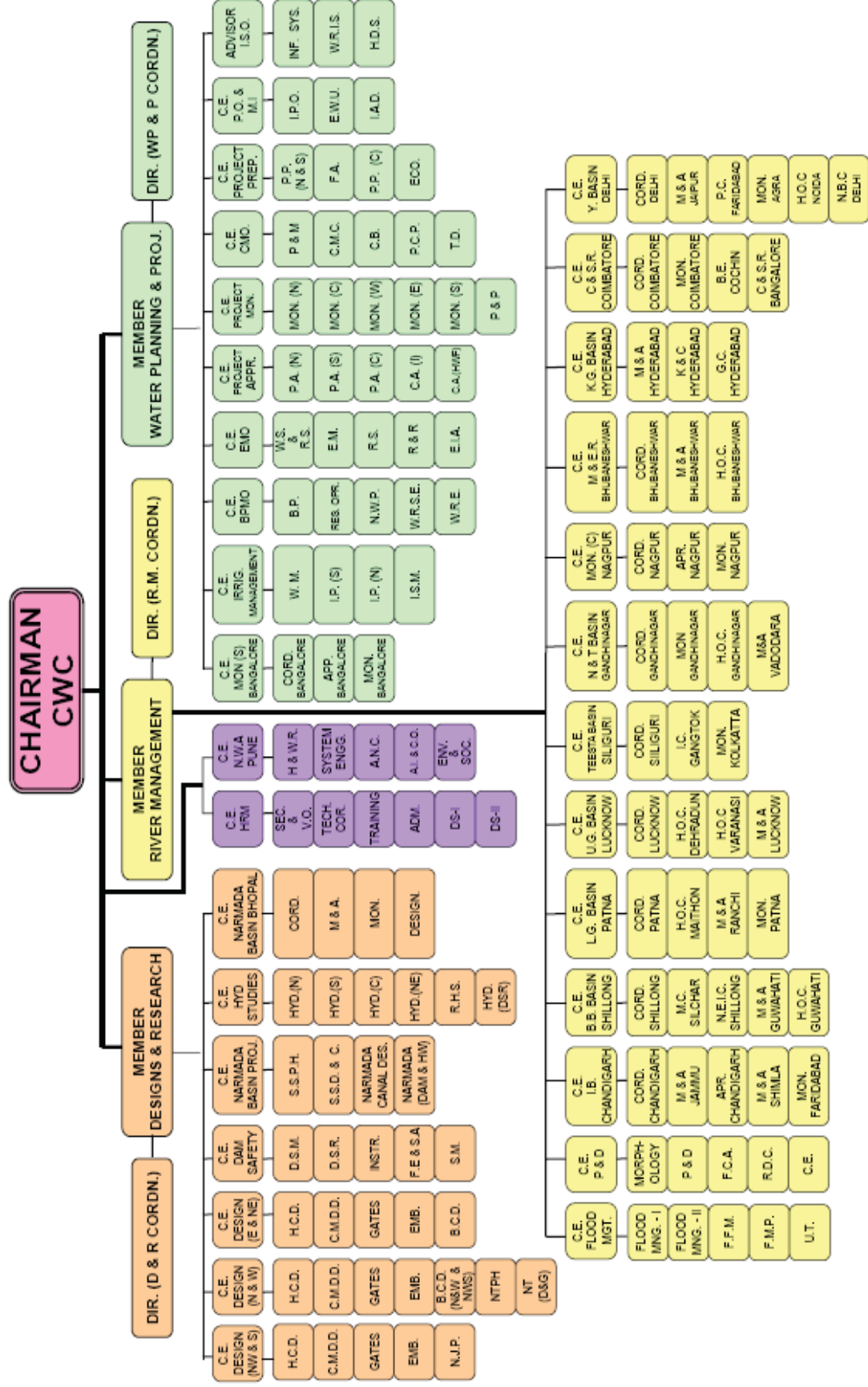


Figure 2:10: The organ-gram of The Central Water Commission

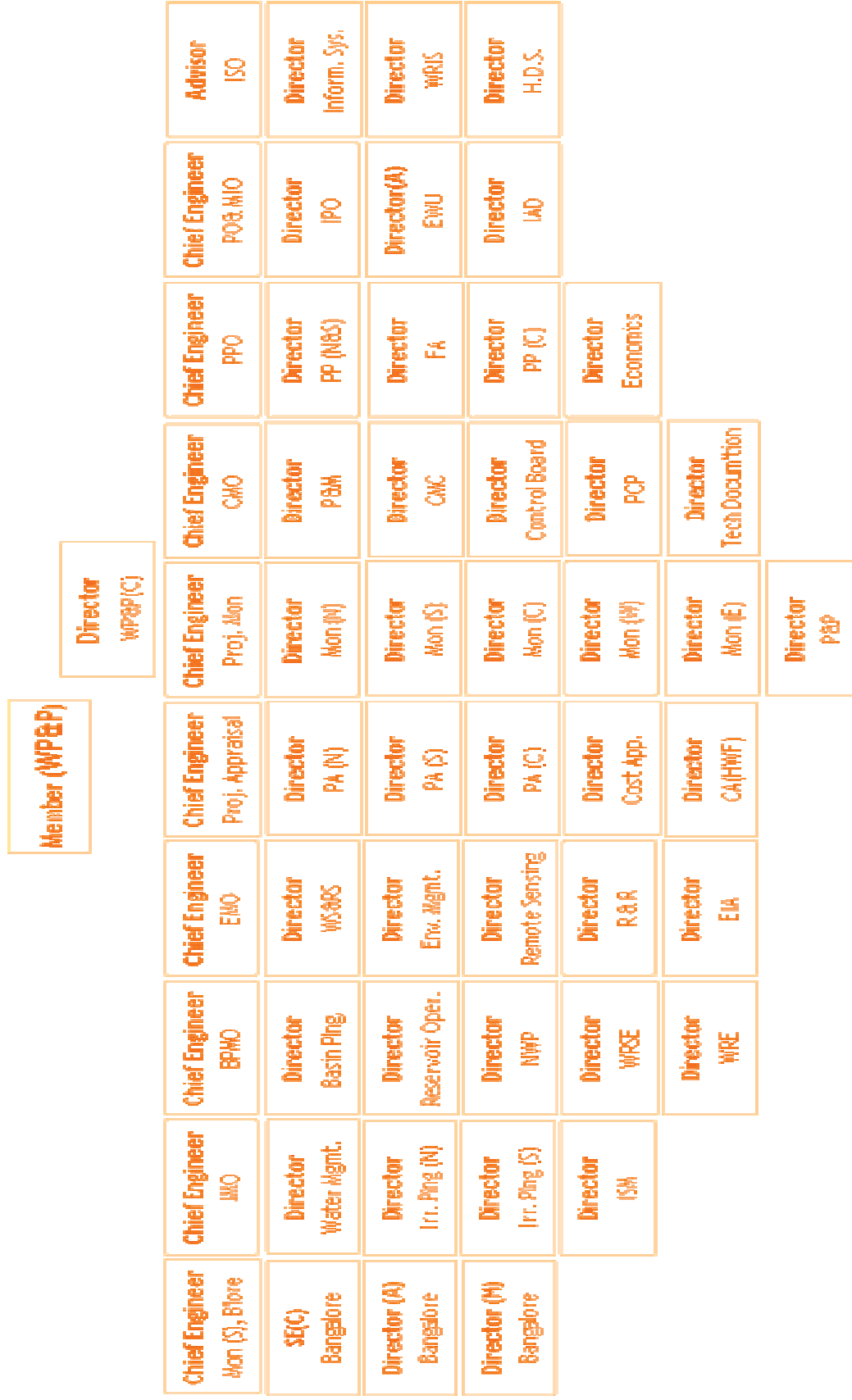


Figure 2.11: The WP&P Wing

The major institutions that govern the water sector at the federal level in both countries are; (i) Ministry of Water and Power, (ii) Department of Chief Engineering Adviser (CEA), (iii) Indus River System Authority (IRSA), (iv) Pakistan Commissioner for Indus Water (PCIW), (v) Federal Flood Commission (FFC), (vi) Water And Power Development Authority (WAPDA), and (vii) Pakistan Meteorological Department (PMD).

At the Provincial level in each country, the basin is managed through; the Provincial Irrigation Departments (PIDS), the Provincial Agriculture Departments (PADS) and the Provincial Environmental Agencies (PEA).

2.3.3.2 *Pakistan*

Farming is Pakistan's largest economic activity. In 1993, agriculture, and small-scale forestry and fishing, contributed 25 percent of GDP and employed 48 percent of the labour force. Although there is agricultural activity in all areas of Pakistan, most crops are grown in the Indus River plain in Punjab and Sindh. Since independence, the amount of cultivated land has increased by more than one-third. This expansion is largely the result of improvements in the irrigation system that makes water available to additional plots.

The scant rainfall over most of the country makes about 80 percent of cropping dependent on irrigation. Fewer than 4 million hectares of land, largely in northern Punjab and the North-West Frontier Province, are totally dependent on rainfall. An additional 2 million hectares of land are under non irrigated cropping, such as plantings on floodplains as the water recedes. Non irrigated farming generally gives low yields, and although the technology exists to boost production substantially, it is expensive to use and not always readily available.

a) Planning and development

After the treaty was signed, Pakistan began an extensive and rapid irrigation construction program, partly financed by the Indus Basin Development Fund of US\$800 million contributed by various nations, including the United States, and administered by the World Bank. Several immense link canals were built to transfer water from western rivers to eastern Punjab to replace flows in eastern tributaries that India began to divert in accordance with the terms of the treaty. The Mangla Dam, on the Jhelum River, was completed in 1967. The dam provided the first significant water storage for the Indus irrigation system. The dam also contributes to flood control, to regulation of flows for some of the link canals, and to the country's energy supply. At the same time, additional construction was undertaken on barrages and canals.

A second phase of irrigation expansion began in 1968, when a US\$1.2 billion fund, also administered by the World Bank, was established. The key to this phase was the Tarbela Dam on the Indus River, which is the world's largest earth-filled dam. The dam, completed in the 1970s, reduced the destruction of periodic floods and in 1994 was a major hydroelectric generating source. Most important for agriculture, the dam increases water availability, particularly during low water, which usually comes at critical growing periods.

Despite massive expansion in the irrigation system, many problems remain. The Indus irrigation system was designed to fit the availability of water in the rivers, to supply the largest area with minimum water needs, and to achieve these objectives at low operating costs with limited technical staff. This system design has resulted in low yields and low cropping intensity in the Indus River plain, averaging about one crop a year, whereas the climate and soils could reasonably permit an average of almost 1.5 crops a year if a more sophisticated irrigation network were in place. The urgent need in the 1960s and 1970s to increase

crop production for domestic and export markets led to water flows well above designed capacities. Completion of the Mangla and Tarbela reservoirs, as well as improvements in other parts of the system, made larger water flows possible. In addition, the government began installing public tube wells that usually discharge into upper levels of the system to add to the available water. The higher water flows in parts of the system considerably exceed design capacities, creating stresses and risks of breaches. Nonetheless, many farmers, particularly those with smallholdings and those toward the end of watercourses, suffer because the supply of water is unreliable.

Water management is based largely on objectives and operational procedures dating back many decades and is often inflexible and unresponsive to current needs for greater water use efficiency and high crop yields. Charges for water use do not meet operational and maintenance costs, even though rates more than doubled in the 1970s and were again increased in the 1980s. Partly because of its low cost, water is often wasted by farmers.

Good water management is not practiced by government officials, who often assume that investments in physical aspects of the system will automatically yield higher crop production. Government management of the system does not extend beyond the main distribution channels. After passing through these channels, water is directed onto the fields of individual farmers whose water rights are based on long-established social and legal codes. Groups of farmers voluntarily manage the watercourses between main distribution channels and their fields. In effect, the efficiency and effectiveness of water management relies on the way farmers use the system.

The exact amounts of water wasted have not been determined, but studies suggest that losses are considerable and perhaps amount to one-half of the water entering the system. Part of the wasted water could be lost through seepages in the delivery system. Even greater amounts are probably lost because farmers use water whenever their turn comes even if the water application is detrimental to their crops. The attitude among almost all farmers is that they should use water when available because it may not be available at the next scheduled turn. Moreover, farmers have little understanding of the most productive applications of water during crop-growing cycles because of the lack of research and extension services. As a result, improvements in the irrigation system have not raised yields and output as expected. Some experts believe that drastic changes are needed in government policies and the legal and institutional framework of water management if water use is to improve and that effective changes can result in very large gains in agricultural output.

b) Drainage

The continuous expansion of the irrigation system over the past century significantly altered the hydrological balance of the Indus River basin. Seepage from the system and percolation from irrigated fields caused the water table to rise, reaching crisis conditions for a substantial area. Around 1900 the water table was usually more than sixteen meters below the surface of the Indus Plain. A 1981 survey found the water table to be within about three meters of the surface in more than one-half of the cropped area in Sindh and more than one-third of the area in Punjab. In some locations, the water table is much closer to the surface. Cropping is seriously affected over a wide area by poor drainage, water logging and by accumulated salts in the soil.

c) Farm ownership and land reform issues and activities

At independence Pakistan was a country with a great many small-scale farms and a small number of very large estates. Distribution of landownership was badly skewed. Less than 1 percent of the farms consisted of more than 25 percent of the total agricultural land. Many owners of large holdings were absentee landlords, contributing little to production but extracting as much as possible from the sharecroppers

who farmed the land. At the other extreme, about 65 percent of the farmers held some 15 percent of the farmland in holdings of about two hectares or less. Approximately 50 percent of the farmland was cultivated by tenants, including sharecroppers, most of whom had little security and few rights. An additional large number of landless rural inhabitants worked as agricultural labourers. Farm labourers and many tenants were extremely poor, uneducated, and undernourished, in sharp contrast to the wealth, status, and political power of the landlord elite.

Land reforms remain a controversial and complex issue. Large landowners retain their power over small farmers and tenants, especially in the interior of Sindh, which has a feudal agricultural establishment. Tenancy continues on a large-scale: one-third of Pakistan's farmers are tenant farmers, including almost one-half of the farmers in Sindh. Tenant farmers typically give almost 50 percent of what they produce to landlords. Fragmented holdings remain a substantial and widespread problem. Studies indicate that larger farms are usually less productive per hectare or unit of water than smaller ones.

d) Cropping production activities

In the early 1990s, most crops were grown for food. Wheat is by far the most important crop in Pakistan and is the staple food for the majority of the population. Between 1961 and 1990, the area under wheat cultivation increased nearly 70 percent, while yields increased 221 percent.

Rice is the other major food grain. Rice yields also have increased sharply since the 1960s following the introduction of new varieties. Nonetheless, the yield per hectare of around 1.5 tons is low compared with many other Asian countries. Pakistan has emphasized the production of rice in order to increase exports to the Middle East and therefore concentrates on the high-quality basmati variety, although other grades are also exported. The government increased procurement prices of basmati rice disproportionately to encourage exports and has allowed private traders into the rice export business alongside the public-sector Rice Export Corporation.

Other important food grains are millet, sorghum, corn, and barley. Corn, although a minor crop, gradually increased in area and production after independence, partly at the expense of other minor food grains. Chickpeas, called *gram* in Pakistan, are the main non grain food crop in area and production. A number of other foods, including fruits and vegetables, are also grown.

In the early 1990s, cotton was the most important commercial crop. Yields increased substantially in the 1980s, partly as a result of the use of pesticides and the introduction in 1985 of a new high-yielding variety of seed. During the 1980s, cotton yields moved from well below the world average to above the world average. Outputs are normally affected by floods and insect infestations. Other cash crops include tobacco, rapeseed, and sugarcane.

The critical challenges facing agriculture and agricultural water in Pakistan include:

- Increase in demand of water for food, fibre and hydropower
- Reduction in water availability due to sedimentation in the Existing reservoirs
- Inefficient use and inequitable distribution of water
- Deteriorating water quality
- Environmental degradation of irrigated lands
- Safe disposal of saline drainage effluent to the sea
- Mining of ground water
- Lack of integrated water resource development and management
- Inadequate stakeholder participation

- Low private sector investment in the sector

2.3.4 Agriculture and Agriculture Water Issues

This is the sixth largest river of the world whose agriculture-centred civilization belongs to the fifth millennium BC, only second to that of Euphrates/Tigris of 7th millennium, but older than Nile's of 4th millennium, or that of Huang Ho (Yellow river) of 2nd millennium. In terms of water carried, the Indus flow is three times Nile's, ten times Colorado's and equal to Columbia's.

In the early 1990s, irrigation from the Indus River and its tributaries constituted the world's largest contiguous irrigation system, capable of watering over 16 million hectares. The system includes three major storage reservoirs and numerous barrages, head works, canals, and distribution channels. The total length of the canal system exceeds 58,000 kilometres; there is an additional 1.6 million kilometres of farm and field ditches. The Salient features of irrigation network include:

- 3 major storage reservoirs (existing live storage 11.74 million cubic meters)
- 19 barrages
- 12 Inter-river link canals
- 45 Independent irrigation canal commands (Figure 2:12)
- 84 small dams

Thus, the Indus River irrigation system forms the world's largest integrated irrigation scheme.



Figure 2:12: Irrigation canal in the Indus Basin

2.3.5 Constraints and challenges of the Indus treaty

The expanding population, which is growing at a rate 3%, and the extremely low rainfall, has meant that most areas in Pakistan cannot grow rain-fed crops. With a growing population, the supply of irrigation water for food production is a top political priority, as is water for industrial and domestic use. There is a need to develop a formal management strategy of the Indus River System. Currently management strategies for efficient and sustainable utilisation of the Indus water are not in place.

2.4 The Organisation for the Development of the Senegal River (OMVS)

2.4.1 The Basin

Senegal River (SR) is the second longest river in West Africa at 1,800 km (Figure 2:13) long providing a lifeline to 300 Sq km area of the Sahel through its 450 sq. km basin area shared by the four nations of Guinea (11%), Mali (53%), Mauritania (26%) and Senegal (10%) and serving a population estimated at 3.5 million people, 85% of whom live near the river.

The river rises from the rainy uplands of Fouta Djallon plateau of Guinea and is then conveyed northwest through Mali and from there through increasingly arid lowlands in the west forming the border between Mauritania in the north and Senegal in the south flowing onwards towards the mouth of the river on the Atlantic Ocean. The border between Senegal and Mauritania lies on the right (northern) bank, meaning that the river belongs to Senegal but Mauritania has permission to use the river.



Figure 2:13: Senegal River Basin

Table 2-5: Senegal Spatial Basin Area

Country	Total area of the country (km ²)	Area of the country within the basin (km ²)	As % Of total area of basin (%)	As % of total area of country (%)	Average annual rainfall in the basin area (mm)		
					min.	max.	mean
Guinea	245,857	29,475	6.1	12.0	1120	2100	1475
Mali	1,240,190	139,098	28.8	11.2	455	1410	855
Mauritania	1,025,520	242,742	50.2	23.7	55	600	270
Senegal	196,720	71,866	14.9	36.5	270	1340	520
For Senegal basin		483,181	100.0		55	2100	550

In the upper basin, SR is formed by three main tributaries: Bafing (contributing about 50% of the river flow), Bakoye and Falame. The Falame and Bafing rivers rise in the sandstones of the Fouta Djallon plateau in Guinea, while the Bakoye rises in western Mali. The Bafing and Bakoye meet at Bafoulabe in Mali to form the Senegal. The stream is then joined by the Falame, near Bakel in Senegal. From Bakel (800 km from its mouth) the river meanders in the low lands where it forms a huge and fertile floodplain.

The basin has three distinct parts: the upper basin, which is mountainous, the valley, and the delta, which is a source of biological diversity and wetlands. Topographical, hydrographical and climatic conditions are very different in these three regions and seasonal temperature variations are extensive. The Bafing and Falame sources receive about 2,000 millimetres of rainfall annually, mostly from late March to early November; the Bakoye basin receives less. The Senegal River Valley proper receives 250 to 750 millimetres of rain annually, from late May to mid October, with mean maximum temperatures of about 41° C in April, and mean minimum temperatures of about 17°C in January. The Rain diminishes downstream. Each year, toward the end of the rainy season (August to October), the floodplain is inundated by the floodwater of the Senegal River covering up to 500,000 ha during years of high rainfall.

2.4.2 Status of the Organisation

The Organization for the Development of the Senegal River (Organisation pour la Mise en Valeur du Fleuve Sénégal) (OMVS), established on 11 March 1972, groups the three riparian countries of the river i.e. Mali, Mauritania, and Senegal. It provided the impetus for the building of two dams, Manantali and Diama that have partly regulated the river since 1988 and made the OMVS, the only RBO in Africa, with its own major revenue generation capability. Guinea joined the organisation in 2005. All the four countries are former French colonies who gained their independence in the early 1960s.

The first institutions to develop the Senegal River valley were created during the colonial period. In 1963, shortly after independence, Guinea, Mali, Mauritania and Senegal signed the Bamako Convention for the Development of the Senegal River Basin, that declared the Senegal River to be an 'International River' and created an 'Interstate Committee' to oversee its development. In 1968, the Labé Convention created the Organization of Boundary States of the Senegal River (OERS, Organisation des Etats Riverains du Sénégal) to replace the Interstate Committee, broadening the field of sub regional cooperation.

As drought conditions in the area worsened in the early 70s, Mali, Senegal and Mauritania formed the *Organization for the Development of the Senegal River (OMVS)*. The *OMVS* was created to increase food production and secure food and water for the peoples of the Senegal River basin.

The objectives of the OMVS are:

- i. Promotion of inter-country co-operation
- ii. Co-ordination of technical, economic studies and other activities related to the Senegal river development such as navigation, irrigation, hydropower generation, environmental protection and conservation, etc
- iii. Regulation of river flow for irrigation, flood control, power generation and other purposes.

The history of cooperation among the countries concerning the Senegal River best characterizes basin management. The Senegal River Basin provides the seemingly rare example of countries working together to negotiate an optimal outcome for all involved. The convention that established the OMVS declared the joint infrastructure investments as common properties of the OMVS member states. Senegal River is therefore regarded as a model through its innovative thinking and experiments.

- The OMVS model has inspired many efforts towards transboundary cooperation on Water (SADC Water Protocol; NBI; etc...);
- MVS hosts the Secretariat of the African Network of Basin Organisations
- The OMVS is reputed for the adoption of the first ever River Basin Water Charter in Sub Saharan Africa
- The basin has established a unique Observatory of the Environment;
- It provided a model on thinking on ecosystem water needs and on ways of responding to such needs while pursuing development objectives through testing the artificial flood releases from the dams.

Three fundamental conventions define the juridical and institutional framework for cooperation between the Senegal riparian countries. The convention of March 11, 1972 established the OMVS and defined the status of the river, while that of December 21st 1978, established the status of the shared infrastructure. The convention of May, 12th 1982 on the other refined this agreement by defining modalities for financing the infrastructure. In May 2002, the Senegal River Water Charter was signed and this established the legal and regulatory framework for governing the status of the river's water. The conventions and the charter clearly state that the river water must be allocated to the various use sectors. The resource is therefore not allocated to riparian states in terms of volumes of water to be withdrawn, but rather to uses as a function of possibilities. The charter stipulates that all water distribution must be made on the basis of resource availability, regional cooperation and integrated water resource management. The various uses can be for agriculture, inland fishing, livestock, fish farming, tree farming, fauna and flora, hydroelectric energy production, urban and rural drinking water supply, health, industry, navigation and the environment.

2.4.3 Institutional Structure and functions

The highest authority is the Conference of Heads of State and Government which determines the general policies of development and cooperation. The Council of Ministers is the legal representative of the OMVS and determines the general management policy of the river, the development of its resources and interstate cooperation and the financial contributions of the member states. It also approves the budget and Rules of Procedure of the High Commissioner. The Office of the High Commissioner is the

executive organ of the OMVS and consists of four departments of Administration and Accounting, Foreign Relations, Technical Matters and the Regional Documentation Centre under a Secretariat.

The OMVS has established three consultative bodies: The Permanent Water Commission, the Advisory Committee, and the Regional Planning Committee.

The Permanent Water Commission is the consultative body of the Council of Ministers and consists of representatives of the member states. Its main task is the definition of the water allocation among the member states and sectors, namely: industry, agriculture, and transport. The Advisory Committee is the consultative body of the OMVS and is composed of representatives from governments, financial institutions and the OMVS. The Regional Planning Committee advises the OMVS whether the available water resources can meet the regional development plans of the member states. The member states have established National Offices that are represented in the Advisory Committee of the OMVS. They assist the organization in implementing its projects and coordinating its activities in the member states.

2.4.4 Agriculture and Agricultural water situation in the OMVS

One of the two conventions signed by the contracting parties addressed specifically rational management of natural resources in the basin. This encompassed environmental protection, conservation and water quality management as well as agricultural and industrial activities in the basin. The convention provided a good legal foundation for the development of agriculture in the basin.

Water management is the driving force behind the productivity of the ecosystems of the Senegal River Estuary and floodplains. It is dependent on human decision-making, but has been separated from the River's flooding since the building of the Diama Dam. The current objectives of OMVS is mainly turned towards the development of irrigated agriculture on the former floodplains and since 2002 the production of hydroelectric power at Manantali.

2.4.4.1 Agricultural development and activities in the basin

The first major attempts to control the Senegal River discharge were made in the 1940s in order to grow rice in the delta. But it was not until 1973 that the State Company for Agricultural Development (SAED, Société d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal) decided to increase this activity by building dikes around 10,000 hectares of flood land and created, in 1975, an irrigated area of 650 hectares.

Thereafter, small irrigated areas were rapidly created as a means to combat the drought cycles in the 1970s that made it almost impossible to grow rainfed and flood recession crops. On the left bank, the surface area of community-based irrigated fields grew from 20 hectares in 1974 to 7,335 hectares in 1983 and 12,978 hectares in 1986. Irrigated agriculture rapidly expanded after the new dams were filled (between 1986 and 1988).

2.4.4.2 Agricultural sectoral objectives and activities

The OMVS's agricultural sectoral objective was to improve food supply for Senegal, Mauritania and Mali by creating 375 000 ha (hectares) of irrigated land: 240 000 ha in Senegal, 126 000 ha in Mauritania and 9000 ha in Mali. The annual yield of these hydro-agricultural schemes was forecast to be 12 tonnes per hectare, in addition to a farming-sector growth rate of 10% per annum.

a) Joint irrigation planning and development

Irrigated agriculture rapidly expanded immediately after the two new dams (Diama and Manantali) were filled (between 1986 and 1988). Today, irrigation is the motor of development in the basin, notably in the valley and in the delta, due not only to improved technology, but also to the wider variety of produce grown (rice, onions, tomatoes, potatoes, sweet potatoes). About 100,000 hectares of land are now cultivated in the basin: 60,000 hectares during the rainy season (June-September) and 20,000 during the dry season (March-June).

Rice is grown in the flood plains of the Senegal, Saloum, and Casamance rivers, but is mainly produced along the Senegal River Valley where irrigation water is readily available (Figure 2:14). It is estimated that approximately 45 percent of the harvested rice area in Senegal is irrigated from recessional floods along the river banks (Figure 2:15), and another 45 percent is irrigated by controlled flooding.

Rice in Senegal is typically planted from June to July and harvested from November to January to take advantage of Senegal’s rainy season that falls in June-October. It is cultivated mainly on small landholdings with limited large-scale production. There is however large scale production of rice and sugarcane at the Richard Toll irrigation scheme located near the Senegal River delta.

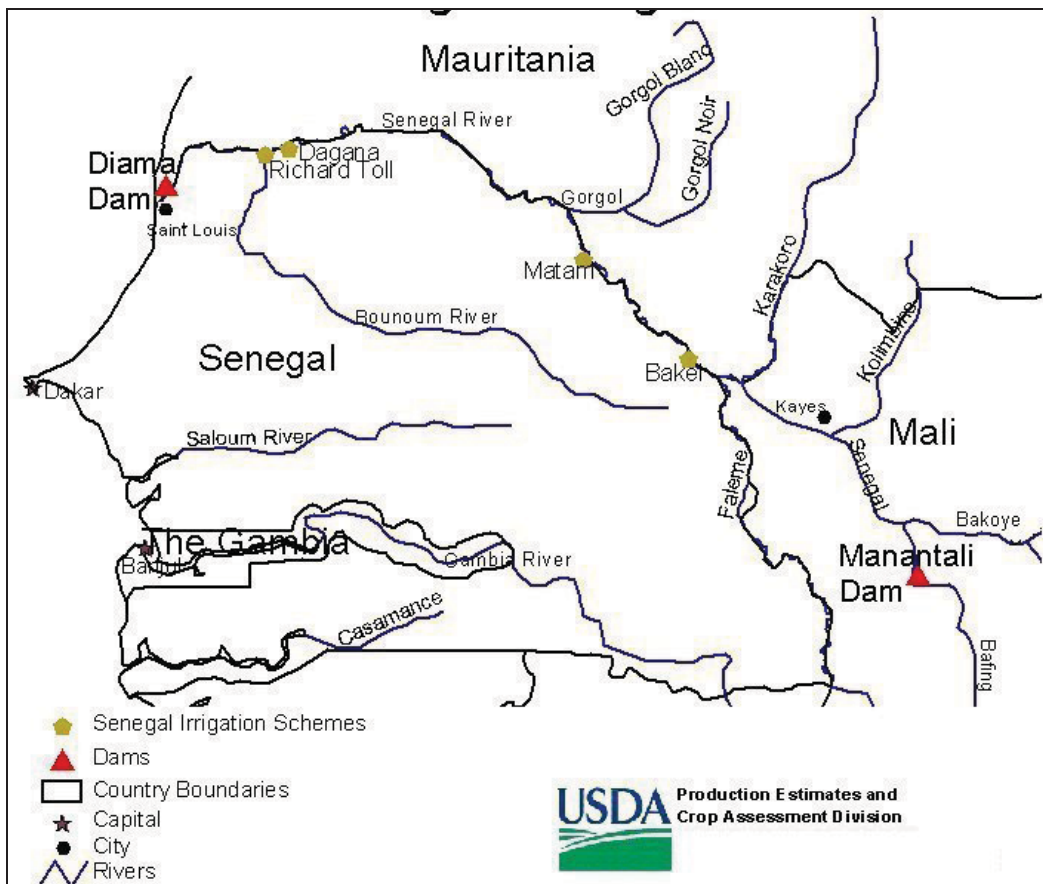


Figure 2:14: Major Irrigation Schemes on Senegal River

b) Traditional husbandry activities in the basin

Livestock husbandry has also always been a major economic activity in the basin. Due to the existence of rather high-potential pasture land, combined with the carrying capacity of the grasslands and the flood

plains, the riparian populations, and even those living elsewhere, practice transhumance and extensive cattle, sheep and goat raising.

c) Assessment and management of the fishing sector

Fishing, in terms of the income of the work force that it employs, is undoubtedly the largest economic activity in the basin after agriculture, notably for populations living near the river in the valley and the delta. Today, however, the future of this sector is in question because for several years now there has been a steady drop in the tonnage caught throughout the OMVS region (i.e. the basin area shared by Mali, Mauritania and Senegal). Some observers link this to the river development projects (dams, dikes) and to their impact on the environment (significant decrease in salinity, proliferation of floating water weeds, eutrophication etc.). A recent OMVS study of fish resources indicates, however, that while it is true that some old species have disappeared, new fish species have appeared. It would even seem that the invasive aquatic plants are breeding grounds, which at the same time does not prevent them from seriously hindering the mobility of fishermen.

2.4.5 Constraints and Challenges of the OMVS

Productive and environmental constraints: So far Irrigated agriculture has covered only 125 000 ha of land with yields plummeting to an average of 4 t per hectare after three years' cultivation due to seawater intrusion caused by

- Alteration of flow regime which disorganized the traditional waalo production systems
- Altered ecology of the floodplain, with negative impacts on the flora (case of the *Acacia nilotica*) and fauna (case of fisheries)
- Double flood peaks which damaged recession agricultural activities

The situation was compromised further with the phasing out of direct subsidies and indirect incentives which impacted negatively by reducing the rate of expansion of irrigated land. As a result, the proportion of land cultivated to that which is fallow decreased on both banks in the early years of inception. The absence of drainage systems on much of the deltaic lands caused them to be waterlogged increasing salinity after only a few years of irrigation.

These constraints were addressed by managing flood releases from Manantali to allow for traditional recession agriculture in the floodplains to continue especially in the years of important natural floods. This compensatory measure attenuated the negative impacts of the dams on the quality of life of the traditional floodplain users. Problems however persist during double peaked floods that wash away the first recession plantings.

The artificial releases were expected to be rapidly phased out as irrigation replaced traditional uses but this has been reviewed following increased understanding - within the donor community and OMVS - of the economic, social and environmental benefits of the artificial floods. Changing agricultural traditions from flood recession farming to irrigated plot farming proved to be much more difficult than initially planned.

Rice which was envisioned as the crop to be grown to feed locals and sell on the market, was not embraced fully by the farmers since though they (farmer's) were the most affected by alteration of Senegal's flow, they were never included in any of the decision-making processes at the planning stage..

The flood plain ecosystems were affected by construction of the dams. In less than ten years, the degradation of the environments and the consequences on the health of the local population were dramatic. Other problems arose from increased competition between agricultural land and firewood. As marginal land on slopes and river banks was cleared, there was increased erosion. In addition, large areas of the basin were denuded due to overgrazing.

Political constraints associated to the transboundary nature of the SRV: Diverging interests of riparian countries meant that a compromise had to be reached in prioritizing water use and infrastructural development (Figure 2:16). This constraint was overcome through a joint management and development of infrastructure as prescribed in the three conventions.

Constraints related to power imbalances among stakeholders:

- Voices of the rural poor vs voices of the influential urban dwellers and industrial sector
- Voices for development (irrigation, electricity, navigation, water supply) vs Voices for nature conservation

The *OMVS* has begun to resolve these issues by attempting to replicate flood conditions to allow a return to flood recession farming practices while shifting to a more inclusive policy-making approach to include all stakeholders.

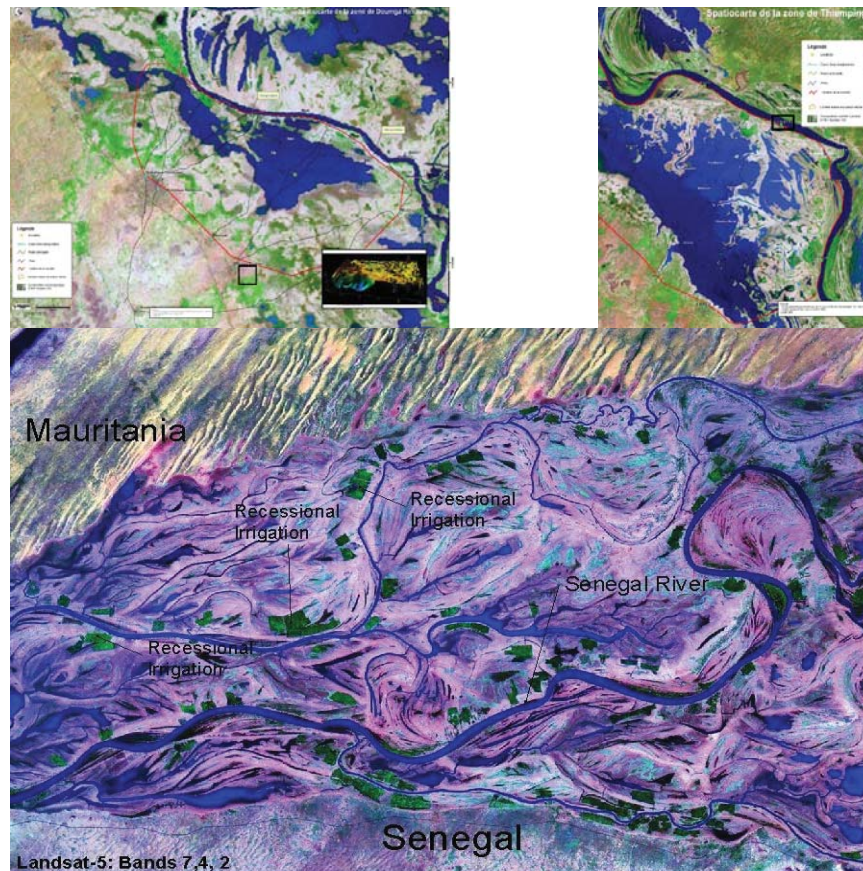


Figure 2:15: Recession Floods Irrigated Rice on the Senegal

Figure 2:16: Diverging Interests Cause Political Constraints

Country	Power Production	Irrigation	Navigation	Recession Agriculture
Guinea	Potentially high	None	None	None
Mali	High	Low	Very High	Low
Mauritania	Very High	Very High	High	High
Senegal	Très haute	Very High	High	High

The Senegal River’s future management is a challenging task since the river is shared by four nations, various ethnic groups, and the two sets of development goals: national and local, which continue to pull in opposite directions. The river management since the 1970s was not carried out in an integrated manner. In developing the Senegal River, the most challenging issue will be the discord between the national and local level development goals.

These issues could be resolved through participatory approaches involving all stakeholders based on a framework that;

- Uses local knowledge, especially on the pre-dam hydrology and its ecological and socio-economic dimensions
- Formulates
an all inclusive management plan
- Improves
existing infrastructures built by OMVS

This new approach has seen a slight increase in rice production in the basin since the year 2000 (Figure 2:17).

2.4.5.1 *Benefits of the cooperation*

The Senegal basin countries show that regional cooperation—rather than unilateral development of a shared resource, can improve the possibilities for tackling poverty. Driven by the idea of pan-African unity, Guinea, Mali, Mauritania, and Senegal realized that they could get more from the Senegal River by cooperating in its development, and at a lower cost to each country, than they could by proceeding unilaterally.

By jointly owning and operating the Manantali and Diama dams, the OMVS countries have increased their electricity and water availability. This in turn is supporting economic growth by reducing investment risk and also reducing poverty by increasing income-generating activities across sectors.

Applying the Shanghai framework to the Senegal basin highlights how the countries’ innovative Cooperation has created an enabling climate for investments and social inclusion.

- *Commitment and political economy for change.* The countries have repeatedly shown their commitment to change in their policies and declarations. National policies encourage private sector involvement through deregulation, and privatization is under way in the basin’s energy sector.
- *Institutional innovation.* The OMVS institutions allowed member countries to give up some sovereignty for the basin’s greater good. The countries own the infrastructure jointly; decision making is based on equality, with the benefits and burdens of development shared equitably.
- *Learning and experimentation.* Since 1963, there have been three different basin organizations, each with mandates that evolved with experience.
- *External catalysts.* The countries captured the political opportunities in the post-independence drive for pan-African unity. The severe droughts of the 1970s were another external catalyst. The 2003 floods prompted the OMVS system to further coordinate its activities with local communities.

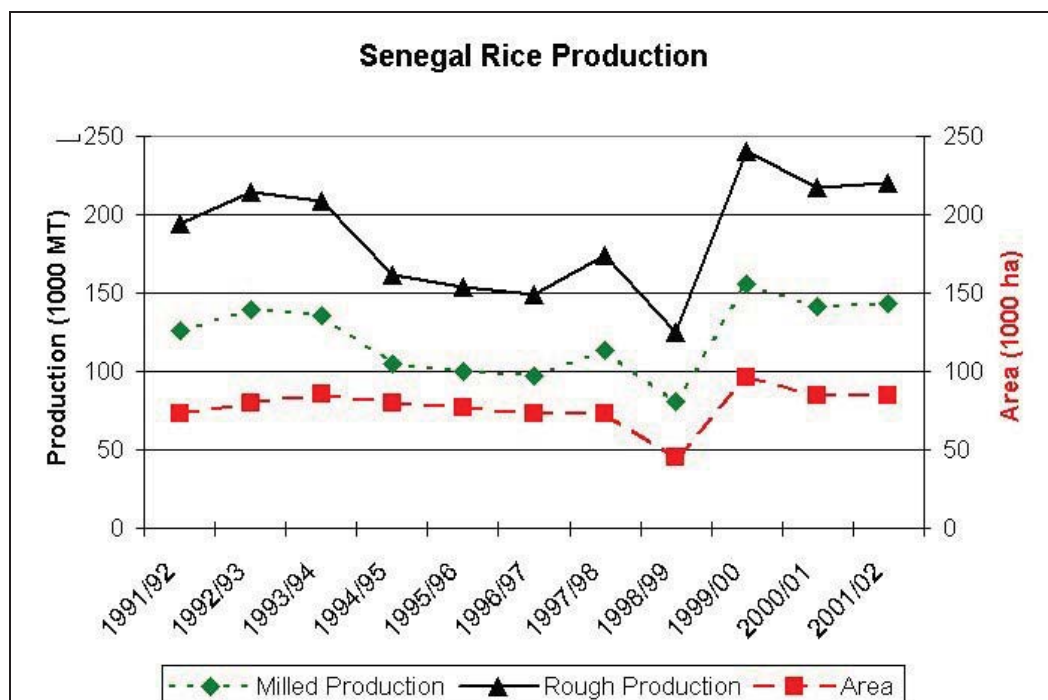


Figure 2:17: Trends in Rice Production

2.5 Niger Basin Authority (NBA)

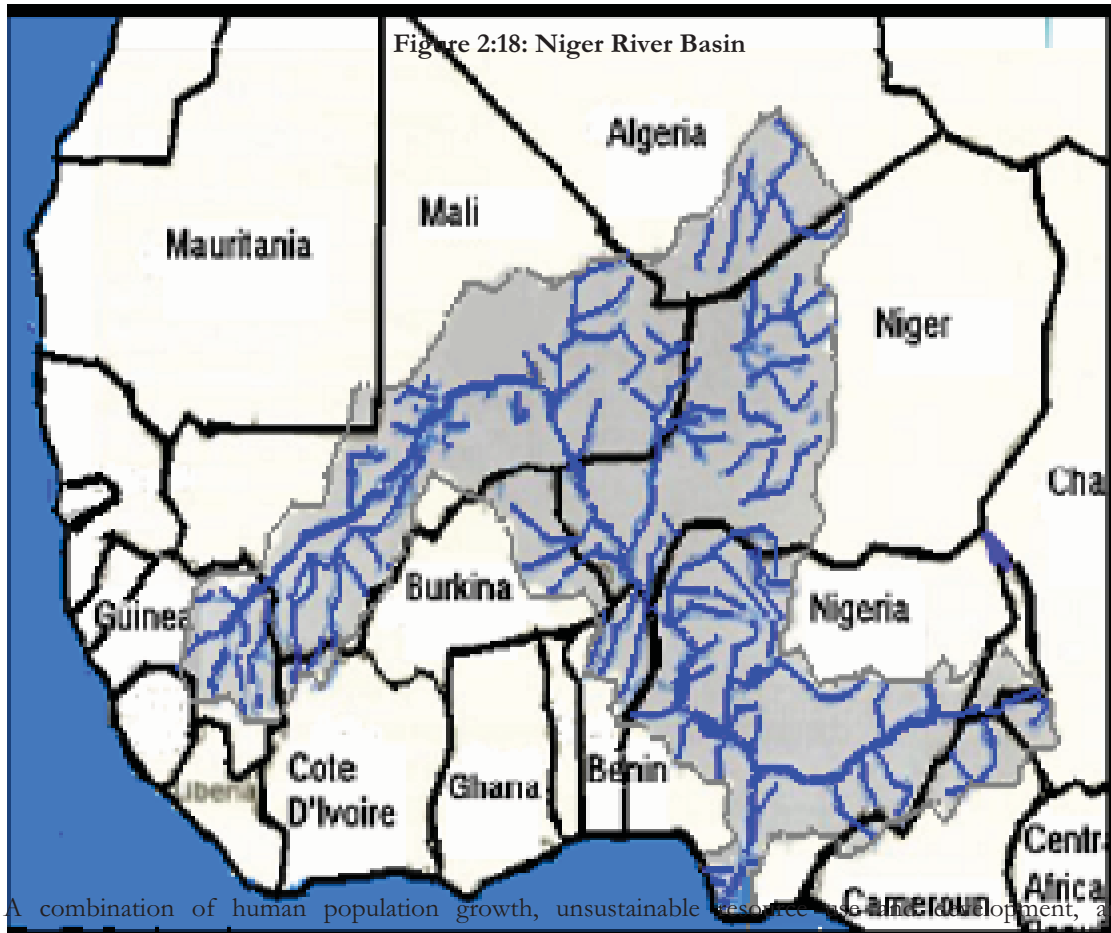
2.5.1 About the Niger Basin

At 4,200 km, the Niger River is the third longest river in Africa (after the Nile and Congo). Its unusual ‘boomerang’ shape was probably produced by two ancient rivers joining together. The Niger Basin, which covers 2.2 million km², spreads over nine countries {**Benin (2%) Burkina Faso (2%) Cameroun (4%)**

Chad (1%) Cote D’Ivoire (1%) Guinea (6%), Mali (25%), Niger (21%) and Nigeria (32%) and includes a human population of more than 100 million, embraces different climatic zones, topographies and rainfall patterns, which lead to a complex and variable flow pattern for the river

Figure 2:18). The basin includes the Niger River which originates from Guinea with its tributaries of Bani, Gouroval, Dargol, Sirba, Gouroubi, Diamangou and Tapoa, all originating from Burkina Faso. The other tributaries include Mekrou, Alibori and Sota originating from Benin and Benue from Chad (Figure 2:19).

In the floodplains and delta wetlands along the river, a specialized flora has evolved that is adapted to extreme fluctuations in water levels. The river basin also supports a wide variety of fascinating animals. Black-crowned cranes rely on floodplain wetland habitat throughout the basin. In addition, the braided wetlands that form Niger’s “Inner Delta” in Mali support hundreds of thousands of migratory birds. The Niger River system also sustains remarkable biological communities. The river has 36 families and nearly 250 species of freshwater fish, of which 20 are found nowhere else on Earth. Eleven of the 18 families of freshwater fish that are endemic to Africa are represented in the Niger River. Manatees can still be found in several pockets of suitable habitat that remains along the river and hippopotami and crocodiles are still present. The river’s true delta in Nigeria contains West Africa’s largest mangrove forest.



A combination of human population growth, unsustainable resource use and development, and desertification are threatening the Niger River's ability to supply crucially needed natural resources to the people of West Africa. River flows in the basin are decreasing at the same time that fishing pressure is increasing, leading to drastic declines in the productivity of the Niger's fisheries. The effects of deforestation and farming of fragile soils is leading to sedimentation of river channels.

Competition over scarce water resources or transboundary areas has been a source of tension between the basin countries. Drought and reduced water availability have forced rural communities, such as farmers and cattle herders, to migrate south to more humid conditions increasing pressure on the remaining floodplains and wetlands. With this migration, traditional resources management have given way to survival needs that are ecologically unsustainable and lead to declining biodiversity and productivity of natural habitats.

A circular relationship between poverty and environmental degradation characterizes the region. Regional poverty is a severe limiting factor and compromises the ability of the countries to invest in costly yet necessary state of the environment monitoring. Human pressures on the resource base include deforestation, bush burning, and unsustainable agricultural practices. This combination of increased human pressure and drought then exacerbates desertification and the cycle continues.

Economic growth is heavily dependent on the performance of two primary sectors – agriculture that contributes 40 percent of GDP in the basin, whereas mining contributes over 10 percent. In many parts

of the basin, inland navigation provides essential transport for people and goods. The basin's rural economy depends heavily upon natural resources. However, the environment is under severe stress, threatening rural livelihoods and increasing the rural population's social and economic vulnerability. Consequently, the economic implications for the basin's development are significant.

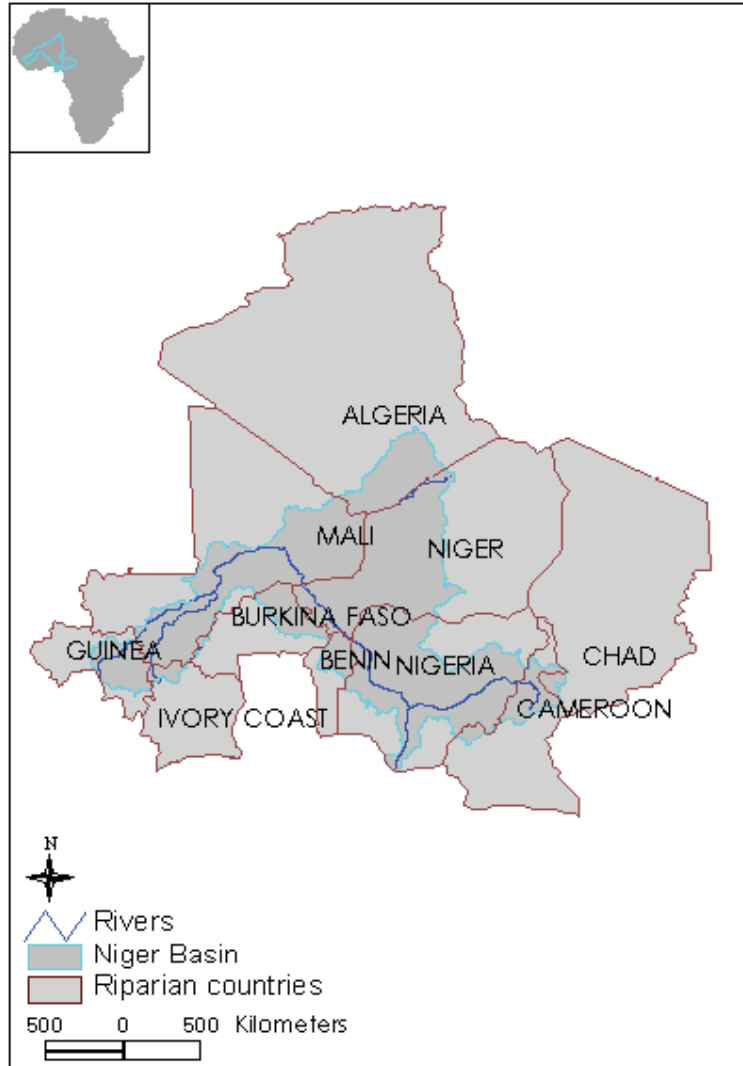


Figure 2:19: Niger River Basin Riparian Countries

2.5.2 The Status of the Niger Basin Authority

The Niger Basin Authority (NBA) is one of the oldest intergovernmental organizations and was created in 1964 as the River Niger Commission (RNC) with the aim of "encouraging, promoting and co-ordinating the studies and programmes related to the development of the basin resources".

The River Niger Commission functioned for 17 years and the results achieved were considered unsatisfactory. Consequently, it was transformed into the **Niger Basin Authority (NBA)** by a Convention agreed to by the nine member states (Chad, Cameroon, Benin, Cote d'Ivoire, Burkina Faso, Guinea, Mali, Nigeria and Niger) in Faranah in 1980 (The expected outcomes would include:

- (i) improved institutional coordination for regional management and development of water resources in the Niger River Basin;
- (ii) improved performances of rehabilitated hydroelectric plants in targeted areas;
- (iii) Improved irrigated agriculture in targeted areas; and
- (iv) Improved watershed management.

In addition, Niger and Nigeria by signing the Maiduguri Agreement in 1990 have established a joint commission to monitor and assess development options, in particular water resources development, in the four major sub-basins common to the two countries. However, the implementation of the Agreement has been ineffective so far.

Table 2-6). The NBA includes nine of the ten countries in the basin, excluding Algeria, which is neither a significant contributor nor a major user of basin water. The NBA aims at promoting cooperation among the member countries and to ensure integrated development of the basin in all fields through development of its resources, notably in the fields of energy, agriculture, forestry exploitation, transport and communications and, industry.

However the financial and institutional crises continued in spite of a mandate reviewed in 1987, which assigned to the NBA the following objectives:

- harmonising and co-ordinating national policies for the development of the Basin's resources;
- participating in planning and development by drafting and implementing a plan for the basin's integrated development;
- promoting and participating in the design and exploitation of infrastructures and joint projects;
- controlling and regulating any form of navigation in the river, its tributaries and sub-tributaries in accordance with the "Niamey Act";
- Participating in the formulation of requests for assistance and in the mobilisation of funds for the studies and works required for developing the basin resources.

The specific objectives of NDA include: (i) promoting cooperation and harmonization of water resources policies and programmes, (ii) planning sub-regional and bilateral projects and, (iii) designing, implementing and maintaining common infrastructure

The preparation in 1998 of a three-year action plan (2000-2002) and its implementation enabled NBA to gradually boost its activities. The statutory meetings are regularly held, most countries pay their contribution and the development partners have restarted their assistance.

The Niger River Basin countries came to understand that they could not rely upon unilateral approaches to development if they were to meet the challenge of providing for the growing population using the reducing resource base. A new cooperative approach evolved around the revitalization of the basin organization – the Nile Basin Authority (NBA) – and to seek support as they moved towards cooperative management at the regional, national and local levels.

2.5.3 NBA mandate:

The project development objective is to enhance regional coordination, development and sustainability of water resources management in the Niger River Basin.

The expected outcomes would include:

- (v) improved institutional coordination for regional management and development of water resources in the Niger River Basin;
- (vi) improved performances of rehabilitated hydroelectric plants in targeted areas;
- (vii) Improved irrigated agriculture in targeted areas; and
- (viii) Improved watershed management.

In addition, Niger and Nigeria by signing the Maiduguri Agreement in 1990 have established a joint commission to monitor and assess development options, in particular water resources development, in the four major sub-basins common to the two countries. However, the implementation of the Agreement has been ineffective so far.

Table 2-6: List of Niger Basin Treaties

Date	Treaty Basin	Signatories	Treaty Name
Feb 26, 1885	Congo, Niger	Austria-Hungary; Belgium; Denmark; France; Germany; Great Britain; Italy; Netherlands; Norway; Portugal; Russia; Spain; Sweden; Turkey; USA	General Agreement
April 20, 1921 Oct 26, 1963	Niger Niger	France; Great Britain; Cameroon; Chad; Dahomey; Guinea; Mali; Niger; Nigeria; Upper Volta	Barcelona Convention Navigation/Economic Cooperation Agreement
Nov 25, 1964	Niger	Benin; Burkina Faso; Cameroon; Chad; Ivory Coast; Guinea; Mali; Niger; Nigeria	River Niger Commission-Transport Agreement
Nov 21, 1980	Niger	Benin; Cameroon; Chad Ivory Coast; Guinea; Mali; Niger; Nigeria; Upper Volta	Niger Basin Authority Convention
Oct 27, 1987	Niger	Algeria; Benin; Burkina Faso; Cameroon; Chad; Guinea; Ivory Coast; Mali; Niger; Nigeria;	Revised Basin Financial Procedures
Oct 29, 1987	Niger	Benin; Burkina Faso; Cameroon; Chad; Ivory Coast; Guinea; Mali; Niger; Nigeria	Revised Convention on NBA Creation
July 12, 1988	Niger	Mali; Niger	Utilization of Niger Water Resources
July 18, 1990	Niger	Niger; Nigeria	Sharing of Common Waters
Jan 14, 1999	Niger	Benin; Niger	Hydroelectric Management

2.5.4 Institutional Structure

As an Intergovernmental organisation, the NBA functions as follows ();

- Summit of Heads of State and Governments
 - The Council of Ministers
 - Technical Committee of Experts
 - NBA Executive Secretariat
-
- The Niger Basin Authority (NBA) is being strengthened through institutional reforms which include a new organizational chart for the Executive Secretariat with enhanced staff and a new system of national focal bodies.
 - Implementation institutions in place include one regional project management unit, and nine national project units. The project's consultative bodies include a Regional Steering Committee, a Scientific/Technical Committee, nine National Steering Committees and nine Local Coordination & Monitoring Committees.
 - A National Steering Committee (NSC), which will meet at least once a year, has been formed in each of the nine riparian countries. The NSC's membership includes Niger Basin Authority and Global Energy Facility Fund (GEF) focal points, (including Small Grants Program representation) concerned ministries from each country, local communities, NGOs and resource specialists as needed.
 - Appropriate administrative and financial mechanisms are in place for project management at regional and national levels as well as for micro grants disbursement.
 - A full TDA was prepared in 2008 through environmental studies in five of the nine countries (Benin, Guinea, Mali, Niger and Nigeria). The updating of this TDA to confirm the results from the preliminary TDA will be complemented with studies in the other countries (Burkina Faso, Cameroon, Chad and Côte d'Ivoire). The SAP process, which was set to start after the completion and endorsement of the full TDA, according to the implementation plan, was set to run from May 2008 till November 2008. It was expected to submit the SAP for adoption by December 2008.

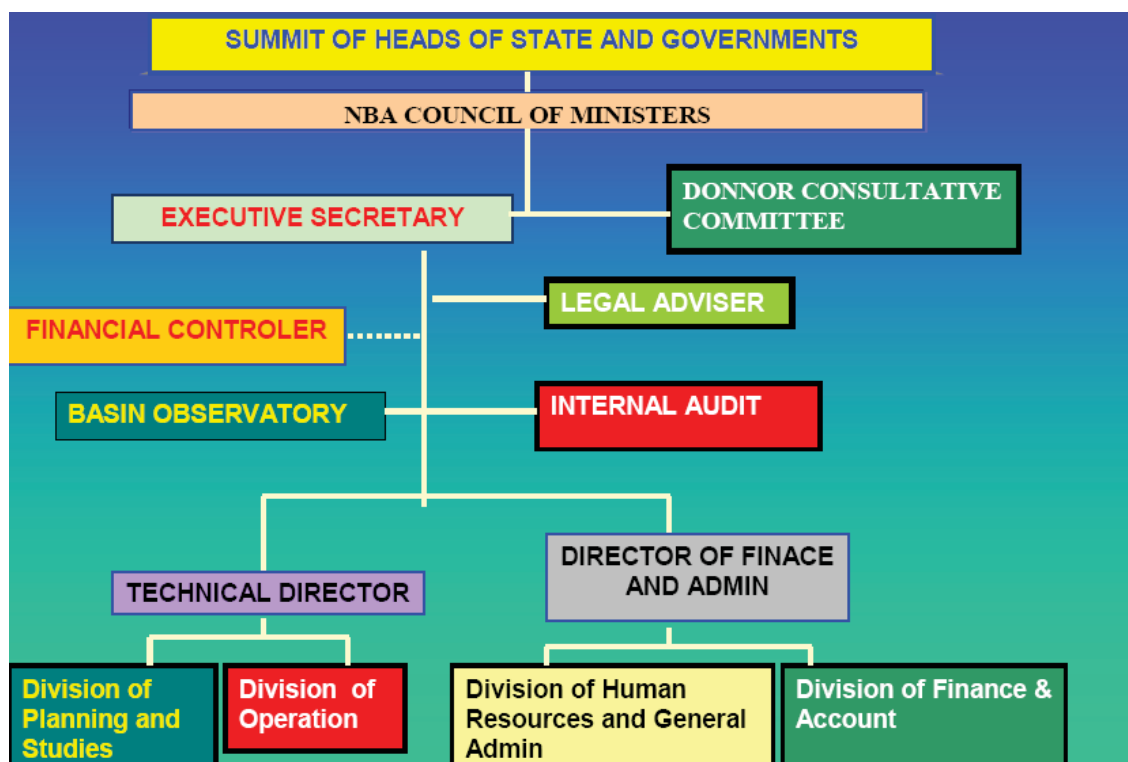


Figure 2:20: Organisational Structure of Niger Basin Authority

2.5.5 Institutional arrangement and activities

The Niger River Basin Integrated Water Resources Management (IWRM) project addresses the transboundary environmental management and capacity building of the shared water and land resources. It focuses on the increment needed to integrate management of the basin's resources, representing the major environmental element of the concurrent Strategic Shared Vision and Sustainable Development Action Plan (SDAP) for the Niger River Basin.

The major components for cooperation are:

a) **Capacity building**

Through the capacity building components, the Project supports integrated regional capacity building of the Niger Basin Authority (NBA); national institutions to increase their knowledge base, and decision-making capacities for strategic management of, and development in the Basin; and local capacity building to manage local resources, through community-based implementation of micro-grant supported interventions;

b) **Planning and management of the land and water resources**

The project's principle focus is to enable the countries to build a robust partnership to reverse land and water degradation trends of the Niger River Basin, through an integrated and participatory approach to upper and lower basin to land-water and environmental management. The project's technical components, through the micro-grant-supported demonstration activities, have been designed to develop an understanding of better land management practices in agriculture, forestry, and other relevant sectors; and define mechanisms to improve water quality while reducing degradation of the regional biodiversity

and ecosystem. In this way the project is offering possibilities for cumulative rural socio-economic benefits for communities that depend on the land and water resources for their livelihood. These possibilities include eco-tourism development as, despite the basin's potential, there has been limited development of the tourism sector. Eco-tourism may be able to provide alternative livelihoods with negligible environmental impacts.

c) Transboundary increment.

The project strategically addresses the incremental costs associated with converting the project's national decision-making capacity and individual national issues, which could be transboundary in nature, into a regional operational context through a Strategic Action Plan (SAP), to achieve global benefits.

d) Funding mechanism and joint programs

The project is being jointly implemented by the World Bank and UNDP. World Bank components include: institution building; data and knowledge management; and transboundary diagnostic analysis (TDA) and strategic action plan (SAP) preparation. UNDP components are: capacity building and public awareness; development of a regional forum; and demonstration pilot projects and micro-grant program.

e) Program development

Legal documents, institutional reviews, etc. were under preparation as part of the NBA shared vision process, which was in its second and final phase and was expected to be completed by the end of 2008. The shared vision objective defined long-term objectives and commitment to a program of action for sustainable development of the basin. The Council of Ministers adopted a Sustainable Development Action Plan (SDAP) for the Niger River Basin in July 2007 and Investment Plan to be operated until 2027 in November 2008.

The validation of a legal framework (Water Chart in Niger River Basin) for the sustainable development is currently in process. The shared vision will also provide a framework to address some of the key MDGs and objectives of the New Partnership for African Development (NEPAD) and World Summit on Sustainable Development (WSSD). The project will support the MDG 7 by promoting integration of the principles of sustainable development into country policies to reverse the loss of environmental resources.

2.5.6 Evolution of agricultural development in the Niger riparian countries

The total irrigation potential in the basin is about 2.8 million ha of which about 930,000 ha are presently irrigated. Public irrigation in the Nigerian context means schemes run either by River Basin Development Authorities (RBDAs) or by the States. By 2004, only about 20 percent of the area planned for public sector irrigation had been developed and only 32 percent of the developed area was being irrigated.

The poor utilization of the developed irrigation area in the public irrigation sector can be attributed to a number of factors including: i) the lack of a coherent irrigation subsector development policy and strategy; ii) insufficient attention to management systems; iii) inadequate funding (including poor cost recovery); iv) high capital and operating costs; v) inadequate farm support services; vi) poor operation, repair and maintenance; vii) a low level of project ownership acceptance by the direct beneficiaries; and viii) uncertain financial and economic viability. Because of these lapses, a number of schemes have already deteriorated badly and are in urgent need of major renovation and repair, less than 20 years after their construction.

Traditionally many farm families in the Niger cultivate small areas in fadamas during the dry season, using water manually drawn from shallow wells or streams. Major fadama areas are located along the flood plains of the Niger river. The promotion of pumps and tubewells, which allow for the extraction of greatly increased amounts of water, began in the late 1980s through Agricultural Development Projects (ADPs) in Nigeria.

The sharing of resources for the benefit of local and rural communities by the Niger Basin Authority has led to:

- i. Increased supply of drinking water to rural communities
- ii. Promotion of female market gardening
- iii. Promotion of pisciculture
- iv. Adoption of the Principle of New Shared Vision

The adoption of the principle of shared vision is a clear demonstration of the willingness of Countries to share resources for the benefit of the local communities in the basin. This is providing a new impetus to the NBA.

2.5.7 Constraints

NBA has carried out many studies, but these have not yet been translated into real activities for the well-being of the riparian populations. Indeed, NBA suffered from:

- Insufficiency of technical and operational capacities to formulate and implement actions related to the objectives assigned to the NBA.
- Lack of dialogue and co-ordination between the NBA and the member Countries regarding the planning and implementation of development actions in the basin.
- Lack of concerted and joint actions to test the legal and institutional mechanisms, defined in the NBA, and to be a catalyst for concerted global co-operation on the basin scale, that could have led to appropriate sub-regional strategies, based on a clear shared vision of the Niger basin development.

This situation led the executive body of the NBA to take some corrective measures and to organise an institutional and organisational audit. The World Bank entrusted this audit to the International Office for Water. The results of this audit will help to restructure and strengthen the NBA. It is a case of a basin authority which started with good intentions but lacked the political will to boot. The trend is however changing with the new interventions being undertaken by the NBA.

2.6 SADC Protocol on Shared Watercourse Systems

Southern Africa's important rivers include the Zambezi, the Limpopo and the Orange-Senqu. Water resources in parts of the region are scarce and unevenly distributed. The fourteen SADC member countries have undertaken several important initiatives aimed at making shared river courses sources of cooperation rather than conflict. They have agreed, in principle, on integrated and cooperative management of transboundary river basins. The general framework for such cooperative endeavours is provided by the (Revised) SADC Protocol on Shared Watercourse Systems (1995/2000) and the SADC water sector (established 1996). In addition, sixteen agreements related to transboundary water courses are in place, including agreements establishing general watercourse commissions, agreements concerning single watercourses and agreements dealing with specific watercourse projects (e.g. dams). Several bilateral and multilateral general water course commissions, specialized river and lake basin commissions, technical committees and development authorities responsible for integrated water resources management (IWRM) of transboundary river courses have been set up by the SADC governments.

Southern Africa's water vision for the 21st century is “an equitable and sustainable utilization of water for social and environmental justice, regional integration and economic benefit for present and future generations.” Several sub-vision statements focusing on equitable social and economic development, equal access to quality water, sanitation, energy and food security, sustainable environment and integrated water resources management have also been developed. The SADC Water Vision was presented to the World Water Forum and Ministerial Conference in The Hague in March 2000. It was agreed in this conference that achieving water security requires cooperation between different water users and between those sharing river basins and aquifers. This has to be done within an environment that allows for the protection of vital eco-systems. Since the World Water Forum, SADC Water Sector together with GWP SATAC began preparation of the framework for action for the region.

The trans-boundary nature of southern African rivers called for international water management mechanisms. These have evolved into joint technical committees, river basin authorities and river basin commissions. Some of these authorities are: Okavango Commission (OKACOM), Orange – Sengu Commission (ORASECOM), Limpopo Basin Permanent Technical Committee (LBPTC), Permanent Technical Committee for Incomati, Maputo and Mbuluzi etc. SADC intends to set up more river basin commissions to oversee a co-ordinated and sustainable use of international shared waters.

The commissions work, in addition to the SADC Protocol, within the 1966 Helsinki Rules that serve as the basis for agreements between states for the purpose of allowing each state an equitable share of international water and to use water within its territory reasonably. The rules were updated in 1994 to include an obligation not to cause harm to another state.

2.6.1 Zambezi Watercourse Commission (ZAMCOM)

2.6.1.1 *The Basin*

Zambezi basin is one of the largest river basins in Africa and is shared by eight basin states namely; Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe (**Figure 2:21**). The basin covers a 1,570,000 km² area, is 2,650 km (Table 2-7) long with a population of over 100 million with 38 million inhabitants living directly in the basin witnessing an annual growth rate of 3%. The total rainfall in the basin varies from 1,800 mm/year in the north to 550 mm/year or less in the south of the basin.



Figure 2:21: Zambezi basin

2.6.1.2 The status of the ZAMCOM

Under the SADC Protocol on shared water courses as an umbrella regional framework, the riparian countries established ZAMCOM, in July, 2004 (Table 2-8). This followed the adoption of the Action Plan for the environmentally sound Management of the Common Zambezi River System (ZACPLAN) by the governments of Botswana, Mozambique, Tanzania, Zimbabwe and Zambia, in 1987. ZACPLAN was subsequently joined by the three remaining riparian states of Angola, Malawi and Namibia in early 1990s. ZAMCOM, also co-exists with the Zambezi River Authority (ZRA) which is an autonomous corporate body jointly owned by the Governments of Zambia and Zimbabwe and primarily mandated to operate, monitor and maintain the Kariba Dam, its reservoir and any other installations owned by the Authority.

Table 2-7: The Zambezi Basin Riparian Countries

Area of Basin in Country	km ²	%
Angola	252,600	18
Botswana	21,900	2
Malawi	112,100	8
Mozambique	168,000	12
Namibia	21,000	2
Tanzania	28,000	2
Zambia	574,000	41
Zimbabwe	224,000	16
Total	1,400,000	100%

Table 2-8: Development of Zambezi Treaties

Date	Treaty Basin	Signatories	Treaty Name
Jun 11, 1891	Busi, Limpopo, Pungwe,	Great Britain;	Spheres of Influence Treaty
Jan 21, 1953	Sabi, Shire, Zambezi Zambezi	Portugal Great Britain; Portugal	Shire Valley Participation Treaty
Nov 18, 1954 Nov 25, 1963	Kwando Kariba, Zambezi	Great Britain; Portugal Northern Rhodesia; Southern Rhodesia	Kwando River Agreement Power Corp Agreement
Apr 1, 1967 May 2, 1984	Zambezi Zambezi	Portugal; South Africa Mozambique; Portugal; South Africa	Hydropower Agreement Cahora Bassa Project Agreement
May 28, 1987	Zambezi	Botswana; Mozambique; Tanzania; Zambia; Zimbabwe	Action Plan
July 28, 1987	Zambezi	Zambia; Zimbabwe	Zambezi River Utilization Agreement
July 13, 2004	Zambezi	Angola; Botswana; Malawi; Mozambique; Namibia; Tanzania; Zambia; Zimbabwe	ZAMCOM Agreement

The objective of the Commission is to promote the equitable and reasonable utilization of the water resources of the Zambezi watercourse, and their efficient management and sustainable development. The ZAMCOM advises the member states on the planning, management, utilization, development, protection, and conservation of the Zambezi. The Commission also advises on measures necessary to avoid disputes between the member states and assists in the resolution of conflicts. ZAMCOM collects, evaluates, and disseminates information and data relevant to the implementation of the agreements and fosters greater awareness for the efficient and sustainable management and development of the Zambezi among the population. Furthermore, ZAMCOM aims at promoting, supporting, coordinating and harmonizing the management and development of the water resources and the national water policies.

2.6.1.3 *Institutional Structure*

ZAMCOM consists of the council of ministers, a Technical Committee and a Secretariat. The Council is composed of one delegate from each member state. A Chairperson and Vice-Chairperson are elected on the basis of rotation. The Technical Committee is made up of three representatives from each member state and are primarily responsible for implementing the Council's decisions and developing the River Basin Management Strategy. The Secretariat is headed by an Executive Secretary and is responsible for the technical and administrative support of the Council.

2.6.1.4 *Agriculture in the Basin*

With a total irrigation potential of about 3.2 million ha only about 1.2 million ha are currently under irrigation.

2.6.1.5 *Constraints*

Very large underdeveloped basin, rampant poverty, hydropower/irrigation potential partially tapped, environmental impact assessment required, Zambia (41% of basin area) not a member of ZAMCOM, low stakeholder involvement and limited financial resources, lack of basin-wide organization for water resources management, inadequate political dialogue on IWRM, lack of common vision, inadequate funding and lack of cooperation mechanism.

2.6.2 Orange-Senque River Commission (ORASECOM)

2.6.2.1 The Basin

The Orange River, (called the Senqu River in Lesotho), originates in the Lesotho Highlands in the vicinity of Mount Machache some 3,300 m above sea level where the average annual precipitation can exceed 1,800 mm, with a corresponding average annual potential evaporation of 1,100 mm. The river stretches 2,300 km from the source to its mouth (Alexander Bay/Oranjemund) on the South Africa/ Namibia border, where the average annual precipitation drops to below 50 mm, while the average annual potential evaporation rises to over 3,000 mm (Figure 2:22).

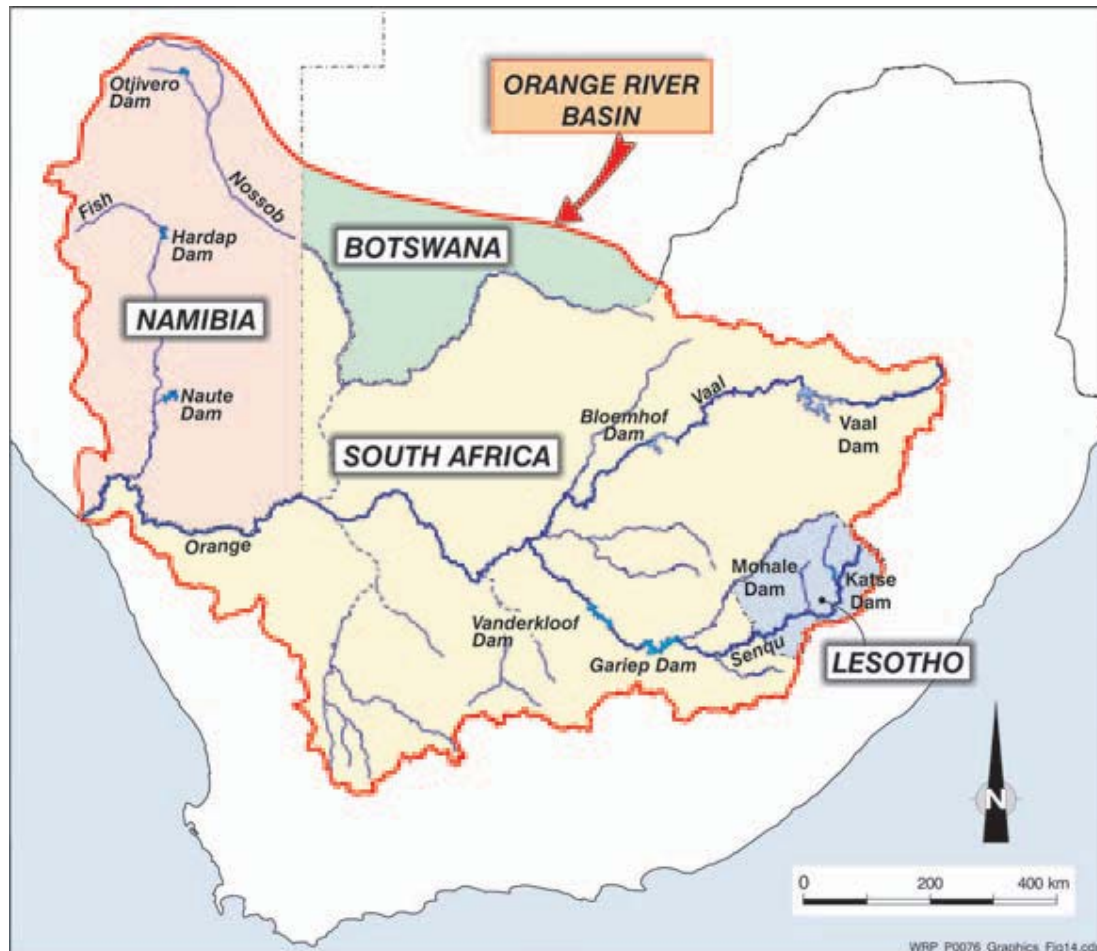


Figure 2:22: The Orange-Senque Basin

The Orange River basin is the largest river basin in southern Africa, with a total catchment area in the order of 1,000,000 km², of which almost 600,000 km² lies within the Republic of South Africa with the remainder in Lesotho, Botswana and Namibia. The effective catchment area is difficult to determine, since it includes many pan areas and also several large ephemeral tributaries, such as the Molopo and Nossob in Botswana, that rarely contribute to flows in the main river.

The Orange-Senque River is joined by the Makhalleng, Caledon, Vaal and Fish Rivers (Figure 2:22). In its catchment area, four large dams have been constructed under the Lesotho Highlands Water Project (LHWP) (Table 2-9). The Vanderkloof Dam is the most significant storage structure on the downstream

portion of the Orange River and effectively controls the flow of water along the 1,400 km stretch of the river between the dam and Alexander Bay on the Atlantic Ocean.

2.6.2.2 The Status of the Treaty

In 1992, South Africa and Namibia established a Permanent Water Commission (PWC) to advise the governments on the development of the Lower Orange River. The PWC replaced the Joint Technical Committee, which was established in 1987. Namibia also entered into an agreement with South Africa on the establishment of a joint authority for an irrigation scheme that is linked with the PWC on the Lower Orange River.

Lesotho and South Africa signed an agreement on the Lesotho Highlands Water Project (LHWP) in 1986, which eventually led to the establishment of the Lesotho Highlands Water Commission (LHWC). The Lesotho Highlands Water Project, LHWP, Treaty was signed by the Governments of Lesotho and of the Republic of South Africa in 1986 (Table 2-10, and Figure 2:23). The project aimed at harnessing the water resources of the highlands of Lesotho to the mutual advantage of South Africa and Lesotho, by transferring water to South Africa to alleviate its water shortage while providing Lesotho with facilities to generate its own electricity. After completion of all phases by 2020 the project will convey 2.2 km³/yr (66 m³/s) of water to South Africa. The Treaty provides for negotiations to be held between Lesotho and South Africa before further phases of the LHWP can be implemented. Such negotiations are ongoing, and as South Africa has reduced its forecasts for population growth, the water demand is growing more slowly than previously expected and Phase II of the LHWP will start later.

After a long process of negotiations, the Orange-Senqu River Commission (ORASECOM) was established as the first multinational, multilateral institution dealing with the management of the trans-boundary water system. Lesotho, together with Botswana, Namibia, and South Africa, share the Orange River basin, and consequently are members of the Orange-Sengu River Commission (ORASECOM) created in 2000.

Table 2-9: Orange-Senqu River Basin

Area of Basin in Country		
	km²	%
Botswana	121,400	12.85
Lesotho	19,900	2.10
Namibia	240,200	25.40
South Africa	563,900	59.65
Total	945,400	100%

ORASECOM through the Council serves as technical adviser to the Riparian Countries on the development, utilization, and conservation of the water resources of the basin. The Commission was mandated to develop a comprehensive perspective of the basin, study the present and planned future uses

of the river system, and determine the requirements for flow monitoring and flood management. The main objective was the realization of the principle of equitable and reasonable utilization, as well as the principle of sustainable development with regard to the River System.

ORASECOM is the fourth basin-wide regime to be established in southern Africa and the first under the SADC Protocol on Shared Watercourse Systems. The ORASECOM Agreement recognises the Helsinki Rules, the United Nations Convention on the Non-Navigational Uses of International Watercourses and the SADC Protocol on Shared Watercourse Systems. It also refers to the Revised Protocol on Shared Watercourses with respect to definitions of the key concepts “equitable and reasonable” and “significant harm”. A dispute resolution mechanism is formally vested in the SADC Tribunal, which is a first for regime creation in the regional water sector. It is within this legal and institutional framework that ORASECOM has to balance the interests of the different riparian states in a cooperative manner.

Table 2-10: Orange-Senque Treaties

Date	Treaty Basin	Signatories	Treaty Name
1978 Oct 24, 1986	Orange-Sengu Senqu/Orange	Lesotho, South Africa Lesotho; South Africa	Joint Technical Committee Lesotho Highland Water Project Treaty
1987 Nov 19, 1991	Orange Orange	Namibia, South Africa Lesotho; South Africa	Joint Technical Committee Protocol IV on Water Treaty
Aug 31, 1992 Sep 14, 1992	Orange Frontier of	Lesotho; South Africa Namibia; South Africa	Ancillary Agreement Permanent Water Commission
Jan 1, 1999	Orange	Lesotho; South Africa	Protocol VI on Water Treaty
Nov 3, 2000	Orange, Senque	Botswana; Lesotho; Naminia; South Africa	Formation of ORASECOM Agreement

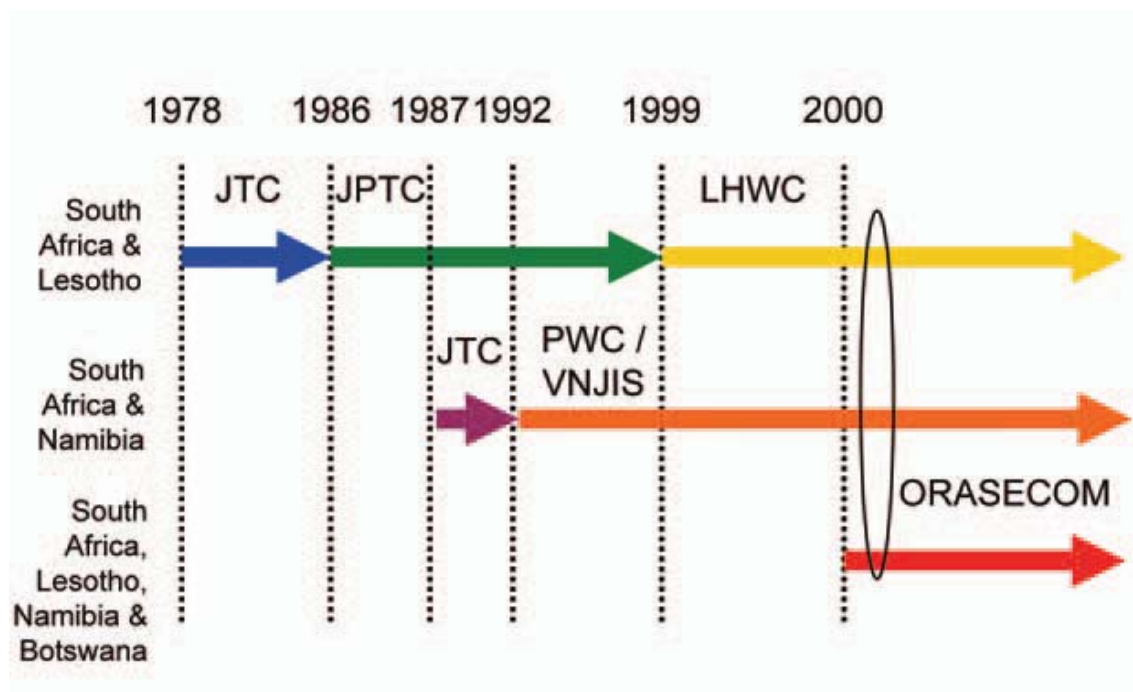


Figure 2:23: The Chronology of Orange-Senque Treaties

2.6.2.3 *Status of the agricultural sector in the Orange-Senque*

Assessment of the irrigation potential for the basin estimates it at 390,000 ha of which 303,000 ha are presently irrigated, mainly in South Africa. Estimates of irrigation potential in Lesotho, considering only the available water resources and taking into account the reduced availability due to the LHWP, reckon that a minimum of 3 500 ha and up to 7 000 ha could be brought under irrigation if the Senqu River potential is fully exploited. However, others still, taking into account the high cost of irrigation development in the country, conclude that irrigation potential is limited by the market for high value crops and put the potential for new irrigation at about 1 000 ha.

The banks of the Orange River downstream of Vanderkloof Dam are heavily developed in many areas, with irrigation being the principal use. Both the Gariep and Vanderkloof dams are used to regulate river flows for irrigation as well as to produce hydro-electricity during peak demand periods. Very little Orange River water is used for domestic or industrial purposes with the exception of that used in the Vaal River basin.

Lesotho

In Lesotho, almost 50% of the population sustains their livelihoods from crop cultivation and agriculture accounts for around half the country's income. The main commercial agricultural zone is the western lowlands but small-scale agriculture is also practiced wherever the terrain of the Maluti Mountains allows. There is a high reliance on rainfed agriculture, with only around three percent of the total irrigable area under water management.

The more successful irrigation projects in Lesotho, such as the small-scale irrigation and water harvesting projects, are based on an individual approach to communally owned irrigation schemes, where farmers control the on-field crop production activities. Private irrigation, consisting mainly of home gardens and small market gardens, is successful and is contributing to meeting household food security needs, as well as supplying rural markets.

The interests of Lesotho in the Orange River lie in sharing the benefits of using the Orange's water. In fact it can be said that Lesotho is not actually selling South Africa its water – rather it is selling hydraulic pressure and the advantages of high altitude storage in a deep dam with lower evaporative losses than possible elsewhere in the basin. Rather than allowing the surplus water to flow downstream unregulated across the border into South Africa, Lesotho benefits from the controlled delivery of the water to South Africa through LHWP infrastructure. The financial benefits from the project to Lesotho, in the form of royalties, has improved the infrastructure in the country and makes a contribution to raising the living standard of Lesotho's predominantly poor population. Thus, Lesotho has a strong interest in continuous international cooperation regarding the utilisation and management of the Orange River Basin.

Botswana

Water availability in Botswana is mostly a function of erratic rainfall patterns. Due to prevailing, extremely arid conditions, it is estimated that up to 80% of precipitation is lost to evaporation. Only 2% constitutes surface runoff, and a meagre 1% reaches the groundwater table. The balance, 17%, is utilized for biomass generation and is productively lost through evapotranspiration. Thus the internal water resources of Botswana are ephemeral in nature, and comprise the impoundment of summer rainfall surface rainfall runoff in the normally dry rivers, groundwater and the utilization of unconventional water resources. Although the limited surface water resources may seem attractive for reservoir development, the efficiency of dams would be very low because the largely ephemeral river flows are too variable, the topography too flat for good dam sites, and evaporation is so high. Groundwater is the source of freshwater for approximately 80% of the population and for livestock. The long-term sustainable yield for

groundwater resources is estimated to be 200 cubic Mm/a, of which 130 cubic Mm/a have been developed. Wastewater re-use is a potential source of supplies as demand increases, as is a focus on demand side regulation.

Botswana realizes that augmentation of its internal water resources through the utilization of internationally shared supplies (border-rivers and perhaps transboundary aquifers) will become extremely important over the next decade. An International Water Unit has been established within the Ministry of Natural Resources to provide technical support for the management of shared river basins. The Unit represents Botswana at meetings pertinent to the Orange River Basin – ORASECOM, the JPTC, and the JPWC - as participants in water related fora created by SADC.

Namibia

In Namibia, an extremely arid hydro climate results in an immediate loss of approximately 83% of precipitation to evaporation. Only two percent of rainfall supplies end up as surface run-off and a mere 1 % becomes available in the groundwater table. The balance, 14%, is utilized for biomass generation and is productively lost through evapotranspiration. The international water resources are situated along the northern and southern perennial border rivers. The Orange River is in the south.

The main user of the Orange River water allocated to Namibia (currently 110 M m³/yr until 2007) is irrigated agriculture, most notably the table grape farm at Aussenkehr.

South Africa

South Africa is by far the biggest user of the water resources of the Orange River Basin. Overall, most of the water is used for irrigation purposes, with mining, industry and domestic consumption being the other main users. Whilst irrigation is the main utilisation along the main stem of the Orange River, mining, industry and domestic consumption are the main factors in the Vaal River Basin.

A significant amount of water from the Orange River is transferred from the Gariep dam into the Fish River catchment in the Eastern Cape to supply irrigation requirements for about 51 500 ha in this province as well a part of the requirements of the city of Port Elizabeth. When released from the Gariep and Vanderkloof dams the water is used for hydropower generation and forms part of Escom's (the national electricity supplier) capacity to meet peak electricity demands.

In the Lower Orange River area, (the area from the Orange/Vaal confluence to the river mouth at Oranjemund), the significance of commercial agriculture as a user sector is great. There are no large urban areas in this region and the water requirements for the inland towns served by supply schemes from the river, are comparatively small. Although mining is an important economic factor in this region, the amount of water used by mining operations is negligible compared to the amounts required for the various irrigation schemes along the river. Irrigated agriculture accounts for 94% of the current total requirement for water of 1, 130 million m³/yr.

In the Middle Orange, most irrigation is used for the production of lower value crops such as grains and fodder, while irrigated agricultural production in the lower parts of the basin concentrates on high value crops such as citrus, table grapes as well as pistachios and pecan nuts. As far as commercial agriculture is concerned, the value created per unit of water is thus much higher in the lower part of the basin than in other parts of the basin.

2.6.2.4 Constraints

The challenges are posed by the nature of the river which though being perennial is seasonal in nature and the demands placed by South Africa's growing industrial development, rising demand for irrigation water, environmental impacts of abstraction, construction of infrastructure necessitated by high water demand and a secretariat in a difficult operationalization phase.

The accelerating uses of the waters of the Orange River basin are rapidly outstripping the region's *institutional ability* to cope. While there are several Commissions that currently have responsibility for management of the system, and the principal Commission, ORASECOM, is an entity with international legal status, none of the Commissions has a permanent Secretariat and thus there is quite limited capacity to jointly identify and undertake the many anticipatory actions that will be necessary for the countries to effectively and jointly manage this key international resource.

The development and implementation of the Orange River Development Plan (ORDP), undertaken by South Africa and driving many of the current uses of the waters of the system, took place at a time when public participation and involvement were not seen as the imperatives that they are today. As supplies in relation to current and projected uses continue to narrow, and as the need to adjust to predictable and non-predictable use questions arise and need to be addressed at all levels, the provision of effective and ongoing public information systems, and comprehensive public involvement vehicles for all affected stakeholders will become management imperatives.

2.6.3 Synthesis of the key agricultural activities within the Orange-Senqu Basin

2.6.3.1 *Setting of the institutional frameworks on agricultural water*

a) *Setting-up the Orange River Development Project (ORDP)*

The ORDP is the culmination of proposals for irrigation projects in the semi-arid climate conditions in the Orange basin brought forward as early as the 1920s. The development scheme sought to bring substantial benefits for South Africa, the Orange basin and particularly white farmers during the heyday of apartheid. The main objectives of the project were:

- irrigation for increased agricultural production,
- supply of water for municipalities and industry,
- generation of hydro-electric power,
- flood prevention,
- recreational facilities,
- promotion of further settlements in the area,
- creation of employment

The proposed measures to reach these goals were to be implemented in six phases and included the construction of several major dams (completed to date are the Gariep dam and the Van der Kloof dam), canal systems for water distribution and drainage purposes, water tunnels connecting catchments with abundant water resources with water scarce-irrigation areas, as well as various hydropower stations. Hence irrigated agriculture was identified as a key component for the development of the basin.

The key issue governing the effective management of agricultural water in this basin is the involvement of many players that include farmer based water user associations. A strong legislative framework governed by supportive policy and Legal Acts provide for effective participation of the water users in the management of the water resources. These are enhanced by the following instruments:

- education and awareness creation of water users and stakeholders,
- the enabling of poorer, historically disadvantaged people to actively participate,
- determination of the capacity of users and stakeholders,
- continuous and consistent approach to public participation throughout the basin,
- Encouragement of the establishment of representative stakeholder groups in each water management area.

b) Operations of the agricultural sector

Prior to the establishment of ORASECOM, international cooperation between the riparian states on matters concerning the Orange River Basin was usually bilateral. The first (bilateral) agreement in the Orange River Basin was signed in 1978 when a Joint Technical Committee (JTC) was established between South Africa and Lesotho to investigate the feasibility of the proposed LHWP (Figure 2:23). In 1986 the Lesotho Highlands Water Project Treaty was signed – establishing two autonomous statutory parastatal bodies. The Lesotho Highlands Development Authority (LHDA) is responsible for the management of the dam construction and related issues within Lesotho itself while the Trans-Caledon Tunnel Authority (TCTA) is responsible for the management of the complex set of delivery tunnels into South Africa. In addition to these, a Joint Permanent Technical Commission (JPTC) was established, consisting of delegates from both riparian states, with the responsibility of coordinating the two parastatals, as well as to report back to their respective governments. This regime was further strengthened in 1999 with the agreement of what became known as Protocol VI of the Lesotho Highlands Water Project Treaty, which upgraded the JPTC into the Lesotho Highlands Water Commission (LHWC).

The success of the commercial farming sector in South Africa rides on the strong institutional framework established to develop, run and maintain the inter basin water transfer system under the LWHP.

2.6.3.2 Water allocation and inter basin transfer

The water resources of the Orange River basin are used for various purposes, with irrigation, mining, industries; power generation and domestic consumption being the main user groups (Figure 2:24). The type of use differs from region to region, with agriculture being a major user of water on the mid to lower reaches while industrial and municipal uses predominate on the upper reaches, of the Vaal River (Figure 2:25).

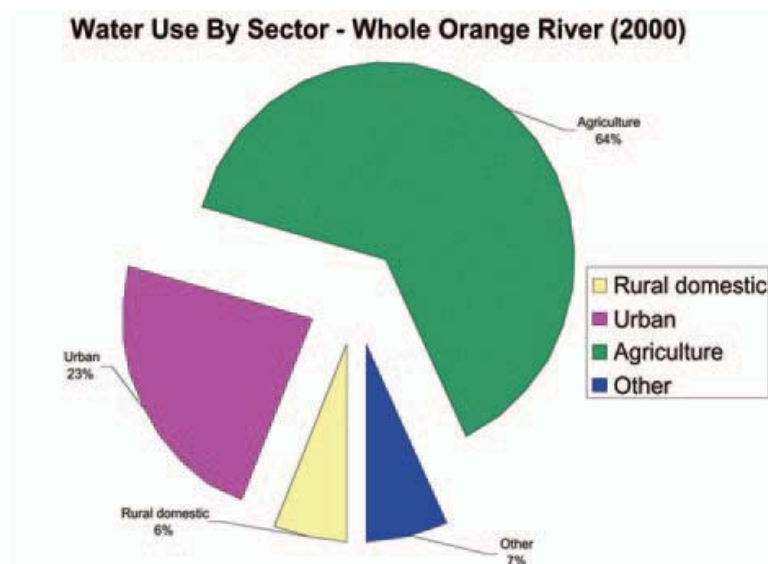


Figure 2:24: Water use by sector

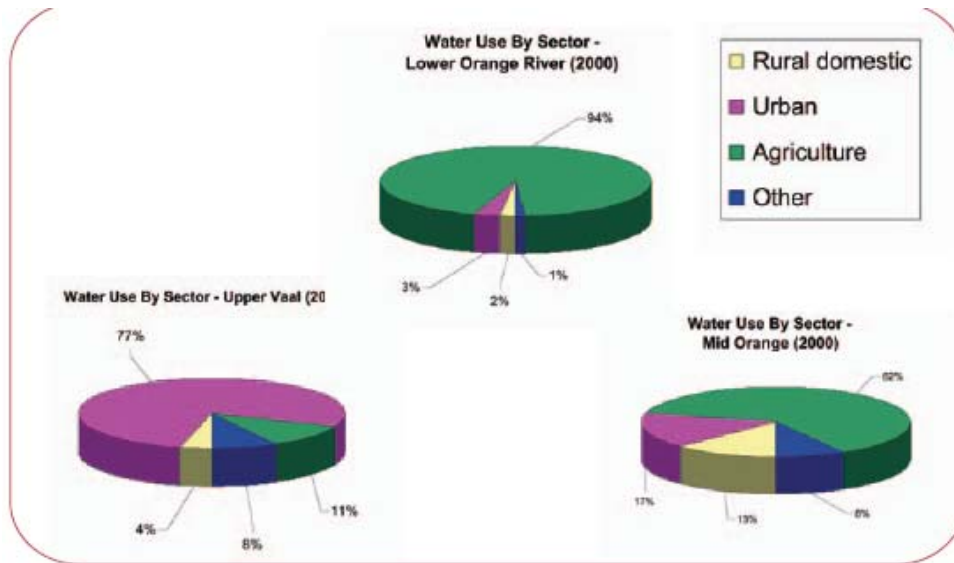


Figure 2:25: Water use per sector basin wise

To ensure equitable and reasonable allocation and use of water within the basin, the water is allocated to each country according to its demand and needs. This is achieved through the joint Orange River Re-planning Study done under the auspices of ORASECOM. These allocations are achieved through an elaborate inter basin transfer mechanism to ensure that water is availed at the point of need with minimal losses (Figure 2:26).

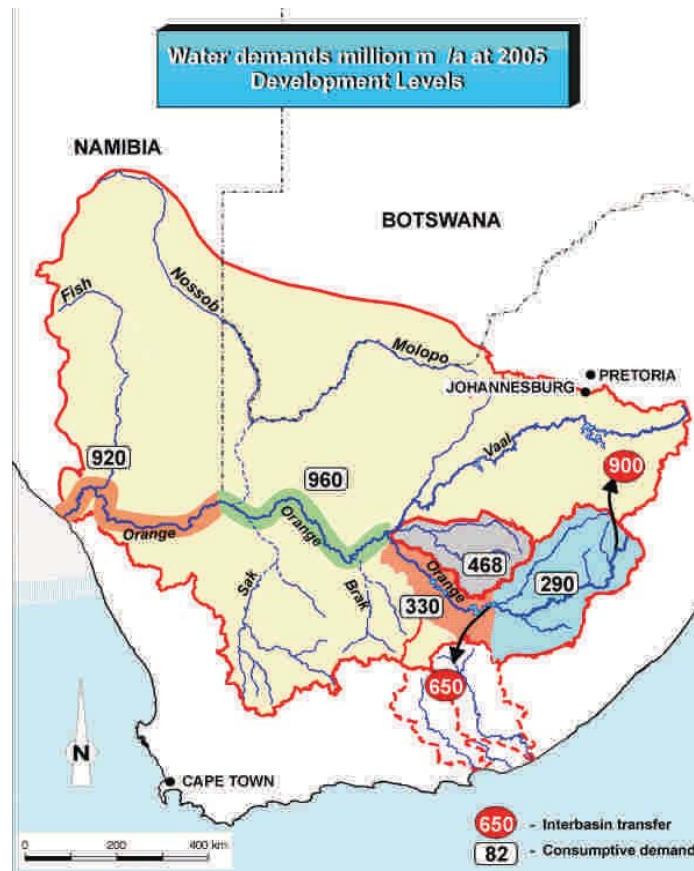


Figure 2:26: Water demand, allocation and transfer in Orange-Senqu

2.6.3.3 *Agricultural Production Activities*

The **agricultural water use** (by 2002) from the Lower Orange, downstream of Vanderkloof Dam, (excluding the Vaal), was 1 375 million m³/a and it was estimated that up to 20%, i.e., 277 million m³/a could be saved and used for irrigating new areas.

A pilot project is being implemented to establish the costs and benefits, which could be achieved by initiatives to improve water use efficiency. The success of water conservation and demand management measures will largely dependent on adequate incentives to farmers, the legislative and administrative regime in South Africa, as well as on significant attention to education and training activities for, and acceptance among numerous private sector irrigators.

Hence the key activities being undertaken to ensure sustained and improved water use efficiency in the basin, particularly in the South African side are;

- ✓ Formulation and establishment of an enabling and supportive legislative and administrative framework,
- ✓ Provision of incentives to farmers to encourage them to use water efficiently
- ✓ Education and training of farmers on use of water saving technologies
- ✓ Encouraging private irrigators to adopt water saving techniques
- ✓ Increased focus on producing high value crops on the lower reaches of the basin where water scarcity is more pronounced while the less valuable cereal crops are produced in areas with abundant rainfall and water

3. **Synthesis of Agriculture in River Basins**

In the past, governments, with the assistance of regional and international partners, have developed models for cooperative frameworks that have led to the establishment of river basin organizations (RBOs). The list of existing RBOs and a brief description of their mandates and activities is given in Annex 1 & 2.

The river basin organisations reviewed provide contrasting management styles that were developed on the basis of geo-political, economic and hydrological considerations. The management styles observed across the world operate under five formal principles;

- i. Watershed Management; which provides a framework for rural development within its boundaries or downstream effects in a hydraulic structure or hydrological regime. The Central government or a bi-national or tri-national commission would normally be the executing body.
- ii. River Basin Management ;normally established to coordinate the action of government and non government institutions in order to solve overriding problems in the basin, usually pollution and to implement water resources management needs and protect the environment. The executing agencies could be a government agency, municipality, community group or civil society.
- iii. International Boundaries and Waters Commissions which provide forums for resolving transboundary water conflict issues or implementing an international treaty. The executing agencies are normally the Foreign Ministries and relevant government technical departments drawn from the riparian countries.
- iv. Bi-national or tri-national river basin commissions formed to manage specific projects within a river basin.
- v. Regional Cooperation, which are autonomous organisations that could be created for decentralised public administration or environmental management.

The kind of cooperation desired should guide in selecting the appropriate management style to adopt. In the Nile Basin, various management systems are in place calling for the establishment of a basin wide management system that could coordinate and streamline the activities of these various organisations to reduce duplication of activities and gain synergy. Such a system in the agricultural context could be tailored to provide;

3.1 Institutional Models and Approaches

Three main types of models for developing institutional frameworks have emerged from cooperation on transboundary water resources management across the World. The underlying principles for effective water management at the basin level however remain as the need to build confidence among riparian countries and the capacity of the RBOs.

- i. In the first model, riparian Countries reach an agreement on a legal framework that leads to the establishment of river basin organization with a full development mandate. The OMVS and NBA have been established following this approach. Should the Nile Basin opt for this approach, then, there will be a need to look at the Nile Waters as a common resource whose harnessing require a coordinated approach. A basin wide development plan could be developed with specific agricultural model and mandate as witnessed in the Mekong case.
- ii. The second type of cooperative arrangement follows the SADC model, where a comprehensive protocol on shared watercourses is agreed at the regional coordination level, providing the legal basis for forming river basin organizations. Such an arrangement could be coordinated within the Nile Basin under the auspices of an economic forum like COMESA. In such an arrangement, the basin could plan agricultural development to meet the food security, trade and market needs across the basin and take advantage of comparative productive advantages existing within the trading block. The GMS approach and the SADC examples could provide a framework for developing such cooperation.
- iii. Under the third model, riparian countries embark on confidence-building measures through the development and implementation of shared vision programmes, before establishing the legal institutional framework. The NBI is a transitional arrangement established under this approach.

Development of a joint program requires that the characteristics of the basin in all of its bio-physical, socio-economic, and geopolitical complexity be understood. This should then be followed by identification of the potential positive-sum solutions based on the disparate interests of each party. Occasionally, this comprehensive approach allowed riparian countries to move beyond looking at water as a commodity to be divided on a zero-sum, rights-based approach and rather to develop an approach that equitably allocates not the water, but the benefits derived from it.

Agreements developed under the Boundary Waters Agreement between Canada and the United States of America; the OMVS and the NBA, for example, allocate not water, but equal benefits, usually defined by hydropower generation, flood control, irrigated agriculture and fishing. This allocation of benefits results in the seemingly odd arrangement that power may be exported out of the basin for gain, but the water itself may not. In the 1964 treaty on the Columbia, an arrangement was worked out where the United States paid Canada for the benefits of flood control and Canada was granted rights to divert water between the Columbia and Kootenai rivers for hydropower. The model derived by the OMVS hinges on this principle too. It addressed the varied interests of the riparian countries (Figure 2:16) by looking at the resource and the needs as a joint issue and the planning and development was therefore done at the Watershed level.

The watershed or river basin council approach is recommendable as it establishes an integrated water resources management strategy and plans water resources assessments nationally and sub-regionally. It

also allows for the establishment of basin committees or councils to coordinate the actions of several overlapping national organisms and administrative jurisdictions and to promote the role and responsibility of the various interest groups in the basin, and facilitates concentration as a problem-solving mechanism. It is also a useful mechanism for achieving greater involvement by the stakeholders and provides a basis for agreement on schemes to account for opportunity costs. In the sub-regional domain, this approach may be useful in solving problems related to water resources management of transboundary river basins, as a vehicle to promote sub-regionally coherent water policies and legislation.

In the second scenario, some treaties simply divide water equally or proportionally between riparians as is the case with the Indus Water Treaty and while some divide the benefits derived from the waters equally proportionally as is the case with ORASECOM and the OMVS. Some treaties favour the existing uses, and/or provide guarantees to down-stream riparians with no regard to the upstream riparian.

One interesting pattern which emerges is that while many international water negotiations begin with differing legal interpretations of rights, whether measured by hydrography or chronology, they often shift rather to needs-based criteria for water allocations, as measured by some mutually agreeable parameter such as irrigable land or population.

The OMVS experience proves that water resources management at the basin level can work in Africa and that it is possible to create reliable socio-economic entities based on the joint and cooperative management of transboundary basins.

The Indus treaty is an example of a shared water resource with the harnessing and development of infrastructure vested in individual countries. The treaty suits countries that live in acrimony over diverse issues but who find a common recourse in sharing the vital water resource.

The new Mekong Agreement that was signed in 1995, after a relatively short period of negotiation benefits from a shared data base, long-established relationships, and the familiarity of the key players. The agreement has led to a rapid development of agricultural production in the basin leading to increased productivity per drop of water. The Basin Wide Approach to planning borrows heavily from the internationally accepted principles of integrated water resource management with national plans being developed on the basis of a common basin vision.

3.2 Development of Water for Food Security in the Nile Basin

During the past three decades, agricultural production in the basin has increased by no more than two percent per year, while population has risen at about three percent. Agricultural productivity per capita has not kept pace with population increase and the region is now in a worse position in terms of nutrition than it was 30 years ago. In most parts of Eastern Africa, the number of people lacking food security almost doubled. Cereal imports are expected also to rise.

It has been estimated that a 3.3% increase in annual agricultural output is needed to achieve the region's food security objectives. In the past, additional food in Africa came from increases in the amount of land cultivated, but as good land becomes less available, the region will be forced to increase yields per hectare. Both rain-fed and irrigated agriculture will need to be intensified. While rain-fed agriculture would benefit from technology inputs on moisture management, it is irrigated agriculture that has a higher potential for intensification.

Currently, three countries control more than 90% of the irrigated areas while the other six countries, share a mere five percent of the irrigated areas. These numbers demonstrate that there is a very wide scope for the expansion of irrigated areas in the region by increasing the proportion of cultivated land

under irrigation. In line with this, a recent FAO projection assumes that in sub-Saharan Africa, 73% of the growth expected by 2030 will come from the intensification of cultivated land. New research from the International Food Policy Research Institute (IFPRI) shows that policy choices and investments made now could either substantially improve or else further worsen the prospects of food security in Africa.

A key question now in relation to management of the river basin is to move away from the ‘stability equilibrium’ of the Nile river system to ‘metastability equilibrium’. This calls for the Nile river managers to understand the dynamic nature of the river systems and evolve flexible institutional and technical options for the river basin management. This ‘threshold approach’, would involve ‘process-oriented’ investigation of the river management problems and efforts to plan and manage them need a site-specific, national driven but basin planned approach. Significant efforts should be placed on evolving the river basin institutions, through a combined watershed and sub-basin development.

3.3 Lessons from the Basins

Cooperative development of the Senegal, Orange, Niger and Mekong Rivers has benefited the economies of the riparian countries by increasing the reliability of key inputs such as electricity and water and improving agricultural development.

- *Grasping opportunities through cooperation.* The countries’ success in collectively raising external investment shows what can be done if all parties cooperate rather than acting unilaterally.
- *Engaging top political leaders.* Political will is fundamental to engendering trust among basin countries and with key international partners.
- *Sharing a vision for development.* From the outset, the basin’s development should be based on an agreed plan that reflects the countries’ priorities through a regional approach.
- *Engaging all stakeholders.* To tap regional opportunities, stakeholders at all levels need to participate in identifying and developing opportunities, and then in sharing the benefits.
- *Looking at different scales of development.* Outcomes at the local, national, and regional levels from development must also be assessed.
- *Binding cooperation with legal instruments.* Legal instruments are needed to capture the agreements and bind future cooperation.
- *Promoting private sector involvement.* Maintaining a consistent policy for private sector involvement is critical.
- *Defining the Agricultural sectoral strategy.* Mainstreaming the agricultural sector into the legal and institutional framework of the river basin is necessary for effective and concerted development of this sector.

3.4 Agricultural issues and activities in the future Nile Organisation

The role of the future Nile RBO will be to realize the stability and development of the agricultural sector through appropriate management of water resources through efforts that will acquire the confidence of people and riparian residents.

The RBO should be the main component of institutional framework in performing integrated water resources management. The RBO should be a professional institution having sufficient capacities and supported with adequate budget to implement water resources management and facilities management in the basin. Capacity development for this purpose is of utmost importance.

Based on the success stories seen in the reviewed water basins, for agriculture to continue to play its significant role in the economies of the Nile riparian countries, the following activities/roles should be defined;

- ✓ **Establishment of a clear institutional structure** within the Nile basin with a mandate to develop and manage the agricultural sector. This structure could be modelled around the two principles governing the systems operating in the Mekong and the Orange-Senqu basins viz;

- An agricultural program with inter ministerial management structure established to formulate basin wide policy and development plans to be adopted by riparian country structures. This will guide in the development and management of the agricultural sector in the basin.
- Bi-lateral and basin wide agreements and structures developed to complement the agricultural program with a clear role of planning and allocating water for the competing sectors according to basin needs to ensure that demand for agricultural water and its effective usage is catered for.
- ✓ Within the auspices of the wider water shed management, ensure that the agricultural sector activities are carried out throughout the basin through;
 - **Advocacy and raising awareness** to integrate agriculture as a key issue in the development of IWRM plans in the future Nile RBO, riparian countries' water sector apex bodies, and leading water sector agencies in the region,
 - **Sharing of information, good practices, and lessons** learned on agricultural development among the participating organizations and countries,
 - **Provide a forum for the management of databases** and web sites for information exchange on equitable and reasonable use of the Nile waters for agricultural production,
 - **Supporting Nile riparian countries to improve water governance**, including establishing enabling policy, institutional, and legal framework for agricultural water use, and the formulation of action plans,
 - **Building capacity of individual country institutions to implement good techniques on agricultural production**, mainly through staff exchange and training among participating institutions,
 - **Supporting institutions with technical advice in regard to the planning, conservation, development**, and the proper and efficient operation and maintenance of water resource facilities, to bring agricultural programs to best practice status within the basin,
 - **Fostering of regional cooperation** for improved management of water resources management in the Nile river basin.
- ✓ Twinning agricultural development within the framework of existing regional trade and economic organisations like COMESA and PTA.

4. Constraints and Limitations to the Review

This work took time to accomplish due to a variety of factors. Information flow from contact sources was slow and the internet based search provided limited information on issues to deal with agriculture.

However within the limits of the data gathered, the review gives an initial attempt at addressing key issues that need to be considered when formulating the future Nile Basin River Organisation. Among the key issues would be the formulation of an institutional and legal framework to govern the agricultural sector, determining the important sectoral program and activities.

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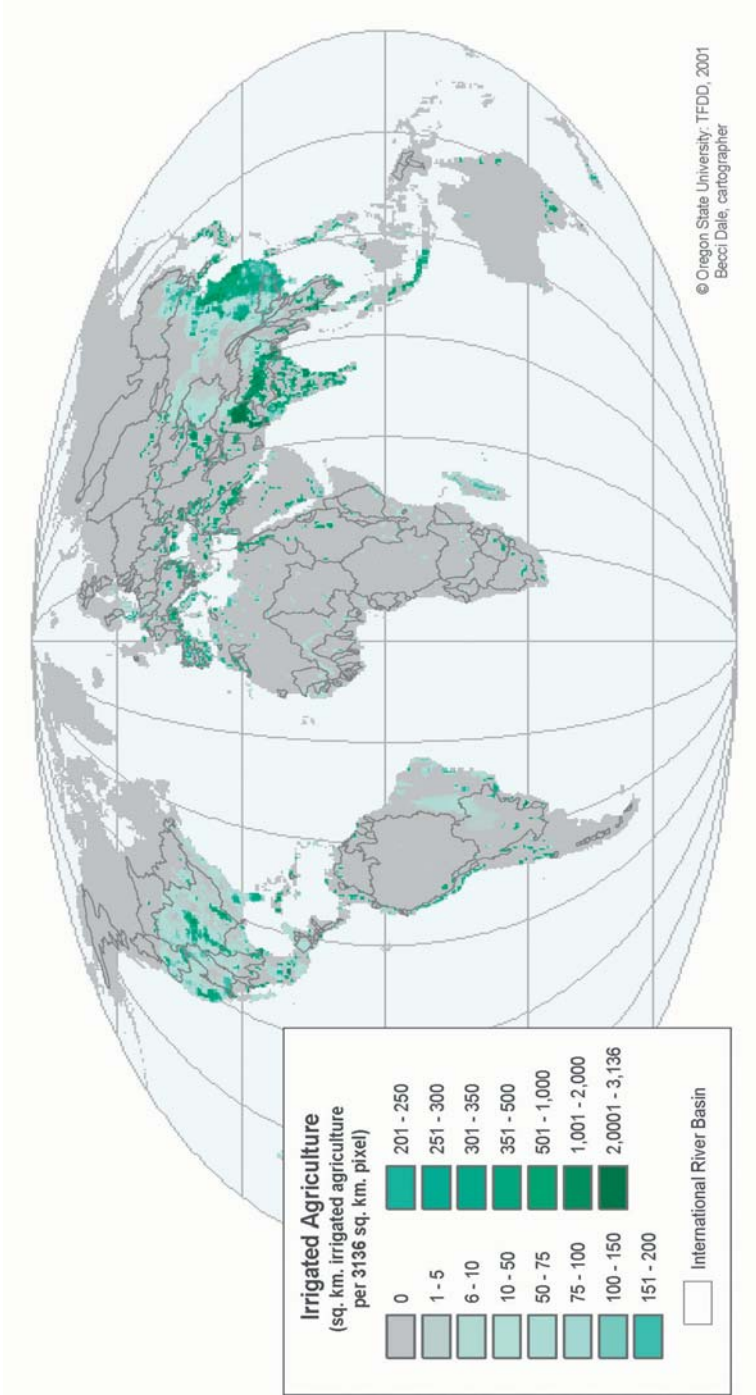
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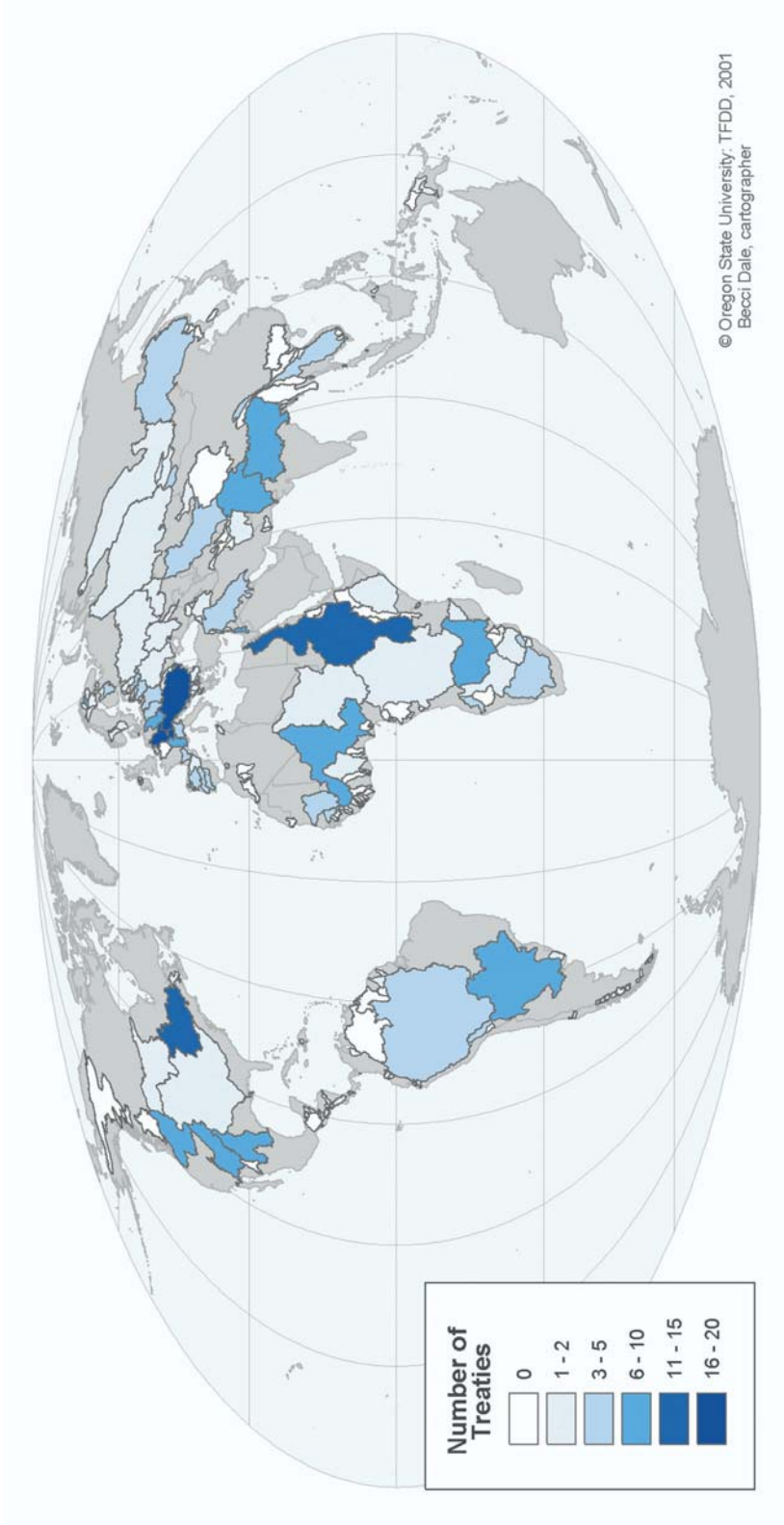
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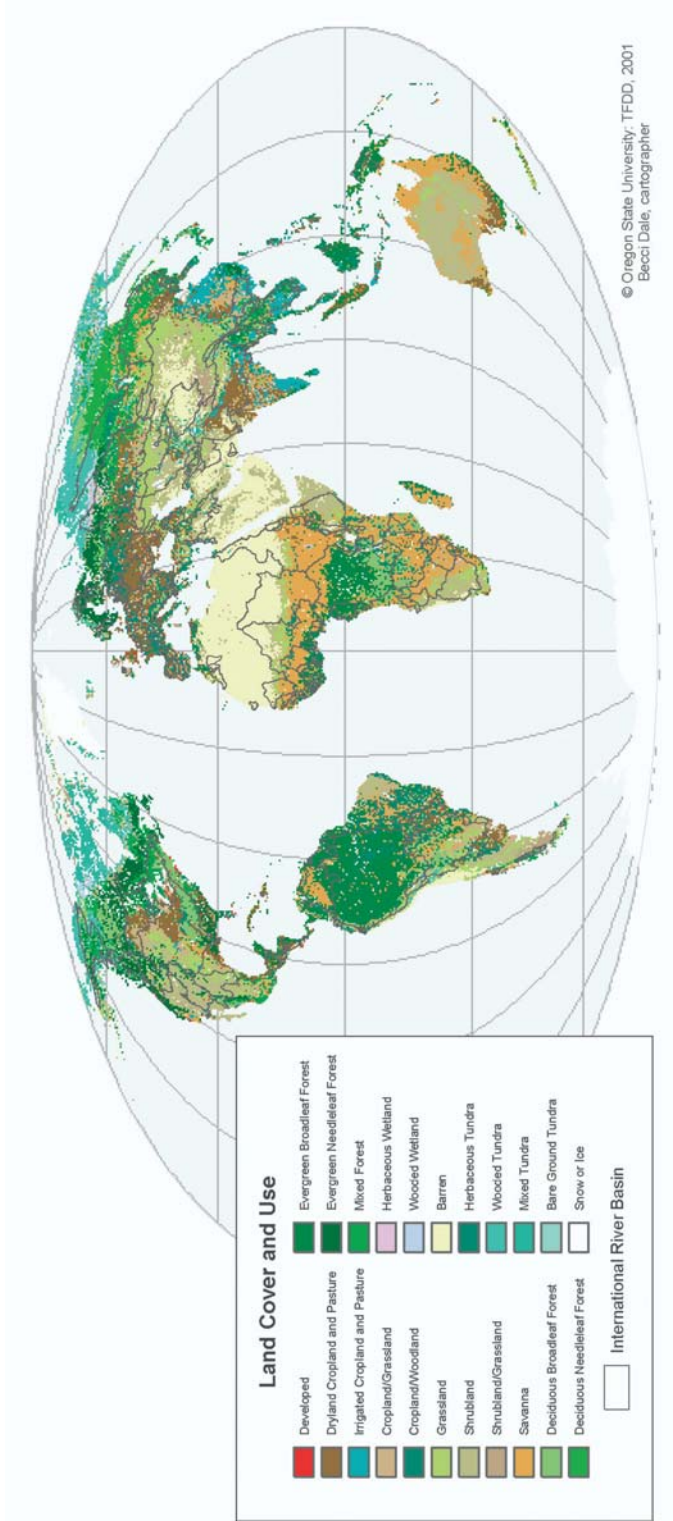
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APPENDIX

A.1 International River Basin Organizations Data

Africa

Name	Participating countries	Level of Collaboration	Type of Collaboration	Principal Issue	Date	Description
Congo/Zaire						
Commission Internationale du Bassins Congo-Oubangui-Sangha (CICOS)	Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of Congo, (Kinshasa)	Official	Commission	Water quality, navigation, flood control/ relief, infrastructure/ development	Nov. 6, 1999, effective since Nov. 23, 2003	Commission Internationale du Bassins Congo-Oubangui-Sangha (CICOS).
Corubal						
Gambia River Basin Development Organization (OMVG: Organisation pour la Mise en Valeur du Fleuve	Guinea, Guinea-Bissau	Official	Organization and economic program	Hydro-power/ hydro-electricity, flood control/ relief, irrigation, infrastructure/ development	1978	The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Saltinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socio-economic integration of its members States.

Gambie)								
Gambia								
Gambia River Basin Development Organization (OMVG: Organisation pour la Mise en Valeur du Fleuve Gambie)	Guinea, Guinea-Bissau	Official	Organization and economic program	Hydro-power/ hydro-electricity, flood control/ relief, irrigation , infrastructure/ development	1978	The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Salinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socio-economic integration of its members States.		
Geba								
Gambia River Basin Development Organization (OMVG: Organisation pour la Mise en Valeur du Fleuve Gambie)	Guinea, Guinea-Bissau, Senegal	Official	Organization and economic program	Hydro-power/ hydro-electricity, flood control/ relief, irrigation , infrastructure /development	1978	The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Salinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socio-economic integration of its members States.		
Incomati								
Tripartite Permanent Technical Commission (TPTC)	Mozambique, South Africa, Swaziland	Official	Commission	Joint management, infrastructure/ development, technical cooperation/ assistance	February 15, 1991	Tripartite Permanent Technical Commission (TPTC).		

Joint Water Commission (JWC)	South Africa, Swaziland	Official	Commission	Joint management, infrastructure/development, technical cooperation/assistance	March 13, 1992	The Joint Water Commission was established as a technical advisory commission to advise the Governments of the Kingdom of Swaziland and the Republic of South Africa on water resources of common interest. The JWC was formed through the JWC treaty signed in 1992. There are three commissioners appointed by each Government for a period determined by each Government. The JWC monitors the activities of KOBWA on behalf of the governments of Swaziland and South Africa.
Komati Basin Water Authority (KOBWA)	Mozambique, South Africa, Swaziland	Official	Organization and economic program	Joint management, infrastructure/development, technical cooperation/assistance	1993	A bi-national company formed in 1993 through the treaty on the Development and Utilization of the Water Resources of the Komati River Basin signed in 1992 between the Kingdom of Swaziland and the Republic of South Africa. The purpose of KOBWA is implementing Phase 1 of the Komati River Basin Development Project. Phase 1 comprise the design, construction, operation and maintenance of Driekoppies Dam in South Africa (Phase 1a) and the Maguga Dam in Swaziland (Phase 1b). Additional party involved: Mozambique which shares the same river system and is participating through TPPTC.
Kunene						
Angola Namibian Joint Commission of Cooperation (ANJCC)	Angola, Namibia	Official	Commission	Economic development, joint management, infrastructure/development, technical cooperation/assistance	1996	Angola Namibian Joint Commission of Cooperation (ANJCC)
Joint Operating Authority	Angola, Namibia	Official	Organization	Economic development, joint	Data not available	Joint Operating Authority

Permanent Joint Technical Commission	Angola, Namibia	Official	Commission	Joint management, technical cooperation/ assistance	Data not available	Permanent Joint Technical Commission
Lake Chad						
Lake Chad Basin Commission (LCBC)	Cameroon, Central African Republic, Chad, Niger, Nigeria,	Official	Commission	Water quality, water quantity, navigation, fishing, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance, border issues	May 22, 1964	The Commission is a Regional Government Organization, designed to manage the basin and to resolve disputes that might arise over the lake and its resources. The aims of the Commission are to regulate and control the utilization of water and other natural resources in the basin; to initiate, promote and coordinate natural resources development projects and research within the basin area; to examine complaints; and to promote the settlement of disputes, thereby promoting regional cooperation. Note: the Central African Republic joined in 1994 and Sudan was admitted as an observer by the 10th Summit held in N'Djamena in July, 2000. It will become the sixth member state after ratifying the convention and statute which created the Commission.
Basin Committee for Strategic Planning (BCSP)	Cameroon, Central African Republic, Chad, Niger, Nigeria	Official	Organization	Economic development, joint management, infrastructure/ development, technical cooperation/ assistance	Data not available	Basin Committee for Strategic Planning (BCSP); created through LCBC, for local initiatives.
Limpopo						

Limpopo Watercourse Commission (LIMCOM)	Botswana, Mozambique, South Africa, Zimbabwe	Official	Commission	Economic development, joint management, infrastructure/development, technical cooperation/assistance	November 1, 2003	This commission was negotiated by the Limpopo Basin Permanent Technical Committee. The Commission between South Africa, Botswana, Mozambique and Zimbabwe is to manage the Limpopo River and must facilitate the building of capacity within the four countries to manage the water resource.
Limpopo River Basin Commission (LIRC)	Botswana, Mozambique, South Africa, Zimbabwe	Official	Commission	Economic development, joint management, infrastructure/development, technical cooperation/assistance	1995	Institutional arrangement to manage water. Operating on a river-catchment basis, rather than by national boundaries, this body provides an appropriate institutional vehicle to guide the development in the basin.
Limpopo Basin Permanent Technical Committee (LBPTC)	Botswana, Mozambique, South Africa, Zimbabwe	Official	Organization	Economic development, joint management, infrastructure/development, technical cooperation/assistance	1986	In 1986, Limpopo Basin States signed in Harare, Zimbabwe, a multilateral agreement establishing a Limpopo Basin Permanent Technical Committee (LBPTC), which was set up to advise, the parties on issues regarding the river. The LBPTC did not however function during its first ten years. LBPTC's second meeting was held in South Africa in 1995. At the meeting, it was agreed to activate the LBPTC, which was a dead organization, and discussions concentrated on mutual interest regarding the common river.
Joint Permanent Technical Committee (JPTC)	Botswana, Mozambique, South Africa, Zimbabwe	Official	Organization	Joint management, technical cooperation/assistance	1983	The JPTC was established in 1983 to make recommendation on matters concerning common interest in the Limpopo.
Joint Water	Mozambique,	Official	Commission	Joint management,	1996	In 1996, after South Africa's political change, the two countries

Commission (JWC)	South Africa			technical cooperation/ assistance		signed in Mozambique, an agreement establishing a Joint Water Commission (JWC), with advisory functions on technical matters relating their common rivers, including the Limpopo.
Mana-Morro						
Mano River Union (MRU)	Guinea, Liberia, Sierra Leone,	Official	Organization	joint management	October 3, 1973	The MRU was established in 1973 to constitute a customs and economic union between the member states in order to improve living standards. Decisions are taken at meetings of a joint ministerial committee. The governments of all three 'Mano River Union' countries recognise that their individual future prosperity depends on increasing dialogue and co-operation between them, and moves to revitalise the Mano River Union are likely to resume as soon as peace has returned to Sierra Leone and to the respective border regions of the three countries.
Niger						
Niger Basin Authority (NBA)	Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone	Official	Organization	Water quality, hydro-power/ hydro-electricity, navigation, fishing, flood control/ relief, economic development, joint management, irrigation , infrastructure/ development, technical cooperation/ assistance	1980	Niger Basin Authority (NBA), formerly the Niger River Commission (RNC). The NBA is one of the oldest African Intergovernmental Organization as its creation dates back to 1964 when it was called River Niger Commission. The River Niger Commission functioned for seventeen years and the results achieved were deemed insufficient. Consequently, the member states decided to replace it with a new organization, the Niger Basin Authority which became heir to all the assets, liabilities and programs initiated by the River Niger Commission. The aim of the Niger Basin Authority is to promote cooperation among the member countries and to ensure integrated development in all fields through development of its resources.
Nigeria-Niger	Niger, Nigeria	Official	Commission	Joint management,	July 18,	This commission was set up to monitor the implementation of the

Joint Commission for Co-operation (NNJC)				water quantity	1990	provisions of the 1990 'Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the equitable sharing in the development, conservation and use of their common water resources'.
Nile						
Nile Basin Initiative (NBI)	Burundi, Central African Republic, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of Uganda, Kenya, Rwanda, Sudan (administered by Egypt).	Official	Organization and economic program	Economic development, joint management, other: poverty eradication	1999	The NBI is a transitional mechanism that includes nine Nile riparian countries as equal members in a regional partnership to promote economic development and fight poverty throughout the Basin. The vision of the NBI is to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources. Within the framework of the Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE), a Nile River Basin action plan was prepared in 1995 with support from CIDA. In 1997, the World Bank agreed to a request by the Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM) to lead and coordinate donor support for their activities. In 1998, recognizing that cooperative development holds the greatest prospects of bringing mutual benefits to the region, all riparians, except Eritrea, joined in a dialogue to create a regional partnership to facilitate the common pursuit of sustainable development and management of Nile waters.
Technical Cooperation Committee for the Promotion of the Development and Environmental	Burundi, Central African Republic, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic	Official	Organization and environmental program	Joint management, technical cooperation/ assistance	1993	Formed in an effort to focus on a development agenda.

Protection of the Nile Basin (TECCONILE)	Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)						
The Permanent Joint Technical Committee (PJTC)	Sudan, Egypt	Official	Committee	Joint management, water quantity	1959	Formed to preside on the application of the 'Nile Waters Treaty Agreement' of 1959.	
Nile (Lake Victoria subbasin)							
Lake Victoria Fisheries Organization	Kenya, Tanzania, Uganda,	Official	Organization and environmental program	Water quality, fishings, joint management	June 30, 1994	Objectives: To foster co-operation amongst the Contracting Parties in matters regarding Lake Victoria; To harmonize national measures for the sustainable utilization of the living resources of the Lake; To develop and adopt conservation and management measures to assure the health of the Lake's ecosystem and the sustainability of its living resources. The Lake Victoria Fisheries Organization was established by a Convention (mandate) signed on 30th June 1994, in Kisumu, Kenya by the "Contracting Parties" who consist of the Governments of the Republic of Kenya, the Republic of Uganda and the United Republic of Tanzania.	
The Lake Victoria Basin Commission (LVBC)	Kenya, Tanzania, Uganda	Official	Commission	Water quality, joint management	June 1, 2006	The Lake Victoria Basin Commission (LVBC) was established by the Protocol on Sustainable Development of Lake Victoria Basin. It is the apex institution of East African Community (EAC) mandated with overall coordination. The Commission became effective in July 2005 and launched in June 2006. Previously the mandate was with	

									the Lake Victoria Development Programme (LVDP) since 2001. It's vision is worded as follows: "A prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits".
Nile (Kagera subbasin)									
Organization for the Management and Development of the Kagera River Basin	Burundi, Rwanda, Tanzania and Uganda	Official	Organization	Hydropower	February 5, 1978	Organization for the Management and Development of the Kagera River Basin			
Okavango									
The Permanent Okavango River Basin Commission (OKACOM)	Angola, Botswana, Namibia,	Official	Commission	Joint management	September 15, 1994	OKACOM is a regional, high-level committee that was formed to ensure the water resources of the Okavango River system are managed in appropriate and sustainable ways and to foster co-operation and co-ordination between the three Basin states; Angola, Namibia, and Botswana.			
Joint Permanent Water Commission (JPWC)	Botswana, Namibia	Official	Commission	Joint management	November 13, 1990	JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.			
Orange									
Orange/Senqu River Commission (ORASECOM)	Botswana, Lesotho (Kingdom of), Namibia, South Africa	Official	Commission	Joint management	November 3, 2000	ORASECOM is the first RBO to be established in terms of the SADC Protocol on Shared Watercourse Systems. The secretariat was established in 2003.			
Lesotho Highlands	Lesotho (Kingdom of),	Official	Organization and economic	Water quantity, Hydro-power/	1930	The LHDA was set up to implement and operate that part of Lesotho Highlands Water Project (LHWP) that falls within the			

Development Authority (LHDA)	South Africa		program	hydro-electricity, economic development, joint management, technical cooperation/ assistance		borders of Lesotho.
Lesotho Highlands Water Commission (LHWC)	Lesotho (Kingdom of), South Africa	Official	Commission	Joint management, technical cooperation/ assistance	October 24, 1986	The signing of the Lesotho Highlands Water Project Treaty by the Government of Lesotho and of the Republic of South Africa on the 24th October 1986 established the Joint Permanent Technical Commission (JPTC) to represent the two countries in the implementation and operation of the LHWP. The Joint Permanent Technical Commission (JPTC), was later renamed the Lesotho Highlands Water Commission (LHWC) with a secretariat in Lesotho to monitor and oversee the Treaty.
Permanent Water Commission (PWC)	Namibia, South Africa	Official	Commission	Joint management, technical cooperation/ assistance	1992	In a bilateral agreement in 1992, Namibia and South Africa established a Permanent Water Commission (PWC). PWC was to act as a technical adviser to the Parties on matters relating to the development and utilization of the Orange water resources.
Joint Irrigation Authority (JIA)	Namibia, South Africa	Official	Organization and economic program	Joint management, irrigation, technical cooperation/ assistance	1992	Countries signed in 1992 another agreement establishing a JIA, administering an existing irrigation scheme along the riverbanks under the auspices of the PWC.
Senegal						
Organisation pour la Mise en Valeur du bassin du fleuve Senegal (OMVS)	Mali, Mauritania, Senegal	Official	Organization and economic program	Water quality, water quantity, hydro-power/ hydro-electricity, navigation, flood	March 11, 1972	In 1963, shortly after independence, Guinea, Mali, Mauritania, and Senegal signed the Bamako Convention for the Development of the Senegal River Basin that declared the Senegal River to be an "International River" and create an "Interstate Committee" to oversee its development. In 1968, the Labe Convention created the

				control/ relief, economic development, joint management, irrigation , infrastructure/ development, technical cooperation/ assistance		Organisation of Boundary states of the Senegal River (OERS - Organisation des Etats Riverains du Sénégal). In 1972 the OMVS, a river management organisation, was created replacing the OERS which broke up after the withdrawal of its fourth member, Guinea.
Volta						
Liptako-Gourma Integrated Authority or Autorite de developpement integre de la region du Liptako-Gourma (ALG)	Burkina Faso, Mali, Niger	Official	Organization and economic program	Hydro-power/ hydro-electricity, navigation, fishing, economic development, irrigation , infrastructure/ development	December 3, 1970	The ALG, a sub-regional institution has the primary mission to promote the integrated development of the Liptako-Gourma region with a view to improving the living conditions of the population.
Zambezi						
Zambezi Watercourse Commission (ZAMCOM)	Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of,	Official	Commission	Border issues, territorial issues	July 13, 2004	Commission to manage and develop the Zambezi river's water resources. Besides managing the Zambezi's resources, the Commission, consisting of three organs - a council of ministers, a technical committee and a secretariat drawn from all eight countries - will advise member countries on planning, utilisation, protection and conservation issues around the river. Country representatives will also protect national interests in actual or potential disputes. Signing the agreement is expected to bring benefits across all sectors,

	Botswana, Namibia, Zambia, Zimbabwe					including trade, industry, energy production, food security, transport and communication, tourism, regional security and peace. Additional parties involved: SADC and the ZRA. The formation of ZAMCOM as by the Watercourse protocol is part of the ongoing Project 6 of the ZACPLAN. The sixth project is considered as a key part of the ZACPLAN formulate a development strategy and simulate various development scenarios for the Basin.
Zambesi River Authority (ZRA)	Zambia, Zimbabwe	Official	Organization and economic program	Water quality, economic development, joint management, technical cooperation/ assistance	1987	The Zambezi River Authority is governed by a Council of Ministers consisting of four members, two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of Zimbabwe. Mission: to cooperatively manage and develop in an integrated and sustainable manner the water resources of the Zambezi River in order to supply quality water, hydrological and environmental services for the maximum socio-economic benefits to Zambia, Zimbabwe and the other Zambezi River basin countries. Promoting regional cooperation in integrated water resources management; Providing hydrological and environmental services to the entire Zambezi River countries; Efficiently, equitably and sustainably managing and operating the Kariba Complex and other future dams on the common Zambezi River.
Joint Permanent Water Commission (JPWC)	Botswana, Namibia	Official	Commission	Joint management	November 13, 1990	JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.

Asia

Name	Participating countries	Level of Collaboration	Type of Collaboration	Principal Issue	Date	Description
Amur River Coordination	China, Mongolia,	Official	Commission	Joint management	2004	Amur River Coordination Committee

<p>Interstate Coordination Water Commission (ICWC)</p>	<p>Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan</p>	<p>Official</p>	<p>Commission</p>	<p>Water quantity, water quality, joint management</p>	<p>Feb. 18, 1995</p>	<p>On February 18, 1992 the five Ministers of Water Resources of Central Asian states signed an "Agreement on cooperation in joint management, use and protection of interstate sources of water resources" and this agreement founded the ICWC. Executive bodies of ICWC are River Basin Authorities (BWOs) SyrDarya and AmuDarya. BWOs are in charge of planning and managing water flow schedules and water resources distribution, as well as direct implementation of the decisions made by ICWC relevant to water allocation, schedules of water flow and releases, water quality control.</p>
<p>International Fund for saving the Aral Sea (IFAS)</p>	<p>Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan</p>	<p>Official</p>	<p>Organization</p>	<p>Other: research and education</p>	<p>1994</p>	<p>An interstate organisation established in order to fund and credit joint regional environmental and research programmes and projects aimed at saving the Aral Sea and improving the environmental situation in the areas affected by the disaster as well as solving regional socio-economic problems. Primary goals include: stabilising and improving the environment of the Aral Sea Basin, rehabilitating the disaster zones, improving water resource management, and increasing the capacity of local and state institutions for planning and implementing programs. -</p>
<p>A Joint Water Committee (JWC)</p>	<p>Israel, Jordan</p>	<p>Official</p>	<p>Commission</p>	<p>Water quality, water quantity, joint management</p>	<p>1994</p>	<p>A Joint Water Committee (JWC) - to jointly manage water resources of the West Bank; for the purposes of monitoring, planning, study, information sharing, and dispute resolution. The Joint Water Committee is to manage mutual water resources, operate jointly established monitoring stations to monitor the quality of water along their boundary, and to develop plans to supply Jordan with an additional 50 mcm/yr. of drinking water.³⁸ Article 6 of the Jordan Israel Peace Treaty provides for mutual assistance in the alleviation</p>

								of water shortages. The JWC served as an institutional mechanism for the interim period, mainly to oversee the implementation of Article 40 (of the agreement deals with water allocation but refers to the immediate needs of the Palestinians without considering the principle of equitable and reasonable utilization of the water resources by both sides).
Coruh								
Joint Boundary Water Commission	Turkey, former USSR (Georgia)	Official	Commission	Joint management	1973			Joint Boundary Water Commission.
Fenny								
Indo- Bangladesh Joint Rivers Commission	India, Bangladesh	Official	Commission	Joint management	March 19, 1972			Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).
Joint Committee of Experts	India, Bangladesh	Official	Commission	Joint management, water quantity	November 22, 1985			Joint Committee of Experts.
Fly								
Fly River Provincial Boundaries Commission	Indonesia, Papua New Guinea	Official	Commission	Joint management	1978			Established in accordance with the Fly River Constituencies Act.
Ganges-Brahmaputra-Meghna								
Indo- Bangladesh Joint Rivers Commission	India, Bangladesh	Official	Commission	Joint management	March 19, 1972			Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).

Joint Committee	India, Bangladesh	Official	Commission	Water quantity	December 12, 1996	Joint Committee to record at Farakka the daily flow below Farakka barrage, in the Feeder canal, at the Navigation Lock, as well as at the Hardinge Bridge.
Ganges-Brahmaputra-Meghna (Mahakali subbasin)						
Mahakali River Commission	India, Nepal	Official	Commission	Water quantity	February 12, 1996	Mahakali River Commission, resulting from the Mahakali Treaty of 12 February 1996. The Commission has been directed to: (i) seek information on and, if necessary, inspect all structures included in the Mahakali Treaty; (ii) make recommendations for the conservation and utilization of the Mahakali River; (iii) provide expert evaluation of projects and make recommendations thereto; (iv) coordinate and monitor plans of action; and (v) examine any differences arising between the two countries concerning the Treaty's interpretation and application.
Helmand						
Helmand River Delta Commission	Afghanistan, Iran, (Pakistan)	Official	Commission	Water quantity, joint management		Task: to measure and divide the river flows between the two signatories.
Indus						
Indus Water Commission or Permanent Indus Commission	India, Pakistan	Official	Commission	Water quantity, joint management	1960	Regulates the allocation of waters from the Indus River basin between India and Pakistan.
Jordan						
Joint Water Committee	Jordan, Palestina	Official	Commission	Water quantity, water quality, joint management	1995	Joint Water Committee set up as a result of the 'Israel-Jordan Peace treaty' of 1994. This treaty provided for this Committee to function as the implementing body of the Program of Action, to oversee water allocation, storage,

								water quality protection, information transfers and data sharing, and generally to coordinate action in alleviating water shortages.
Jordan (Yarmouk subbasin)								
Joint Syro-Jordanian Commission	Jordan, Syria	Official	Commission	Water quantity, joint management	July 8, 1953	Joint Syro-Jordanian Commission set up under the 'Agreement Between the Republic of Syria and the Hashemite Kingdom of Jordan Concerning the Utilization of the Yarmuk Waters' which entered into force on 8 July 1953. It was established for the application of the provisions of this Agreement, the regulation and exercise of the rights and obligations which the two Governments have assumed there under and supervision over the settlement of all questions to which its application may give rise.		
Karnaphuli								
Indo- Bangladesh Joint Rivers Commission	India, Bangladesh	Official	Commission	Joint management	March 19, 1972	Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).		
Joint Committee of Experts	India, Bangladesh	Official	Commission	Joint management, water quantity	November 22, 1985	Joint Committee of Experts.		
Kura-Araks								
Joint Commission	Georgia, Turkey				being set	Joint Commission		
Mekong								
Mekong River Commission (formerly known as Mekong)	Cambodia, Lao PDR, Thailand and Vietnam	Official	Commission	Hydro-power/ hydro-electricity, irrigation, navigation,	1957	A coordinating mechanism between the four countries. Original aim was development of large scale water-resource developments, but this has never been realized. Now objections include hydropower, irrigation, flood control,		

Committee; name change in 1995)				fishing, flood control/ relief, joint management		collection and distribution of hydrological data. Also, the MRC serves as focal point for donor organizations and countries. MRC maintains regular dialogue with the two upper states of the Mekong River Basin, China and Myanmar. The MRC member countries agree to co-operate in all fields of sustainable development, utilisation, management and conservation of the water and related resources of the Mekong River Basin, such as navigation, flood control, fisheries, agriculture, hydropower and environmental protection.
ASEAN- Mekong Basin Development Cooperation (AMBDC)	Brunei Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam	Official	Commission	Economic development, joint cooperation	June 17, 1996	ASEAN-Mekong Basin Development Cooperation (AMBDC) was set up by the Ministers of the countries to cooperate in the development of the Mekong Basin. The main objectives of this cooperation are (i) to enhance economically sound and sustainable development of the Mekong Basin; (ii) to encourage a process of dialogue and common project identification which can result in firm economic partnerships for mutual benefit; and (iii) to strengthen the interconnections and economic linkages between the ASEAN member countries and the Mekong riparian countries.
Talas						
The Commission of the Republic of Kazakhstan and the Kyrgyz Republic on the Use of Water Management	Kazakhstan, Kyrgyzstan	Official	Commission	Joint management	January 21, 2000	Article 5 of the international agreement between the Government of the Kazakh Republic and the Government of the Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas states that "in order to ensure safe and reliable work of water management facilities of intergovernmental status, the Parties shall create permanent commissions to determine the

Facilities of Intergovernmental Status on the Rivers Chu and Talas							working regimes and the range of necessary expenses for exploitation and maintenance".
Tumen							
The Tumen River Area Development Coordination Committee	China, DPRK and Russia	Official	Committee	Economic development, joint management	1996		The Committee's purpose was to advance development of Tumen River Economic Development Area (TREDA).
Tumen River Area Consultative Commission	China, DPRK, Mongolia, ROK, and Russia	Official	Commission	Economic development, joint management	1996		The Commission's purpose was to support development in Tumen River Economic Development Area (TREDA) as well as the Northeast Asia region.
Tigris-Euphrates/Shatt al Arab							
Joint Technical Committee on Regional Waters	Iraq, Turkey (and Syria)	Official	Commission	Water quantity, technical assistance/cooperation, joint management	1980		Formed on the basis of a former protocol (1946) concerning the control and management of the Euphrates and the Tigris. Set up in 1980 by both countries to discuss regional water matters. Syria joined the committee afterwards.

Europe

Name	Participating countries	Level of	Type of		Principal Issue	Date	Description
			Collaboration				

Danube						
Joint Commission	Poland, Ukraine	Official	Commission	-	October 10, 1996	Joint Commission established according to the agreement signed by both countries on October 10, 1996.
International Commission for the Protection of the River Danube (ICPDR)	Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Moldova, Poland, Romania, Slovakia, Slovenia, Switzerland, Ukraine, Yugoslavia (Serbia and Montenegro)	Official	Commission	Water quality, joint management	October 22, 1998	The ICPDR is an international organisation consisting of 13 cooperating states and European Union, implementing the Danube River Protection Convention. It is the institutional frame not only for pollution control and the protection of water bodies but it sets also a common platform for sustainable use of ecological resources and coherent and integrated river basin management. The ICPDR is the body charged to implement the "Convention on the Protection and Sustainable Use of the Danube River" (Danube River Protection Convention, DRPC).
Danube Commission	Austria, Bulgaria, Croatia, Germany, Hungary, Moldova, Slovakia, Romania, Russia, Ukraine, Serbia	Official	Commission	Navigation	May 1, 1905	The member states should maintain their sections of the Danube in a navigable condition for river-going and, on the appropriate sections, for sea-going vessels and carry out the works necessary for the maintenance and improvement of navigation conditions and not to obstruct or hinder navigation on the navigable channels of the Danube.
Danube (subbasin Tisza)						

Joint Commission	Ukraine, Slovakia	Official	Commission	Joint management	1994	For the regulation of water supply.
Danube (subbasin Sava)						
International Sava River Basin Commission	Bosnia and Herzegovina, Republic of Croatia, Republic of Slovenia, Republic of, and Yugoslavia, Federal Republic of	Official	Commission	Water quality, flood control/relief, joint management	December 29, 2004	International Sava River Basin Commission
Daugava						
Russian-Byelorussian-Latvian Commission	Russian Federation, Republic of Belarus and Republic of Latvia	-	-	-	Draft agreement May 2003	Draft agreement includes the establishment of a joint commission ("To accomplish the aims of the present Agreement the Parties shall establish a joint Russian-Byelorussian-Latvian Commission on the use and protection of water resources of the Zapadnaya Dvina/Daugava River Basin").
Dnieper						
International Dnieper Basin Council	Belarus, Russian Federation and Ukraine	Official	Commission	Joint management, border issues	2003	In 2003, Ministers of Belarus, Russian Federation and Ukraine signed a statement on ecological rehabilitation of the Dnieper River, leading to the creation of the International Dnieper Basin Council. The creation of this Council was facilitated within the framework of the UNDP-GEF Dnieper Basin Environment Programme. The Council is consultative in nature and will function as a coordinating body to ensure effective international cooperation focused on the environmental rehabilitation of the Dnieper basin. It will play an active role in the development and implementation of both the regional Strategic Action Plan as well as the

							three countries' National Action Plans. It will also aim to ensure the development of stable transboundary monitoring systems, encourage sustainable exchange of environmental information and facilitate wide participation of interested stakeholders in river basin management.
Dniester							
Joint Commission	Poland, Ukraine	Official	Commission	-	October 10, 1996	Joint Commission established according to the agreement signed by both countries on October 10, 1996.	
Duero / Douro							
International Commission of International Rivers	Portugal, Spain	Official	Commission	Hydropower, water quantity	July 16, 1964	Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.	
Elbe							
International Commission for the Protection of the Elbe (ICEP)	Czech Republic, European Union, Germany	Official	Commission	Water quality, joint management	1990	The contracting parties shall cooperate in the International Commission for the Protection of the Elbe to prevent the pollution of the Elbe and its drainage area. The main goals are the possibility to produce drinking water from water pumped from the river accompanying groundwater, possibility to use the water and sediments for agriculture, return to a close to natural ecosystem with a healthy species diversity, and reducing the bad effects of Elbe river basin on the North Sea.	
German- Czech boundary waters commission	Czech Republic, Germany	Official	Commission	Water quality, water quantity, flood control/relief, economic development	December 12, 1995	German-Czech boundary waters commission	
Garonne (Lake Lanoux subbasin)							
Joint Commission	France and Spain	Official	Commission	Water quantity	January	Joint Commission set up to supervise the implementation of the	

						27, 1970	measures referred to in the 'Agreement Between the Government of the French Republic and the Spanish Government Relating to Lake Lanoux' which entered into force on 27 January 1970.
Guadiana							
International Commission of International Rivers	Portugal, Spain	Official	Commission	Hydropower, water quantity		July 16, 1964	Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Kemi							
Finnish-Norwegian Transboundary Water Commission	Finland, Norway	Official	Commission	Water quality, joint management		1980	The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role. It submits proposals and motions and issues statements on matters related to water management. Many actions need preparatory work, for example, monitoring of the state of the environment and activities influencing the catchments, as well as hearing experts before (recommendations) decisions can be made by the Commission.
Lake Prespa (Lake Ohrid subbasin)							
Alliance for Lake Cooperation in Prespa and Ohrid	Albania, Macedonia	Official	Organization	Border issues		January 15, 2000	The alliance focuses on promoting and supporting the cross-border activities in the protection of the environment in the Region of Ohrid and Prespa Lakes aiming at sustainable development of the region. The approach includes development of cross border cooperation and coordination between the relevant states and above all local government and NGOs in order to ensure the active participation of the local population.
Lima							

International Commission of International Rivers	Portugal, Spain	Official	Commission	Hydropower, water quantity	July 16, 1964	Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Mino						
International Commission of International Rivers	Portugal, Spain	Official	Commission	Hydropower, water quantity	July 16, 1964	Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Naatamo						
Finnish-Norwegian Transboundary Water Commission	Finland, Norway	Official	Commission	Water quality, joint management	1980	The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role. It submits proposals and motions and issues statements on matters related to water management. Many actions need preparatory work, for example, monitoring of the state of the environment and activities influencing the catchments, as well as hearing experts before (recommendations) decisions can be made by the Commission.
Narva						
Estonian- Russian Joint Transboundary Water Commission	Estonia, Russia	Official	Commission	Joint management	1997	Estonian - Russian Joint Transboundary Water Commission
Neman						
Joint Commission	Lithuania,	Official	-	-	being set	Joint Commission.

	Poland					up	
Joint Commission	Russian Federation, Poland	Official	-			being set up	Joint Commission.
Ob							
Joint Russian-Kazakhstan Commission for Utilization and Protection of Transboundary Waters	Kazakhstan, Russia	Official	Commission	Water quality, water quantity, joint management		Data not available	Joint Russian-Kazakhstan Commission for Utilization and Protection of Transboundary Waters.
Ob (Irtysh subbasin)							
International Commission for the management of the Irtysh	Russia, Kazakhstan	Official	Commission	Joint management, water quality		1992	International Commission for the management of the Irtysh.
Ob (Tobol subbasin)							
Joint Working Group on Basin of River Tobol	Russia, Kazakhstan	Official	Commission	Water quality, water quantity, irrigation, flood protection/control		20 June 1996	Joint Working Group on Basin of River Tobol.
Oder/Odra							
International Commission for the Protection of the Oder River against Pollution	Poland, the Czech Republic, Germany	Official	Commission	Water quality, flood control/relief, joint management		April 26, 1999	The objectives of the ICPOAP are: 1. to prevent the pollution of the Oder and the Baltic Sea by contaminants and to achieve a reduction in the pollution thereof; 2. to achieve the most natural aquatic and littoral ecosystems possible with the corresponding species diversity;

(ICPOAP)							3. to permit utilisation of the Oder, in particular the production of drinking water from bank filtrate and the use of its water and sediments in agriculture; 4. to provide for precautions against the risk of flood damage and achieve a sustained reduction thereof; and 5. to coordinate implementation of the Water Framework Directive in the Oder river basin.
International Oder Commission	Poland, Prussia, Czechoslovakia, Great Britain, France, Sweden	Official	Commission	Navigation	1919		International Oder Commission, established after the Peace Treaty of Versailles (1919)
Olanga							
Finnish- Russian Joint Commission on the Utilization of Frontier Waters	Finland, Russia	Official	Commission	Water quality, joint management	1964		This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.
Oulu							
Finnish- Russian Joint Commission on the Utilization of Frontier Waters	Finland, Russia	Official	Commission	Water quality, joint management	1964		This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.
Pasvik							
Finnish- Norwegian Transboundary Water Commission	Finland, Norway	Official	Commission	Water quality, joint management	1980		The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role. It submits proposals and motions and issues statements on matters related to water management.

						Many actions need preparatory work, for example, monitoring of the state of the environment and activities influencing the catchments, as well as hearing experts before (recommendations) decisions can be made by the Commission.
Finnish- Russian Joint Commission on the Utilization of Frontier Waters	Finland, Russia	Official	Commission	Water quality, joint management, border issues	1964	This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.
Po						
Mixed Commission for the Protection of Italo- Swiss Waters against Pollution	Italy, Switzerland	Official	Commission	Water quality	April 20, 1972	Primary focus area: protection of surface and groundwater, preservation of ecosystems.
Rhine						
International Commission for the Protection of the Rhine (formerly: International Commission for the Protection of the Rhineagainst Pollution) (ICPR)	European Union, France, Germany, Luxembourg, the Netherlands, Switzerland	Official	Commission	Water quality, flood control/relief, joint management	1950	Targets: 1. Sustainable development of the entire Rhine ecosystem 2. Guarantee the use of Rhine water for drinking water production 3. Improvement of the sediment quality in order to enable the use or disposal of dredged material without causing environmental harm. 4. Overall flood prevention and environmentally sound flood protection 5. Improvement of the North Sea quality in accordance with other measures aimed at the protection of this marine area.
International Commission for	Switzerland, Austria,	Official	Commission	Other: research and education	1970	An organisation where the scientific institutes of the Rhine riparian states formulate joint hydrological measures for sustainable development of the

the Hydrology of the Rhine Basin (CHR)	Germany, France, Luxembourg and the Netherlands					Rhine basin. Mission: 1) Expansion of the knowledge of the hydrology in the Rhine basin and 2) making a contribution to the solution of cross-border problems.
The International Meuse Commission (IMC)	Germany, France, Luxembourg and the Netherlands	Official	Commission	Water quality, other: research and education	2002	The main goals of the IMC are: - to coordinate the implementation of the European Water Framework Directives - to give advice and recommendations to the parties to prevent and protect against high waters - to give advice and recommendations to the parties to prevent and combat water pollution (prevention and detection systems) NGOs can participate in the IMC meetings.
Central Commission for Navigation on the Rhine (CCNR)	Netherlands, Belgium, Germany, France, and Switzerland	Official	Commission	Navigation	1815	The Commission passes resolutions unanimously in line with its terms of reference as follows: - proposals concerning the prosperity of navigation on the Rhine - adoption of technical and administrative regulations (and their amendments) concerning the safety of vessels - complaints arising from the application of the Mannheim Convention.
International Government Commission of Alpine Rhine (IRKA; or Joint Rhine Commission)	Austria, Switzerland	Official	Commission	Flood relief / control	1892	Set up for the Alpine Rhine on the basis of a treaty from 1892.
Internationale Rheinregulierung (IRR; or International	Austria, Switzerland	Official	Commission	Economic development	1892	Set up on the basis of the 1892 treaty between Austria and Switzerland.

Commission for the Regulation of the Rhine)							
Tripartite Belgian-French-Luxembourg Standing Committee on Polluted Waters	Belgium, France, Luxembourg	Official	Commission	Water quality	April 8, 1950	This committee has established three technical subcommittees: one for the Yser and Lys, one for the Scheidt and Spiere, the Sambre and a third for the Meuse, the Chiere, the Sure and the Alzette.	
Rhine (Lake Constance subbasin)							
International Commission for the Protection of Lake Constance (IGKB)	Austria, Baden-Württemberg, Bavaria, Liechtenstein, Switzerland	Official	Commission	Water quality	1959	International Commission for the Protection of Lake Constance (IGKB).	
Rhine (Moselle subbasin)							
International Commission for the Protection of the Moselle and the Sarre (CIPMS/IKSMS: Commission Internationales pour la Protection de la Moselle et de la Sarre / Internationales Kommissionen zum Schutze der Mosel und der Saar (CIPMS/IKSMS or International Commission for the Protection of the Moselle and the Sarre)	France, Germany, Luxembourg	Official	Commission	Water quality, joint management	October 27, 1956	Commission Internationales pour la Protection de la Moselle et de la Sarre / Internationales Kommissionen zum Schutze der Mosel und der Saar (CIPMS/IKSMS or International Commission for the Protection of the Moselle and the Sarre)	

Kommissionen zum Schutze der Mosel und der Saar)									
Rhine (Saar subbasin)									
International Commission for the Protection of the Moselle and the Sarre (CIPMS/ IKSMS: Commission Internationales pour la Protection de la Moselle et de la Sarre / Internationalen Kommissionen zum Schutze der Mosel und der Saar (CIPMS/ IKSMS or International Commission for the Protection of the Moselle and the Sarre)	France, Germany	Official	Commission	Water quality, joint management	July 1, 1962				
Rhine (Doubs subbasin)									
International Commission for the Protection of the Moselle and the Sarre (CIPMS/ IKSMS: Commission Internationales pour la Protection de la Moselle et de la Sarre / Internationalen Kommissionen zum Schutze der Mosel und der Saar (CIPMS/ IKSMS or International Commission for the Protection of the Moselle and the Sarre)	France, Germany	Official	Commission	Water quality, joint management	July 1, 1962				

Internationales pour la Protection de la Moselle et de la Sarre/ Internationalen Kommissionen zum Schutze der Mosel und der Saar)							
Franco- Swiss Joint Commission on fishing and the protection of the aquatic environment	France, Switzerland	Official	Commission	Fishing	1993	Franco-Swiss Joint Commission on fishing and the protection of the aquatic environment	
Rhône							
Joint commission for the protection of Italian- Swiss waters against pollution (CIPAIS)	Italy, Switzerland	Official	Commission	Water quality	-	Area(s) of activity: * Examine all problems related to pollution and all other changes to the Swiss-Italian waterways; * Organize and ensure the necessary research to determine the origin, the nature of and the scale of pollution, and to make use of the results of this research; * Propose to the contracting governments measures to take to treat existing pollution and to prevent all future pollution.	
Rhône (subbasin Lake Geneva)							
Franco- Swiss Consultative Commission on	France, Switzerland	Official	Commission	Fishing	September 1, 1982	Objectives: Harmonize the legal provisions between the two States governing fishing, and ensure the effective protection of fish and their habitat.	

Fishing in Lake Geneva								
International commission for the protection of Lake Geneva (CIPEL)	France, Switzerland	Official	Commission	Water quality	November 1, 1963	Focus: Lake Geneva. Area(s) of activity: * Organize and carry out the necessary research into determining the nature, the scale and the origin of pollution, and make use of the results of this research; * Recommend to the contracting governments measures to be taken to treat current pollution and to prevent all future pollution; * Examine all other questions concerning pollution of the Lake.		
Swiss delegation for the regularization of Lake Geneva	France, Switzerland	Official	Commission	-	December 15, 1964	Swiss delegation for the regularization of Lake Geneva		
Schelde								
International Scheldt Commission (ICBS)	Belgium, France, Netherlands	Official	Commission	Water quality, joint management	1995	International cooperation in order to protect the waters of the Scheldt river.		
Struma								
Permanent Yugoslav- Greek Hydro- Economic Commission	Greece, Turkey	Official	Commission	Economic development	June 18, 1950	Permanent Yugoslav-Greek Hydro-Economic Commission		
Tana								
Finnish-Norwegian Transboundary Water	Finland, Norway	Official	Commission	Water quality, joint management	1980	The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border		

Commission							region. The Commission has an advisory role. It submits proposals and motions and issues statements on matters related to water management. Many actions need preparatory work, for example, monitoring of the state of the environment and activities influencing the catchments, as well as hearing experts before (recommendations) decisions can be made by the Commission.
Tajo/Tejo							
International Commission of International Rivers	Portugal, Spain	Official	Commission	Hydropower, water quantity	July 16, 1964		Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Torne/Tornealven							
Finnish-Norwegian Transboundary Water Commission	Finland, Norway	Official	Commission	Water quality, joint management	1980		The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role. It submits proposals and motions and issues statements on matters related to water management. Many actions need preparatory work, for example, monitoring of the state of the environment and activities influencing the catchments, as well as hearing experts before (recommendations) decisions can be made by the Commission.
Finnish-Swedish Frontier River Commission	Finland, Sweden	Official	Commission	-	15 December 1971 (in force 1 January 1972)		Established by the 'Agreement Between Finland and Sweden Concerning Frontier Waters 'to ensure that frontier watercourses are used in the manner most in keeping with the interests of the two States and their frontier areas. The Agreement furthermore regulates certain matters relating to water rights and fishing rights in connexion with the said watercourses.

Tuloma							
Finnish- Russian Joint Commission on the Utilization of Frontier Waters	Finland, Russia	Official	Commission	Water quality, joint management	1964	This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.	
Wistula/Wista							
Joint Commission	Ukraine, Poland	Official	Commission	Water quantity, irrigation, joint management	1996	For the cooperation in the field of water management in frontier waters; irrigation, regulation, water supply.	
Volga							
Joint Russian-Kazakhstan Commission for Utilization and Protection of Transboundary Waters	Kazakhstan, Russia	Official	Commission	Water quality, water quantity, joint management	Data not available	Joint Russian-Kazakhstan Commission for Utilization and Protection of Transboundary Waters.	
Vuoksa (subbasin Lake Saimaa)							
Joint Commission	Russian Federation, Finland	Official	Commission	Joint management	October 26, 1989	For regulation of the rules for the lake Saimaa and the Vuoksa rivers.	
Finnish- Russian Joint Commission on the Utilization of Frontier Waters	Finland, Russia	Official	Commission	Water quality, joint management	1964	This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.	

North America

Name	Participating countries	Level	Type	Principal Issue	Date	Description
		of Collaboration				
Alsek						
Joint Transboundary Technical Committee (TBRTC)	Canada, United States of America	Official	Commission	Joint management, fishing	1999-2008	<p>Provision of the Pacific Salmon Treaty (1985). The Committee shall:</p> <ul style="list-style-type: none"> - assemble and refine available information on migratory patterns, extent of exploitation and spawning escapement requirements of the stocks; - examine past and current management regimes and recommend how they may be better suited to achieving preliminary escapement goals; and - identify enhancement opportunities that: <ul style="list-style-type: none"> a) assist the devising of harvest management strategies to increase benefits to fishermen with a view to permitting additional salmon to return to Canadian waters; and b) have an impact on natural transboundary river salmon production.
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management, border issues	1909	<p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary</p>

						environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
The Pacific Salmon Commission	Canada, United States of America	Official	Commission	Joint management, fishing	1985	The body formed by the governments of Canada and the United States to implement the Pacific Salmon Treaty of 1985. There is a specific Transboundary Panel that has responsibility for salmon originating in the Alsek, Stikine, and Taku river systems.
Chilkat						
Joint Transboundary Technical Committee (TBRTC)	Canada, United States of America	Official	Commission	-	1999-2008	Provision of the Pacific Salmon Treaty (1985). The Committee shall: - assemble and refine available information on migratory patterns, extent of exploitation and spawning escapement requirements of the stocks; - examine past and current management regimes and recommend how they may be better suited to achieving preliminary escapement goals; and - identify enhancement opportunities that: a) assist the devising of harvest management strategies to increase benefits to fishermen with a view to permitting additional salmon to return to Canadian waters; and b) have an impact on natural transboundary river salmon production.
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management, border issues	1909	The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to

								bilateral disputes.
The Pacific Salmon Commission	Canada, United States of America	Official	Commission	Joint management, fishing	1985			The body formed by the governments of Canada and the United States to implement the Pacific Salmon Treaty of 1985. There is a specific Transboundary Panel that has responsibility for salmon originating in the Alsek, Stikine, and Taku river systems.
Colorado								
International Water Boundary Commission (IBWC)	Canada, United States of America	Official	Commission	Water quantity, joint management	1950			The two Governments through the IBWC jointly administer the terms of the 1944 Water Treaty relating to the Colorado River, which provides that of its waters there are allotted to Mexico, (a) a guaranteed annual quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) and (b) any other quantities arriving at the Mexican points of diversion with certain conditions stipulated in the 1944 Treaty. The application of these terms began in 1950. The operations are performed in collaboration with the United States Bureau of Reclamation, Department of the Interior.
Columbia								
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management, border issues	1909			The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
IJC Board: International	Canada, United	Official	Organization	Water quantity, joint management	1941			The Board keeps the Commission apprised of streamflow and water-level data on both sides of the international boundary and reports to the Commission

Columbia River Board of Control	States of America				each April. Established by Order of the International Joint Commission (IJC) dated 15 December 1941 to ensure the implementation of the provisions of that Order-which granted approval for the United States to construct and operate the Grand Coulee dam and reservoir (Franklin D. Roosevelt Lake)-and to continue to study the effect of the operation of the Grand Coulee dam and reservoir upon water levels at and above the international boundary.
Firth					
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management	1909
Fraser					
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management	1909
<p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.</p> <p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to</p>					

								bilateral disputes.
Mississippi								
International Boundary and Water Commission (IBWC)	Mexico, United States of America	Official	Commission	Joint management	1889			Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties.
Nelson-Saskatchewan								
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management	1909			The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
Río Grande								
Río Grande/ Río Bravo Basin Coalition	Mexico, United States of America	Official	Organization	Joint management, water quality	1994			The mission of the Río Grande/ Río Bravo Basin Coalition is to facilitate local communities in restoring and sustaining the environment, economies, and social well being of the Río Grande/ Río Bravo Basin.
International Boundary and Water Commission	Mexico, United States of America	Official	Commission	Joint management	1889			Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties.

(IBWC)							
Skagit							
International Joint Commission (IJC)	Canada, United States of America	Official Commission	Joint management	1909	<p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.</p>		
St. Croix							
International Joint Commission (IJC)	Canada, United States of America	Official Commission	Joint management	1909	<p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.</p>		
International St. Croix River Board	Canada, United States of America	Official Organization	Joint management	1915 (2000)	<p>On September 26, 2000, the International Joint Commission formally combined its existing International St. Croix River Board of Control (founded in 1915) and its International Advisory Board on Pollution Control - St. Croix River and established the International St. Croix River Board. It's mandate is to</p>		

						assist the Commission in preventing and in resolving disputes regarding the boundary waters of the St. Croix River, to monitor the ecological health of the St. Croix River boundary waters aquatic ecosystem, and to ensure compliance with the Commission's Orders of Approval for structures in the St. Croix River.
St. John						
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management	1909	The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
St. Lawrence						
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management	1909	The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.

Great Lakes Commission	Canada, United States of America	Official	Commission	Joint management	1955	The Great Lakes Commission is a binational public agency dedicated to the use, management and protection of the water, land and other natural resources of the Great Lakes-St. Lawrence system.
The Great Lakes Fisheries Commission	Canada, United States of America	Official	Commission	Joint management, fishing	1955	The Commission was established in 1955 by the Canadian/U.S. Convention on Great Lakes Fisheries. The commission coordinates fisheries research, controls the invasive sea lamprey, and facilitates cooperative fishery management among the state, provincial, tribal, and federal management agencies. The Commission has two major responsibilities: 1. To develop coordinated programs of research on the Great Lakes, and, on the basis of the findings, to recommend measures which will permit the maximum sustained productivity of stocks of fish of common concern; and 2. To formulate and implement a program to eradicate or minimize sea lamprey populations in the Great Lakes.
Great Lakes Science Advisory Board	Canada, United States of America	Official	Organization	Other: research and education	1978	Provides scientific advice to the International Joint Commission and the Great Lakes Water Quality Board and is responsible for developing recommendations on all matters related to research and the development of scientific knowledge pertinent to Great Lakes water quality.
Great Lakes Water Quality Board	Canada, United States of America	Official	Organization	Water quality	1978	The principal advisor to the IJC with regard to all functions, powers and responsibilities regarding water quality.
Integrated Atmospheric Deposition Network (IADN)	Canada, United States of America	Official	Organization	Water quality	1990	Established by the United States and Canada for conducting air and precipitation monitoring in the Great Lakes Basin.
IJC Board: International Lake Superior Board of	Canada, United States of	Official	Organization	Joint management, water quality, water quantity, other:	1914	The Board's duties include setting Lake Superior outflows, and overseeing the operation of the various control works. Activities related to these responsibilities include: conducting studies to develop and improve the

Control	America			research and education		regulation plan; monitoring repairs and maintenance of the control facilities; and directing flow measurements in the St. Marys River for the purpose of determining the discharge capacities of the various control works. The Board provides the Commission with advice on matters related to: adverse hydrologic conditions on the lakes; modification of the control facilities; and levels and flows in the St. Marys River, including the environmentally sensitive St. Marys Rapids.
IJC Board: International Niagara Board of Control	Canada, United States of America	Official	Organization	Water quantity, hydro-power/ hydro-electricity, joint management.	1950	The Board's main duties are to oversee water levels regulation in the Chippawa-Grass Island Pool and installation of the Lake Erie-Niagara River Ice Boom. The Board also collaborates with the International Niagara Committee, a body created by the 1950 Niagara Treaty to determine the amount of water available for the Falls and power generation.
The International Niagara Board of Control	Canada, United States of America	Official	Commission	Water quantity	1953	The International Niagara Board of Control, established by the Commission in 1953 to provide advice on matters related to the Commission's responsibilities for water levels and flows in the Niagara River.
The International Niagara Committee	Canada, United States of America	Official	Commission	Water quantity, hydro-power, joint management.	1950	Created by the 1950 Niagara Treaty to determine the amount of water available for the Falls and power generation.
IJC Board: International St. Lawrence River Board of Control	Canada, United States of America	Official	Organization	Joint management, water quantity, other: research and education	1952	Its main duty is to ensure that outflows from Lake Ontario meet the requirements of the Commission's order. The Board also develops regulation plans and conducts special studies as requested by the Commission. Outflows are set by the Board under the regulation plan.
Lake Huron Binational Partnership (LHBP)	Canada, United States of America	Official	Organization	Water quality, joint management, other: research and education	2002	In 2002 the federal, state and provincial agencies that manage binational environmental activities under the 1987 Great Lakes Water Quality Agreement formally endorsed the formation of a Lake Huron Binational Partnership in order to prioritize and coordinate environmental activities in the Lake Huron basin. The federal and state/provincial environment agencies and the

						state/provincial natural resource agencies form the core of the Partnership by providing leadership and coordination. This partnership builds upon the efforts begun by the Michigan Office of the Great Lakes in their Lake Huron Initiative. The Partnership facilitates information sharing and priority setting for binational environmental protection and restoration activities of importance in the Lake Huron basin and also the development of partnerships to undertake efforts that can not be accomplished by individual agencies alone. One of the purposes of the Partnership is to develop an action-oriented process for addressing Lake Huron concerns to help identify priority issues and future efforts needed to ensure a healthy Lake Huron watershed. The effort has led to the development of a binational work plan that focuses on longer-term priority setting (over 5 years) and short term project implementation (over the next 2 years).
Stikine						
Joint Transboundary Technical Committee (TBRTC)	Canada, United States of America	Official	Commission	Joint management, fishing	1999-2008	Provision of the Pacific Salmon Treaty (1985). The Committee shall: - assemble and refine available information on migratory patterns, extent of exploitation and spawning escapement requirements of the stocks; - examine past and current management regimes and recommend how they may be better suited to achieving preliminary escapement goals; and - identify enhancement opportunities that: a) assist the devising of harvest management strategies to increase benefits to fishermen with a view to permitting additional salmon to return to Canadian waters; and b) have an impact on natural transboundary river salmon production.
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management, border issues	1909	The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting

							boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
The Pacific Salmon Commission	Canada, United States of America	Official Commission	Joint management, fishing	1985			The body formed by the governments of Canada and the United States to implement the Pacific Salmon Treaty of 1985. There is a specific Transboundary Panel that has responsibility for salmon originating in the Alsek, Stikine, and Taku river systems.
Taku							
Joint Transboundary Technical Committee (TBRTC)	Canada, United States of America	Official Commission	Water quality, fishing	1999-2008			Provision of the Pacific Salmon Treaty (1985). The Committee shall: - assemble and refine available information on migratory patterns, extent of exploitation and spawning escapement requirements of the stocks; - examine past and current management regimes and recommend how they may be better suited to achieving preliminary escapement goals; and - identify enhancement opportunities that: a) assist the devising of harvest management strategies to increase benefits to fishermen with a view to permitting additional salmon to return to Canadian waters; and b) have an impact on natural transboundary river salmon production.
International Joint Commission (IJC)	Canada, United States of America	Official Commission	Joint management, border issues	1909			The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality

							Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
The Pacific Salmon Commission	Canada, United States of America	Official	Commission	Joint management, fishing	1985		The body formed by the governments of Canada and the United States to implement the Pacific Salmon Treaty of 1985. There is a specific Transboundary Panel that has responsibility for salmon originating in the Alesek, Stikine, and Taku river systems.
Tijuana							
International Boundary and Water Commission (IBWC)	Mexico, United States of America	Official	Commission	Joint management, border issues	1889		Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties. The IBWC is an international body composed of the United States Section and the Mexican Section,
Whiting							
International Joint Commission (IJC)	Canada, United States of America	Official	Commission	Joint management, border issues	1909		The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
Yaqui							
International Boundary and	Mexico, United	Official	Commission	Joint management, border issues	1889		Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these

Water Commission (IBWC)	States of America						<p>treaties. The IBWC is an international body composed of the United States Section and the Mexican Section.</p>
Yukon							

International Joint Commission (IJC)	Canada, United States of America	Official Commission	Joint management, border issues	1909	<p>The International Joint Commission is an independent binational organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.</p>		
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South America

Name	Participating countries	Level of Collaboration	Type	Principal Issue	Date	Description
amazon						
The contracting parties of the Organization of the Amazon Cooperation Treaty (OTCA)	Brazil, Peru, Bolivia, Colombia, Ecuador, Venezuela, Guyana, Suriname, French Guiana	Official	Organization	Water quality, economic development, joint management	July 3, 1978	OTCA has agreed to undertake joint actions and efforts to promote the harmonious development of their respective Amazonian territories in such a way that these joint actions produce equitable and mutually beneficial results and achieve also the preservation of the environment, and the conservation and rational utilization of the natural resources of those territories
Candelaria						
International Boundary and Water	Guatemala, Mexico	Official	Commission	Joint management, water quantity, border issues	July 17, 1990	International Boundary and Water Commission

Commission								
The International Commission on Limits and Waters between Mexico and Guatemala (CILA)	Guatemala, Mexico	Official	Commission	Water quantity, border issues	1961	The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.		
Coatan Achute								
International Boundary and Water Commission	Guatemala, Mexico	Official	Commission	Joint management, water quantity, border issues	July 17, 1990	International Boundary and Water Commission		
The International Commission on Limits and Waters between Mexico and Guatemala (CILA)	Guatemala, Mexico	Official	Commission	Water quantity, border issues	1961	The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.		
Cullen								
Binational Commission of Economical Cooperation and Physical Integration	Argentina, Chile	Official	Commission	Economic program, joint management	Data not available	Binational Commission of Economical Cooperation and Physical Integration		
Grijalva								
International Boundary and Water	Guatemala, Mexico	Official	Commission	Joint management, water quantity, border issues	July 17, 1990	International Boundary and Water Commission		

Commission							
The International Commission on Limits and Waters between Mexico and Guatemala (CILA)	Guatemala, Mexico	Official	Commission	Water quantity, border issues	1961	The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.	
Hondo							
International Boundary and Water Commission	Guatemala, Mexico	Official	Commission	Joint management, water quantity, border issues	July 17, 1990	International Boundary and Water Commission	
The International Commission on Limits and Waters between Mexico and Guatemala (CILA)	Guatemala, Mexico	Official	Commission	Water quantity, border issues	1961	The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.	
La Plata (Del Plata)							
The Administrative Commission for the Río de la Plata (CARP: Comisión Administradora del Río de la Plata)	Argentina, Uruguay	Official	Commission	Joint management, border issues	November 19, 1973	Comisión Administradora del Río de la Plata or the Administrative Commission for the Río de la Plata (CARP) is an international organism, of binational character, that offers the legal frame and enables dialogues between its the Argentine Republic and the Eastern Republic of Uruguay, for the negotiation in matters of interest common to both nations concerning the Río de la Plata.	
Buenos Aires-	Argentina,	Official	Commission	Economic development,	1985	This commission was based on a common interest in	

<p>Colonia Bridge Binacional Commission (COBAICO): Comision Binacional Punte Buenos Aires Colonia)</p>	<p>Uruguay</p>			<p>joint management, technical cooperation/ assistance</p>	<p>increasing commerce between Argentina and Uruguay. In order to facilitate this commerce, a bridge was created across the Plata River which runs between the two national territories. One of the responsibilities of COBAICO is overseeing the sustainable management and preservation of the Plata River.</p>
<p>The permanent Intergovernmental Co-ordinating Committee (CIC)</p>	<p>Brazil, Argentina, Uruguay, Paraguay, Bolivia</p>	<p>Official</p>	<p>Commission</p>	<p>Joint management</p>	<p>The permanent Intergovernmental Co-ordinating Committee (CIC) is responsible for ongoing administration of the La Plata Basin Treaty (1969). The committee is composed of representatives of each country and has a secretariat with responsibility for coordination promotion, and control of the multinational efforts. The 1969 treaty provides an umbrella framework for several bilateral treaties between the riparian, and a direction for joint development of the basin. The treaty requires open transportation and communication along the river and its tributaries, and prescribes cooperation in education, health, and management of 'non-water' resources (e.g., soil, forest, flora, and fauna). The foreign ministers of the riparian states provide the policy direction.</p>
<p>Comision Technica de Mixta de Salto Grande (CTMSG)</p>	<p>Argentina, Uruguay</p>	<p>Official</p>	<p>Commission</p>	<p>Water quantity, hydro-power/ hydro-electricity, economic development, joint management, technical cooperation/ assistance</p>	<p>The Salto Grande River Basin forms an international sub-basin within the La Plata River Basin. The CTMSG was set up for the production of electrical energy, using the rapids of the Salto Grande between Argentina and Uruguay. Work began in 1974, actual electricity generation starting in 1979. Now the commission manages, operates and maintains the turbines. Argentina and Uruguay have their power markets totally integrated; these turbines contribute 60% of Uruguay's energy demand and covers 10% of the Argentina</p>

						market.
Joint Commission of the Parana River (COMIP: Comision Mixta del Rio Parana)	Argentina, Paraguay, Brazil	Official	Organization	Economic development, joint management, technical cooperation/ assistance	1971	The Parana forms an international sub-basin within the La Plata River Basin. COMIP was agreed to by both Paraguay and Argentina in 1971. This agreement legally binds both countries to a set of laws regulating the shared use of the Paran River as a natural resource. COMIP functions as an international organization, as such it is responsible for conducting evaluations in such areas as industrial, agricultural and recreational use of Paran River.
La Plata (Bermejo subbasin)						
Binational Commission for the Development of the upper Bermejo River and Grande de Tarija River Basins (COBINABE)	Argentina, Bolivia	Official	Commission	Economic development, joint management, technical cooperation/ assistance	June 9, 1995	Bi-National Commission for the Development of the upper Bermejo River and Grande de Tarija River Basins (COBINABE). The Bermejo and Tarija River Basin forms an international sub-basin within the La Plata River Basin. This Commission is responsible for the administration of the Upper Bermejo River and Grande de Tarija River Basins, in order to promote sustainable development in its area of influence, optimize its natural resources development, contribute to its socioeconomic development, and allow rational and equitable management of water resources.
La Plata (Tarija subbasin)						
Binational Commission for the Development of the upper Bermejo River and Grande de Tarija River Basins (COBINABE)	Argentina, Bolivia	Official	Commission	Economic development, joint management, technical cooperation/ assistance	June 9, 1995	The Bermejo and Tarija River Basin forms an international sub-basin within the La Plata River Basin. This Commission is responsible for the administration of the Upper Bermejo River and Grande de Tarija River Basins, in order to promote sustainable development in its area of influence, optimize its natural resources development, contribute to its socioeconomic development, and allow rational and equitable management of water resources.

							equitable management of water resources.
La Plata (Pilcomayo subbasin)							
Tri-national Commission for the Development of the Pilcomayo River Basin (Comisión Trinacional para el Desarrollo de la Cuenca del Río Pilcomayo)	Argentina, Bolivia, Paraguay	Official Organization	Joint management	February 9, 1995			The Pilcomayo River Basin forms an international sub-basin within the La Plata River Basin. The Commission is responsible for the study and execution of joint projects in the Pilcomayo River.
La Plata (Cuareim/Quarai subbasin)							
River Cuareim Commission (CRC)	Brazil, Uruguay	Official Commission	Water quality	1991			Set up to coordinate actions related to the Cuareim River.
La Plata (Uruguay subbasin)							
The River Uruguay Executive Commission (CARU: Comisión Administradora del Río Uruguay)	Uruguay, Argentina	Official Commission	Joint management	September 18, 1976			Set up after the Statute of the River Uruguay entered into force in 1976. CARU directs, regulates and conciliates the objectives and interests of both parties in the shared segment of the river.
Lagoon Mirim							
Commission for the Development of the Mirim Lagoon Basin (CLM)	Uruguay, Brazil	Official Commission	Joint management	April 26, 1963			Set up to perform joint initiatives in the Mirim Lagoon, with Brazilian and Uruguayan agents. It acted satisfactorily to address the problems and issues inherent in the proposal of regional development. However, attempts at integrated institutional actions were frustrated, and over the years, each country has established its own agenda. In June 2002, a

								unilateral legal instrument to help reactivate the Commission was signed.
Lake Fagnano								
Binational Commission of Economical Cooperation and Physical Integration	Argentina, Chile	Official	Commission	Economic development, joint management	data not available			Binational Commission of Economical Cooperation and Physical Integration
Lake Titicaca-Poopo System								
Binational Autonomous Authority of the Lake Titicaca (ALT)	Bolivia, Peru, Chile	Official	Organization	Water quality, economic development, joint management, technical cooperation/ assistance	May 29, 1996			The ALT is an entity of international public right with autonomy in its decisions and administrations in technical and economic fields; ALT's political functioning is associated with the Peruvian and Bolivian State Secretaries. ALT's General Objective is to promote and conduct actions, programs and projects, to dictate norms of management control and protection of the water resources in the Hydrologic System of the Lake Titicaca, the Desaguadero river, lake Poopo and The Coipasa Salt Lake (TDPS); under the framework of the Master Plan of the TDPS system.
Joint Subcommittee for the Development of the Lake Titicaca Integration Zone (SUBCOMILAGO)	Bolivia, Peru	Official	Organization	Joint management	1987			Joint Subcommittee for the Development of the Lake Titicaca Integration Zone (SUBCOMILAGO).
The Autonomous Binational TDPS System Authority for the TDPS	Bolivia, Peru	Official	Organization	Joint management	July 1, 1993			The Autonomous Binational TDPS System Authority for the TDPS.

Joint Peruvian-Bolivian Commission	Bolivia, Peru	Official	Commission	Joint management	June 28, 1955	Joint Peruvian-Bolivian Commission.
Lempa						
Trinational Commission of the Trifinio Plan (CTPT; Comisión Trinacional del Plan Trifinio)	El Salvador, Honduras, Guatemala	Official	Commission	Water quality, economic development, joint management, technical cooperation/ assistance	1992	The CTPT is the entity in charge of overseeing the execution of the Trifinio Plan, and its continuous updating, with administrative, financial, and technical autonomy, and its own legal status. Also, the Plan Trifinio forms part of the Central American integration process, and is attached to the Central American Integration System (SICA).
Parana						
Joint Argentine-Paraguayan Technical Commission for the utilization of the water- power from and the improvement of the navigability of the River Paraná at the islands of Yacyretá and Apipé	Argentina, Paraguay	Official	Commission	Hydropower	January 23, 1958	Established by the 'Agreement Between the Argentine Republic and the Republic of Paraguay Concerning a Study of the Utilization of the Water Power of the Apípe Falls'.
The Paraná River Argentinean-Paraguayan Joint Commission (COMIP: Comisión Mixta Argentino-Paraguaya del Río Paraná)	Argentina, Paraguay	Official	Commission	Joint management	1971	Set up for the administration of the shared waters and for the development of Corpus Christi multiple-purpose dam-project.

Paz								
Comisión Binacional del Río Paz	Guatemala, El Salvador	Official	Commission	Joint management	Data not available	Comisión Binacional del Río Paz	Main task: to advice and assist the governments of both countries on border issues, while enabled to carry out research and studies, as well as to execute works previously approved by the Governments. CILA's tasks include: providing an opinion on any construction projects intended to be executed in the terrestrial boundaries, or in the basins of international rivers and lakes, and supervising their construction, to guarantee the rights of any of the countries are not jeopardized. All matters and issues related to defence works, and to the use of international waters shall be dealt with on the basis of the rules and principles recognized by International Law, which international organizations have promoted, and which allow for the greater benefit of the population and interest of both countries.	
International Waters and Borders Committee (CILA)	Guatemala, El Salvador	Official	Organization	Economic development, joint management, infrastructure/development, technical cooperation/ assistance, border issues	1971			
San Martin								
Binational Commission of Economical Cooperation and Physical Integration	Chile, Argentina	Official	Commission	Joint management	Data not available	Binational Commission of Economical Cooperation and Physical Integration		
Sixaola								
Comité de la cuenca del río Sixaola	Costa Rica, Panama	Official	Organization	Joint management	Data not available	Comité de la cuenca del río Sixaola (CCRS).		

(CCRS)							
Suchiate							
International Boundary and Water Commission	Guatemala, Mexico	Official	Commission	Joint management, water quantity, border issues	July 17, 1990	International Boundary and Water Commission	
The International Commission on Limits and Waters between Mexico and Guatemala (CILA)	Guatemala, Mexico	Official	Commission	Water quantity, border issues	1961	The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.	
Zapaleri							

Binational Commission of Economical Cooperation and Physical Integration	Chile, Argentina, Bolivia	Official	Commission	Economic development, joint management	Data not available	Binational Commission of Economical Cooperation and Physical Integration	
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A.2 African water basins draining more than 30,000 km²

N°	Name of catchment	Basin area basin(x 1000 km ²)	Countries sharing the basin
1	Congo	3690	Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Rwanda, Tanzania, Zambia
2	Nile	2850	Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
3	Niger-Benué	2230	Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger, Nigeria
4	Lake Chad	1900	Cameroon, Central African Republic, Chad, Niger, Nigeria, Sudan
5	Zambezi	1290	Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
6	Orange Senou	800	Botswana, Lesotho, Namibia, South Africa
7	Lake Turkana	500	Ethiopia, Kenya, Sudan, Uganda
8	Juba-Shebelli	450	Ethiopia, Kenya, Somalia
9	Limpopo	400	Botswana, Mozambique, South Africa, Zimbabwe
10	Volta	390	Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Togo
11	Senegal	340	Guinea, Mali, Mauritania, Senegal
12	Okavango	320	Angola, Botswana, Namibia, Zimbabwe
13	Ogoue	220	Cameroon, Democratic Republic of Congo, Equatorial Guinea, Gabon
14	Ruvuma	150	Malawi, Mozambique, Tanzania
15	Awash	120	Djibouti, Ethiopia
16	Cunene	110	Angola, Namibia
17	Sabi (Save)	103	Mozambique, Zimbabwe
18	Gambia	78	Gambia, Guinea, Guinea-Bissau, Senegal
19	Sassandra	78	Côte d'Ivoire, Guinea
20	Comoé	77	Burkina Faso, Côte d'Ivoire
21	Baraka	60	Eritrea, Sudan
22	Cross	48	Cameroon, Nigeria
23	Oueme	48	Benin, Nigeria, Togo
24	Komati	46	Mozambique, South Africa, Swaziland
25	Pangani	35	Kenya, Tanzania
26	Maputo	34	Mozambique, South Africa, Swaziland
27	Cavally	32	Côte d'Ivoire, Guinea, Liberia
28	Gash	32	Eritrea, Sudan