

**ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA (ESCWA)**

**KNOWLEDGE MANAGEMENT AND ANALYSIS  
OF ESCWA MEMBER COUNTRIES CAPACITIES  
IN MANAGING SHARED WATER RESOURCES**

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## **ABBREVIATIONS AND EXPLANATORY NOTES**

ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands
bcm	billion cubic meters
CEDARE	Center for Environment and Development for the Arab Region and Europe
CRT	Columbia River Treaty
EIA	environmental impact assessment
GIS	geographic information systems
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
IAEA	International Atomic Energy Agency
IDRC	International Development and Research Centre
ICPDR	International Commission for the Protection of the Danube River
IWLP	International Water Law Project
IWRM	Integrated Water Resources Management
MoEW	Ministry of Energy and Water (Lebanon)
MRC	Mekong River Commission
MWRI	Ministry of Water Resources and Irrigation (Egypt)
NBCBN-RE	Nile Basin Capacity Building Network for River Engineering
NBI	Nile Basin Initiative
NBTF	Nile Bank Trust Fund
Nile-COM	Nile Basin Council of Ministers
Nile-SEC	Nile Basin Permanent Secretariat
Nile-TAC	Technical Advisory Committee
NGO	non-governmental organization
NSAS	Nubian Sandstone Aquifer System
NWS	Nile Water Sector
NWSAS	North Western Sahara Aquifer System
OSS	Sahara and Sahel Observatory
SADC	Southern African Development Community
SIDA	Swedish International Development Agency
TECCONILE	Technical Cooperation Committee for Promotion of Development and Environmental Protection of the Nile Basin
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNECE Water Convention	UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes
United Nations Watercourse Convention	United Nations Convention on the Law of the Non-navigational Uses of International Watercourses
USACE	United States Army Corps of Engineers
USAID	United States Agency for International Development
WFD	European Union Water Framework Directive
WSCU	SADC Water Sector Coordinating Unit



## Executive summary

Water scarcity is a fundamental challenge to sustainable development in arid and semi-arid regions. Climate change impacts and pressures associated with population growth exacerbate the situation. In the ESCWA region, the annual average available renewable water resources is 870 m<sup>3</sup> per capita/year, and stands at less than 200 m<sup>3</sup> per capita/year in countries like Bahrain and Qatar.<sup>1</sup> In some areas of the region, rainfall rate does not exceed 50 mm per year, and this is accompanied by high evaporation rates. In addition, most groundwater in the region derives from fossil resources that are non-renewable. Therefore, even with significant investments in non-conventional water resources such as water reuse and desalinization, drawing water from shared watercourses and aquifers remains of utmost importance for the ESCWA member countries. The matter is further complicated when one considers that much of these freshwater resources are shared with countries outside the Arab region.

Approximately 40 per cent of the global population lives in shared water basins. Differing perceptions regarding water rights between riparian countries have sometimes led to political conflict. Therefore, international treaties and agreements on shared water resources have been ratified to create formal instruments for preventing and resolving differences regarding shared water resources based on international legal principles. These include the principle of “reasonable and equitable” use, as stated in the Helsinki Rules on the Uses of the Waters of International Rivers (1966), and the need to ensure that no new use of water within a shared river basin will cause “appreciable harm” to other riparian states, as espoused in the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (1997). The Convention on the Protection and use of Transboundary Watercourses and International Lakes (1992) prepared by the United Nations Economic Commission for Europe and the United Nations General Assembly resolution on the law of transboundary aquifers (2009) provide other legal instruments that can assist member countries in developing joint mechanisms for managing shared water resources. Additionally, there are a large number of regional and bilateral agreements that have been signed by two or more countries sharing a river basin, some of which have mandated the establishment of joint bodies for improved management of shared water resources.

There are seven major shared surface watercourses in the ESCWA region, with an average annual discharge of approximately 195 billion cubic meters (bcm). The largest three are the Nile, the Euphrates and the Tigris Rivers, which originate from outside the ESCWA region. Two others are shared by Lebanon and the Syrian Arab Republic namely the El-Kabir and Al-Assi Rivers, while the remaining two, the Hasbani-Wazzani and Jordan Rivers flow into Palestine. Moreover, the ESCWA region has a number of shared aquifers, which contribute approximately 170 bcm of freshwater resources to the region; however, only 12 per cent are renewable resources. The largest four, in aerial extent and thickness, are the: (a) Basaltic Aquifer between Jordan and the Syrian Arab Republic; (b) Plaeogene Aquifer, which is shared by Oman and the United Arab Emirates; (c) Disi Sandstone Aquifer, which is shared by Jordan and Saudi Arabia; and (d) Nubian Sandstone System, which is the largest aquifer in the world and extends between Chad, Egypt, the Libyan Arab Jamahiriya and the Sudan. In addition, there are many other smaller aquifers with multiple lithological layers that are shared by ESCWA member countries, including several extending between Saudi Arabia and neighbouring countries.

Lessons learned from examining shared water resource management mechanisms put into place in different parts of the world reveal the importance of four pillars supporting the effectiveness of a shared water resource management regime. An effective regime needs: (a) to base agreements on internationally accepted legal principles; (b) to establish well-defined and appropriate institutional arrangements that involve relevant stakeholders; (c) to promote sound policy development based on adequate access to information and knowledge; and (d) to invest in sufficient technical and human capacity for monitoring and managing shared water resources.

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<sup>1</sup> ESCWA (2007).

These lessons are drawn from an analysis of a series of international and regional case studies, which are presented through the lens of these four pillars as a means for mapping national and basin-wide capacities for shared water resource management in the ESCWA region. The analysis is based on interviews with senior and mid-level officials, field work and an extensive literature review. The results show that there are several legal instruments, institutional arrangements, policy development and knowledge management processes, and capacity-building and awareness-raising initiatives that are in place in the region that support shared water resource management. However, their adoption and application varies between countries in the region. As such, there is a significant need to enhance the capacity for shared water resource management at the national level in order to improve the effectiveness of basin-wide cooperation arrangements for shared water resource management at the regional level. This in turn would reduce the risk of conflicts over shared water resources, particularly in water scarce countries. The study closes with a proposed scheme for improved governance of shared water resources through institutional strengthening at the national and regional levels.



## **Introduction**

Water scarcity is a fundamental challenge to sustainable development in arid and semi-arid regions. Climate change likely impacts and pressures associated with population growth exacerbate the situation. However, one of the most difficult and politically sensitive challenges facing member countries of the Economic and Social Commission for Western Asia (ESCWA) is how to manage scarce water supplies when the great majority of water consumed in the region is drawn from shared water resources. The matter is further complicated when one considers that much of these water resources are shared with countries from outside the ESCWA region. Similar challenges and constraints are faced in other parts of the world.

The management of shared water resources cannot be treated separately from other national issues in countries whose quantity and quality of water is dependent upon the use and protection of shared waters both at home and in neighbouring countries. Limited national capacities in the areas of water governance and water resource management can thus have regional implications for peace, public health, environmental protection and sustainable development. Indeed, while water resources management policies and actions implemented at the national level affect the allocation of resources within countries, they also can have implications for neighbouring riparian countries and particularly downstream users in shared water basins. National development priorities and programmes related to water supply and sanitation in shared water basins thus need to be examined within a transboundary context. However, the political aspects of development planning at the national level can raise political sensitivities at the regional level and possible unwillingness of Governments to discuss, coordinate and cooperate on shared water resources. This increases the potential for conflict, particularly when there is limited information, knowledge and capacity available to manage shared water resources.

This situation has prompted several countries in the region to establish joint mechanisms for addressing shared water resource issues. Some of these mechanisms have been in place for many years, while others have been only recently established. In most cases, national offices or units have been formed or assigned to contribute to the work of these joint mechanisms. However, despite these advances, the capacity of member countries in the region to manage effectively shared water resources in a sustainable manner remains a challenge. This is largely due to legal, institutional, policy and technical constraints that stymie the effective management of shared water resources at the national and regional levels. A clearer understanding of national capacities and a greater appreciation of the mutual benefits that can result from successful joint management of shared water basins can thus improve the situation.

There are numerous cooperative mechanisms in place for managing shared water resources around the world. These range from informal bilateral arrangements to long-standing multilateral conventions. In some cases, coordination is organized through ad hoc committees, while other agreements establish basin-wide institutional arrangements such as joint commissions that host representatives from all riparian countries of a shared water body. In all cases, joint coordination bodies should seek to apply international legal principles related to the management of shared water resources. In tandem, they must also overcome challenges associated with reconciling dissimilar legal systems and diverse national approaches to water management into a common vision at the basin-level. Differences in technical and financial capacities for managing and monitoring national resources within a shared water basin can also be an obstacle to cooperation and may complicate efforts to adopt common goals and transfer best practice. Mapping the capacity of member countries for managing shared water resources and drawing lessons learned from successful experiences in shared water resource management can identify capacity deficiencies and thus help to overcome these challenges.

In managing shared water resources, countries and joint coordination mechanisms should also seek to apply integrated water resources management (IWRM) practices at the national and basin levels. This requires adopting a multi-sectored consultative approach to water management and involving a variety of stakeholder groups within each country in decision-making processes. This is particularly challenging when there are divergent national development priorities between riparian countries that must be reconciled. For

instance, public policies related to food security, agricultural production, rural development, hydropower generation, subsidies and economic instruments all have significant implications for water consumption, water use efficiency, and water quality in ways that may complicate shared water resource regimes. Realities associated with iterative international relations and power politics can also influence the ability to cooperate effectively on the management of a shared water resource. Accordingly, it is important to accentuate the mutual benefits of coordination and cooperation on the use and protection of shared water resources, and enact and empower bilateral or multilateral agreements to act for that purpose.

#### A. OBJECTIVES OF THE STUDY

The main goal of the study is to analyse existing national capacities to manage shared water resources in the ESCWA region. This is done by drawing lessons from international experiences in shared water resource management, and mapping national institutions and instruments for shared water resource management in selected ESCWA countries based on those indicators of success. Recommended policies and organizational reforms are suggested as an approach for strengthening the capacity of ESCWA member countries to adopt international legal principles and IWRM practices into the management of shared water resources in the national and regional levels. To achieve this objective, the study:

- Reviews the main principles found in international water law, as well as international conventions related to the management of shared water resources;
- Presents success stories from case studies on shared water resources management in order to extract lessons learned and identify good practices;
- Analyses the current status of national capacities of selected shared water basins in the region to identify strengths and gaps; and
- Proposes policies and institutional arrangements to improve shared water management in the region through the use of IWRM practices.

#### B. DATA COLLECTION AND METHODOLOGICAL APPROACH

Interviews were undertaken with senior and mid-level officials from concerned ministries and institutions in selected ESCWA member countries to discuss various issues related to the management of shared water resources. A list of questions was prepared to guide the discussions (see annex 1). Information was also gathered through the implementation of two pilot projects<sup>2</sup> on shared water resource management in the Arab region with regional and national stakeholders (namely the Nubian Sandstone Aquifer System and the El-Kabir River Basin). A review of the relevant, publicly available literature was also conducted, as well as an examination of public documents and decisions issued by various government agencies on the existing mechanisms for shared water resources in the region.

Lessons learned from success stories from other regions on effective shared water resources management approaches were collected from the literature and examined within the context of a methodological framework adopted for mapping and analysing the use of shared water resource management tools. Based on this discussion of good practices and lessons learned, the same methodological framework is applied for mapping and examining the capacity of selected ESCWA countries for managing shared water resources. Challenges and opportunities are highlighted, followed by proposed recommendations for improving the utilization, development and management of shared water resources in the region in the light of international best practice and regional specificities.

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<sup>2</sup> ESCWA (2008 a,b).

### C. REPORT OUTLINE

Following this introduction, the study is composed of seven chapters. Chapter I presents the tools for shared water resources management, the methodological framework for analysis of existing capacities and a brief review of international legal instruments for shared water resources management. Chapter II offers lessons learned from international experiences in shared water resources management. Shared water resources management in the Arab region at the basin-level are then presented in Chapter III, which also provides a matrix detailing the key characteristics of shared surface water and groundwater resources in the region. Chapter IV offers country case studies from the ESCWA region in shared water resource management in order to analyse governance challenges and the capacity of national institutions to address shared water resources issues and negotiations. Chapter V provides an assessment of the current capacity of the water sector for shared water resource management in the ESCWA region based on the methodological framework of analysis applied to the case studies. Potential measures and recommendations for improving shared water resources management in the ESCWA region are then offered in Chapter VI, along with a proposed institutional arrangement that can be considered for adoption at the regional and national levels. Chapter VII then provides closing remarks within the context of the four areas for analysis established for examining capacity for shared water resources management.

## I. TOOLS FOR SHARED WATER RESOURCE MANAGEMENT

There are at least 263 internationally shared water basins worldwide. Most of these are shared by two countries, but, in many cases, water bodies are shared by several countries.<sup>3</sup> For instance, there are thirteen water basins shared by five to eight riparian countries, and five basins are shared by nine to eleven countries, namely the Congo, Niger, Nile, Rhine and Zambezi river basins. Watercourses shared by two or more countries account for approximately 60 per cent of the world's river flow.<sup>4</sup>

Ninety-seven per cent of the world's freshwater resources are stored in nearly 240 shared aquifers around the world. However, limited attention has traditionally been given to management of shared groundwater sources. River basin agreements and organizations are normally not mandated or equipped to adequately monitor or manage shared groundwater.<sup>5</sup> Data and information about shared aquifers are also limited. There is also insufficient coverage of aquifers in international treaties. However, some legal instruments have emerged. The 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes specifically addresses groundwater resources. The resolution adopted by the United Nations General Assembly in 2009 on the law of transboundary aquifers suggests a new framework for managing aquifers in an international context.

Nevertheless, the joint management of shared aquifers remains a new issue in international law and it remains to be determined if groundwater will be addressed within the context of existing regimes governing shared surface watercourses or increasingly as a separate resource subject to independent monitoring and management arrangements.

### A. TYPOLOGY OF SHARED WATER RESOURCES

There are several types of shared freshwater resources, which can be generally classified as shared surface water or shared groundwater resources, as elaborated in table 1. Legal instruments adopted to better manage these shared resources have mostly been applied to rivers and aquifers.

There are also other types of shared water resources which are more difficult to place within a legal framework. For example, there are intermittent streams that only exist during wet seasons which cross international borders. The hydrologic regime of subterranean limestone caves carved by groundwater, known as karsts, are often obscure and difficult to be assessed. Therefore, despite their potential importance for maintaining the water balance in border communities it is likely that these and other water resources have yet to be addressed in a legal context by the different countries that share them.

### B. METHODOLOGICAL FRAMEWORK FOR ANALYSING MANAGEMENT CAPACITY

Four pillars have been identified for guiding the analysis and mapping shared water resource capacities at the global, regional and national level through case studies presented in this report. The methodological approach examines legal frameworks, institutional arrangements, policy development and knowledge management processes, and capacity-building and awareness-raising initiatives as means for examining capacities in shared water resource management.

For the purposes of this study, reference to regional level issues on shared water resource management refers to the region encompassing only the countries that share a given water basin, unless otherwise stipulated in the text. It should also be noted that while these four pillars provide an analytical framework for supporting this mapping exercise, these pillars are mutually reinforcing. For instance, legal frameworks

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<sup>3</sup> United Nations Educational, Scientific and Cultural Organization (UNESCO) (2007).

<sup>4</sup> Ibid.

<sup>5</sup> Jarvis (2006).

establish institutional arrangements and knowledge management tools, such as websites, support and awareness-raising. As such, these pillars are not rigorously applied in the case studies so as to expose complementarities and avoid repetition.

TABLE 1. TYPES OF SHARED WATER RESOURCES

Shared resource	Hydrologic element	Description	Importance for ESCWA region	Legal framework
Surface water	<i>Rivers</i>	A surface watercourse with a constant source of water and drainage basin	Very important	Core subject of international water law
	<i>Lakes</i>	Inland water body fed by a river or spring; usually slow moving; may exist only on a seasonal basis	Important	Dealt with in treaties
	<i>Snow melt</i>	Results from the melting of snow cover from shared mountain ranges	Not current addressed in the region	Not addressed in international agreements
	<i>Streams</i>	Smaller surface watercourses that often is part of shared drainage systems; includes intermittent streams	Very important, particularly during seasonal flood events	Sometimes dealt with in treaties
Groundwater	<i>Aquifers</i>	Groundwater storage system with a permeable or impermeable waterbed from which water can be extracted	Very important	Core subject of international water law
	<i>Springs</i>	Surface flowing groundwater sources; often shared through their catchment areas	Important, particularly at the local level	Sometimes addressed in informal agreements
	<i>Karstic conduits</i>	Underground caverns filled with water that span between countries; often undefined	Not currently addressed in the region	Not addressed in international agreements

### 1. Legal framework

Legal instruments take a variety of forms and operate at the global, regional and national levels. Conventions and resolutions adopted by inter-governmental processes help to establish the legal principles which can guide the efforts of countries seeking to establish joint mechanisms for managing shared water resources. While international water law is mostly based on soft law principles, many have become the guiding pillars influencing the management and allocation of shared water resources throughout the world.

Legal agreements established at the basin level include treaties and protocols between two or more countries sharing the same water resources. Oftentimes, the purpose of these agreements is to resolve conflicts that arise between riparian countries on shared water resources. For example, such was the case with the signature of the treaty between Iraq, the Syrian Arab Republic and Turkey on the sharing of the waters of the Euphrates River in 1990. However, in other cases, countries have signed protocols on a proactive basis to reduce the risk of conflict.

Basin-level agreements draw upon international legal water principles and usually identify the respective roles and responsibilities of riparian countries sharing a water resource. For instance, legal agreements calling for the joint monitoring of a shared water resource by riparian countries demonstrate the application of a collaborative tool that can be used to monitor the hydrologic and hydro-geologic regimes (including water quantity and quality) and related socio-economic aspects of a shared water resource. These mandated monitoring mechanisms are oftentimes also supported by other legal principles calling for

transparency and information exchange, which are also usually incorporated into bilateral and basin-wide agreements on shared water resource management

## *2. Institutional arrangements*

Basin management requires understanding the role of stakeholders that are involved or affected by decisions related to the management of shared water resources. Institutional arrangements are thus put into place in order to formalize the participation of the various key stakeholder groups in the management of shared water basins. Cooperative structures should lead to cooperation across administrative boundaries between upstream and downstream countries, cross-sector cooperation by involving government bodies from different sectors and, also public-private sector participation by involving non-governmental stakeholders in planning and decision-making.

There are many ways to get stakeholders involved in this process. For instance, institutional arrangements at the national and regional levels, including river basin authorities, regional commissions, national focal units and national committees can strengthen cooperation among concerned stakeholders. Cooperation is stronger between countries when there are clear mandates and regular communication mechanisms that are formalized through a regional institutional framework. Where meetings are infrequent and minimal levels of accountability and transparency are present, outcomes based on cooperative efforts tend to suffer.

The effectiveness of communication and coordination arrangements among those implementing national and local water resources plans is an important component of assessing the effectiveness of the institutional framework. These institutional arrangements should thus include representatives from the range of decision-making bodies responsible for water resource management and use at the local, nation and basin-level. Such arrangements also often require inter-ministerial and cross-sector coordination bodies at the national level that contribute to the work of committees or other institutional structures established formally or informally at the basin-level.

Non-governmental stakeholders, such as representatives of civil society, local communities and water user associations, should also be engaged in these institutional structures, which can regularize their participation in shared water resource decision-making. It is also essential to ensure that the financial resources needed to involve all concerned stakeholders are available and adequate.

## *3. Policy development and knowledge management*

Policies are the outcomes of decision-making that are manifested in strategies, plans, guidance documents and associated statements. Reliable information and effective knowledge management schemes are needed to inform policymaking processes. Policies developed at the national and regional levels should be in harmony and should be sufficiently flexible to address future alternatives and scenarios. Policies have to be reviewed and modified periodically to consider new and unforeseen circumstances. Management options, and their associated costs and benefits, need to be identified. Priorities and actions of all stakeholders then need to be coordinated to streamline goals and targets. This is oftentimes the result of iterative discussions and negotiations pursued both among national stakeholders and bilaterally or multilaterally between basin countries.

Reliable information on the status of water resources is essential for proper water management. Without sufficient and reliable information it is difficult to reach an agreement between riparian countries. Information is needed to develop policies and prepare development plans based on the needs of different users within a basin. Open communication channels and trust building can be achieved by exchanging data and information between Governments. Disclosure of information to the general public is also an important component of planning and preparedness related to shared water resources management and risk mitigation.

Advanced technologies, such as geographic information systems (GIS) and decision support systems are useful tools that can contribute to enhanced management of shared water resources. They can assist in setting priorities and developing scenarios and management options which will lead to enhanced decision-making. Knowledge management tools matched with modelling and scenario-building exercises can then contribute to more informed consultation processes with relevant stakeholder groups as well as more informed decision-making.

#### *4. Capacity-building and awareness-raising*

While water institutions play a key role in managing shared water resources in the region, they oftentimes do not have sufficient technical, institutional and legal capacities to perform their work in an efficient and effective way. Examining the commitment and ability of countries to access and benefit from capacity-building support services contributes to assessments regarding current and potential capacities in shared water resources management.

Capacity-building can be delivered in a variety of forms and can target various specialists and administrators that support the management of shared water resources. Donor assistance in capacity-building for institutional strengthening is sometimes provided in the form of on-site advisory services or technical units that seek to provide and transfer technical expertise and experience to host institutions. In some cases, the capacity of local staff is built through technical assistance programmes that support the work of the institution. In other cases, capacity-building is provided by twinning staff with counterparts in other water institutions.

Training activities and workshops are the most common form of capacity-building. These activities focus on different topics, such as IWRM, negotiations, conflict resolution, project management and implementation. While workshops often target water practitioners, capacity-building providers have now increasingly provided training for non-governmental stakeholder groups, including community-based organizations, water user groups, women and local leaders so as to increase the ability of these stakeholders to contribute to discussions and engage in decision-making on shared water resources management.

Raising stakeholder awareness is closely related to capacity-building initiatives. Awareness-raising is a vital component of ensuring participatory approaches in the decision-making process. It can enhance stakeholder interest in management of water resources and encourage engagement and ownership of basin management plans at the community and political levels. There is a variety of ways to improve public awareness. Tools include conducting information campaigns through the national and local media, disseminating printed materials and newsletters, conducting seminars, etc. Other communication tools such as computer websites, e-platforms and list-serves can be used to exchange information about best practice and to discuss the challenges and opportunities related to implementation of basin plans among all concerned stakeholders.

Raising awareness about shared water resource management among public sector officials is also important as it can increase understanding of the connections between shared water resources and other socio-economic development objectives and strategies being pursued whether nationally or locally.

#### **C. BRIEF REVIEW OF INTERNATIONAL LEGAL INSTRUMENTS**

A treaty (or convention) is an international legal agreement signed by countries and governed by international law. Effective long-term cooperation agreements in international watercourses are usually guided by a legal agreement. Treaties should establish clear guidelines for cooperation and the sharing of water resources, as well as define measures to deal with conflict.

Although there have been over 3,000 treaties and agreements covering more than 100 international river basins that have been signed over the centuries, 158 international river basins are managed in the

absence of any type of cooperative agreement.<sup>6</sup> Additionally, many shared water treaties are related to the navigational use of shared rivers. Yet navigation is rarely a source of tension because it is a non-consumptive use of water and does not change the quantity and quality of water (except for possible pollution) available to other users. Few international shared water treaties thus provide the means to address fully the quantity and quality issues of shared waters as well as mechanisms to mitigate conflicts.

It is also noted that very few treaties and agreements address shared aquifers worldwide. On the basis of a survey of 400 freshwater treaties and agreements, about 15 per cent include provisions for groundwater.<sup>7</sup> Thus, physical interactions between surface and groundwater have largely been ignored in international water law, despite their importance.

In addition, international water law is a normative system shaped by international legal principles, such as the principle of equity of States, good neighbourliness and the peaceful settlement of disputes which are among the core principle of international law. Additionally, with the progress of time, water law has shifted from being an instrument of water utilization to an instrument that supports environmental protection and sustainable development goals.<sup>8</sup> The following section details some of the treaties and guidance documents influencing the management of shared water resources at the global level.

### 1. *Helsinki Rules (1966)*

In 1966, after ten years of negotiations, the International Law Association approved the Helsinki Rules on the Uses of International Rivers.<sup>9</sup> These quickly became the most authoritative rules in customary international law on internationally shared waters.<sup>10</sup> The Helsinki Rules advocate that international drainage basins or watersheds be managed as a single unit in order to ensure the full utilization of its waters. As such, it covers all tributaries, including groundwater, and as such extends the rules reach beyond the primary international watercourse itself.<sup>11</sup>

The Helsinki Rules is the first legal instrument to include rules for both the navigational and non-navigational uses of international rivers, and to introduce the principle of “equitable and reasonable utilization”, which can ultimately be considered a rule that restricts the sovereignty of riparian countries with respect to the management of shared water bodies, but for the mutual benefit of all riparian countries. The rule states that “each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin” based on factors such as geography, hydrology, climate, past and current utilization, economic and social needs, population, the availability of other resources and avoidance of waste among others. The ‘obligation not to cause harm’ was not included as an element to determine equitable utilization, but rather appeared in its own article referring to injury that may result from the use of the river by one riparian to others. Other issues covered by the Helsinki Rules include the obligation to cooperate, the protection, preservation and management of the ecosystem as well as procedures for dispute settlements.<sup>12</sup>

Although the Helsinki Rules are not legally binding on countries, they remained the single most authoritative and widely quoted set of rules for regulating the use and protection of international watercourses for over thirty years. The Rules have been referred to or adopted by a number of organizations

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<sup>6</sup> United Nations Environment Programme (UNEP) (2003).

<sup>7</sup> Jarvis op. cit.

<sup>8</sup> Barrett (2003).

<sup>9</sup> International Law Association (ILA) (1966).

<sup>10</sup> Dellapenna.

<sup>11</sup> Ibid.

<sup>12</sup> Salman (2007).



and countries in preparing their own legal agreements, such as in the Southern African Development Community Protocol on Shared Watercourses Systems adopted in 1995.

## *2. UN Convention on the Law of the Non-navigational Uses of International Watercourses (1997)*

In 1970, the United Nations General Assembly requested the International Law Commission to prepare a set of draft articles on the non-navigational uses of international watercourses modelled on the Helsinki Rules. A draft Convention was proposed in 1994 and was later adopted by the General Assembly in 1997 as the United Nations Convention on the Law of Non-Navigational Uses of International Watercourses (United Nations Watercourse Convention). While it has yet to be ratified, it has nonetheless become recognized as the authoritative instrument of customary international law governing the issues it concerns. Debates leading to the drafting of the convention centred on the rule of equitable and reasonable utilization and the obligation not to cause significant harm.<sup>13</sup>

The convention provides a framework that aims at ensuring the utilization, development, conservation, management and protection of international watercourses, and the promotion of optimal and sustainable utilization of these resources for current and future generations. As a framework convention, it addresses some procedural aspects while leaving the details for the riparian countries to complement in agreements that can take into account the specific characteristics of the watercourse in question.

The convention contains 37 articles dealing with the obligations of riparian countries that share a common resource to cooperate with each other, to protect the environment, and to resolve disputes in a peaceful manner. The articles on international consultations, environmental protection, and dispute resolution are more detailed than comparable provisions in the Helsinki Rules. Moreover, the convention restricts its scope to shared surface waters, with the exception of groundwater sources that flow into a “common terminus” as a surface watercourse.<sup>14</sup>

The United Nations Watercourse Convention concerns the issues of equitable and reasonable utilization and the obligation not to cause harm, as well as the need for planned measures; environmental protection, preservation and management of watercourses; and dispute settlement. Thus, similar to the Helsinki Rules, the United Nations Watercourse Convention embraces the principle of equitable and reasonable utilization, and lays down certain factors and circumstances that should be taken into account for determining such equitable and reasonable utilization, which are largely similar to those of the Helsinki Rules. These factors include but are not limited to physical characteristics of geography, hydrology, climate, ecology, etc. social and economic needs, population, the effects of proposed use or uses, conservation, protection, development and economy of the water resources of the watercourse and the cost of measures taken to that effect, and the availability of alternatives of comparable value to a particular planned or existing use. Similarly to the Helsinki Rules, the convention also states that in determining what is a reasonable and equitable use, all relevant factors are to be considered together.<sup>15</sup>

## *3. Berlin Rules (2004)*

Although groundwater makes up about 97 per cent of the world’s freshwater apart from the polar ice caps and glaciers, there is little agreed upon state practice regarding the management of shared underground water resources. Thus, in 2004, the International Law Association approved the Berlin Rules on Water Resources as another customary international legal instrument applicable to water resource management at the national or international level. The Berlin Rules cover surface water and groundwater sources, and even

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<sup>13</sup> Salman op. cit. and Dellapenna op. cit.

<sup>14</sup> United Nations General Assembly (2005).

<sup>15</sup> Salman op. cit. and Dellapenna op. cit.

refers to the environment that relates to these waters (the “aquatic environment”) and stresses the need to integrate the management of waters with the context of the surrounding environment.<sup>16</sup>

The Berlin Rules do not depart significantly from the Helsinki Rules and the United Nations Watercourse Convention, but they do provide more details on such issues as armed conflict, state responsibility, private legal remedies, and the settlement of international disputes. The Berlin Rules also introduce new issues such as the importance of environmental protection and the need for public and private participation, IWRM, and the minimization of environmental harm. They also provide basic principles applicable solely to international waters.<sup>17</sup>

Another significant innovation in the Berlin Rules is the discussion of groundwater as the rules provide details on how the general legal principles apply specifically to the management of both national and shared aquifers. It differentiates itself from the United Nations Watercourse Convention by making it explicit that its rules apply to all aquifers regardless of whether the aquifer is connected to surface waters or whether it receives any recharge from a surface water source.<sup>18</sup>

The Berlin Rules also introduce some new paradigms, which have gained acceptance in customary international water law over the last decade. These include participatory water management; conjunctive management; integrated water resource management (IWRM); sustainability; and minimization of environmental harm. In addition, the Berlin Rules restate the three rules relating to water in a strictly international or transboundary context, which are: cooperation; equitable utilization; and the avoidance of transboundary harm.

#### *4. United Nations General Assembly Resolution on the law of transboundary aquifers (2009)<sup>19</sup>*

The United Nations Watercourse Convention is considered limited in scope with respect to groundwater, as it only concerns groundwater when it is connected to surface water flowing to a common terminus. All groundwater unrelated to surface water is thus excluded from the convention, thereby excluding many important transboundary aquifer systems, including several in the ESCWA region. Given the limited coverage afforded to transboundary aquifers in international law, an appropriate legal framework for managing transboundary aquifers was needed.<sup>20</sup>

As such the ILC was invited to develop draft articles on transboundary aquifers, which were adopted by resolution of the United Nations General Assembly in 2009. These draft articles constitute an important step forward in the development of international law in the field of transboundary aquifers. While a non-binding legal instrument, the draft articles offer guidance for countries sharing a transboundary aquifer when preparing an agreement and encourages the States concerned to make appropriate bilateral or regional arrangements for the proper management of internationally shared aquifers.<sup>21</sup>

The draft law of transboundary aquifers consists of 19 articles, which are largely based on the United Nations Watercourse Convention, with appropriate adaptations to fit the special characteristics of aquifers. The draft articles call on States to use transboundary aquifers according to the principle of equitable and reasonable utilization, while keeping in mind the need to maximize the long term benefits, establish

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<sup>16</sup> ILA (2004).

<sup>17</sup> Ibid.

<sup>18</sup> Dellapenna op. cit.

<sup>19</sup> United Nations General Assembly (2009).

<sup>20</sup> Salman (2008).

<sup>21</sup> Ibid.

comprehensive utilization plans, and ensure the sustainability of the aquifer. The draft articles also deal with the obligation not to cause significant harm, the general obligation to cooperate, exchange data and information and to protect and preserve the ecosystems (including prevention, reduction and control of pollution). Notification for planned activities is dealt with as in the United Nations Watercourse Convention and calls on aquifer States planning to implement any activities which may affect a transboundary aquifer to provide the other aquifer States concerned with timely notification. Such notification shall be accompanied by available technical data and information, including any environmental impact assessment (EIA), in order to enable the notified State to evaluate the possible effects of the planned activities. The draft articles also address the issues of technical cooperation with developing States and measures for dealing with emergency situations.<sup>22</sup>

### 5. Regional conventions

In addition to the international legal treaties, laws and protocols, regional conventions have been forged in response to shared water issues between the riparians countries. These conventions are mostly based on the water law principles. Tables 2 and 3 list some of the key regional conventions for managing shared river basins in Europe and Asia, respectively. Some regional and basin-level agreements forged between ESCWA countries are included in table 3.

TABLE 2. MAJOR EUROPEAN AGREEMENTS ON SHARED WATER RESOURCES

Treaty	Date	Description
Geneva Aquifer Convention	1977	Ensure aquifer conservation while allowing water abstraction between Switzerland and France
United Nations Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention)	1992	Strengthen national measures for the protection and ecologically sound management of transboundary waters
Danube River Protection Convention	1994	Promotes cooperation on transboundary water management for equity and sustainability
Convention on cooperation and sustainable exploitation of the waters of the Luso-Spanish hydrographic basins	1998	Sustainable use of water in five basins between Portugal and Spain
Convention on the protection of the Rhine	1999	Preserve and improve the ecosystem of the Rhine
Meuse River Convention	2002	Integrated river basin (surface and groundwater) management
Framework agreement on the Sava River Basin	2003	
Carpathians Convention	2003	Framework for cooperation in the protection and sustainable development of the Carpathians

Source: *International Water Law Project (IWLP)*, 2008.

The United Nations Economic Commission for Europe (UNECE) Water Convention applies to both surface and groundwaters, which cross or are located on boundary areas between two or more States. This definition was made broad enough in order to include transboundary aquifers. The UNECE Water Convention was modelled on the Helsinki Rules and as such, it is also guided by the concepts of equitable and reasonable use, the obligation not to cause significant harm and most other issues dealt with in Helsinki Rules. What differentiates the convention is that it calls on riparian countries to enter into agreements and establish joint bodies, which have the responsibility to collect and compile data and to elaborate joint monitoring programmes relative to the shared resource. It also contains provisions on the prevention, control and reduction of transboundary impacts and encourages countries to apply appropriate measures and EIA for

<sup>22</sup> Ibid.

sustainable water-resources management and promotion of the ecosystem approach. It also urges concerned parties to establish bilateral and multilateral agreements and also stresses the importance of making information related to transboundary waters available to the public, including measures taken or planned and the effectiveness of them.

TABLE 3. MAJOR ASIAN AGREEMENTS ON SHARED RIVERS

Treaty	Date	Countries	Topic
Amur River Basin Agreement	1956	Soviet, China	Joint Research Operations to Determine the Natural Resources
Indus River Basin	1964	India, Pakistan	Sharing Indus water
Kosi River Basin	1966	Nepal, India	Sharing Kosi water
Ganges River Basin	1977	British Government and Patella state	Sharing Ganges water
Euphrates River Basin	1990	Syrian Arab Republic, Iraq, Turkey	Regulation of the waters of the Tigris and Euphrates and of their tributaries
Aral Sea Basin	1993	Kazakhstan, Tajikistan,	Joint activities in addressing the Aral Sea
Yarmouk River Basin	1999	Jordan, Syrian Arab Republic	Utilization of the waters of the Yarmouk River
Jordan River Basin	2001	Palestine, Israel	Declaration for keeping the water infrastructure out of the cycle of violence

*Source: IWLP, 2008.*

The UNECE Water Convention provides a model that could be adapted for ESCWA and Arab countries seeking to establish a regional legal or policy framework for managing shared water resources. Such a framework agreement could address the need for joint monitoring activities on both water quantity and quality, promote research on issues related to pollution control and develop mechanisms to improve knowledge and information exchange on the occurrence, distribution and transfer of pollution at the basin-level. Information on pollution and water resources management measures could also be exchanged between the riparian countries and ideally shared with the public through easily accessed tools, through such a regional agreement.

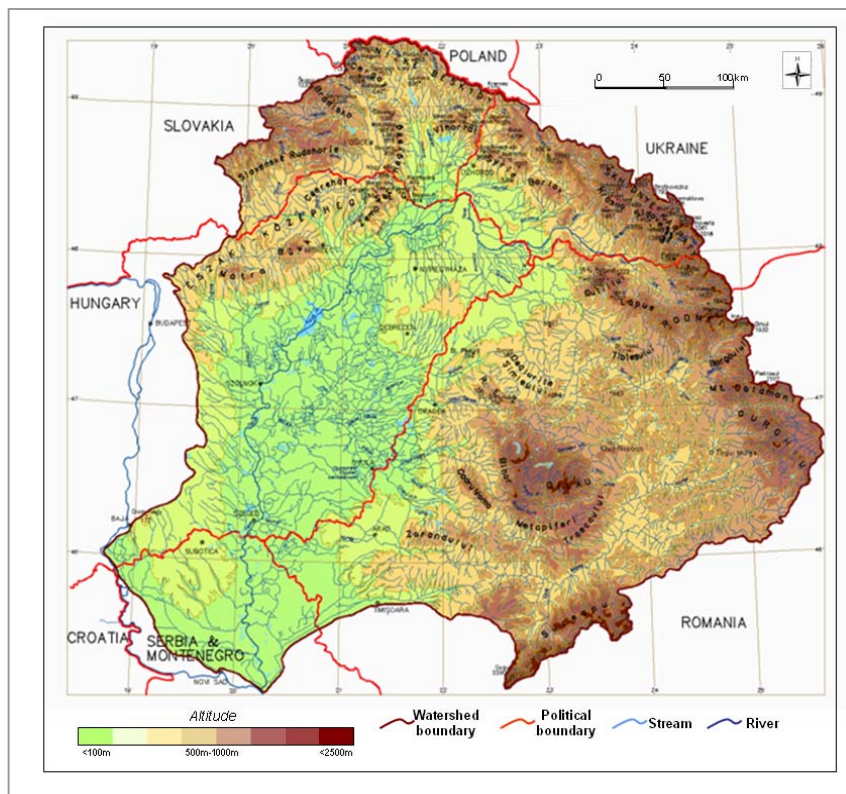
## II. LESSONS LEARNED FROM INTERNATIONAL EXPERIENCES IN SHARED WATER RESOURCE MANAGEMENT

The management of shared water resources is a priority issues for many countries around the globe facing increasing water supply challenges as well as concerns regarding water quality and water use by upstream riparian countries. This has resulted in numerous cases of coordinated management of shared surface water and groundwater resources. This chapter thus elaborates four case studies on shared water resource management in different international water basins in order to draw lessons and identify tools that can be transferred to or adapted for use in the ESCWA region or by Arab countries.

### A. TISZA RIVER BASIN

The Tisza River Basin (157,186 km<sup>2</sup>) is the largest sub-basin in the Danube River Basin system. It is shared by five countries, namely, Hungary, Romania, Serbia, Slovakia and Ukraine. The Tisza River is the main water source for Hungary and Serbia and an important source for western Romania and southern Slovakia, as can be seen in figure 1. There are more than 30 hydropower stations within the basin, which is home to 14 million people. The significant water resources and environmental concerns in the basin are flood management, water quality deterioration, water supply and sewage treatment and ecological reconstruction.

**Figure 1. Tisza River Basin**



Source: Shmu and Icim, 2003.

#### 1. Legal framework

The European Union Water Framework Directive (WFD) is a legislative instrument passed by the European Union in 2000 that places river basins at the centre of planning regarding the protection of water

resources.<sup>23</sup> In doing so, the law seeks the integrated management of rivers, lakes, groundwater, estuaries and coastal waters through the development of integrated river basin plans and calls on European Union member States to ensure the good status of these water bodies by December 2015. Good status, as defined in Article 2 (Definitions) of the WFD is primarily concerned with ecological conditions in which water quality is protected, as well as water quantity when needed for the purpose of environmental protection. Water quantity is specifically identified as an indicator in determining good groundwater status. This approach signals a significant departure from previous water laws in Europe that were more country-based and focused less on the environment. The European Union subsequently issued several guidance documents to support compliance with the WFD, which includes the “Common Strategy on the Implementation of the Water Framework Directive” in 2001.

While the Convention on Co-operation for the Protection and Sustainable Use of the River Danube (Danube River Protection Convention) entered into force in 1998, and predates the WFD, it established the International Commission (ICPDR). The convention serves as the legal basis for cooperation between countries at the basin level and seeks to ensure that surface waters and groundwater within the Danube River Basin are managed and used in a sustainable and equitable manner.

As such, to cope with this new directive, as well as the WFD requirement to prepare integrated river basin plans by the end of 2009, the International Commission for the Protection of the Danube River (ICPDR) organized a ministerial meeting in 2004 where a memorandum of understanding was signed by the five countries that share the Tisza River Basin to prepare an Tisza River Basin Management Plan. It was agreed that the plan would address water quality and water quantity issues, land and water resource management, as well as flood and drought control instruments in one integrated plan.

## 2. Institutional arrangements

The ICPDR is an international organization consisting of 14 cooperating States and the European Union that supports the protection of the Danube River through information exchange, public awareness campaigns, integrated planning and assistance to member countries in incorporating basin-level recommendations into national legislation. The commission serves as a network of support for various institutional arrangements that exist at the sub-basin level. The Tisza Group was thus established by the ICPDR to serve as a platform for strengthening coordination and information exchange between the five Tisza River Basin countries, as well as to facilitate the harmonization and effectiveness of water plans being implemented at the international, regional and national levels.<sup>24</sup>

Several country-level and local-level coordination mechanisms have also been established in the Tisza River Basin countries that support institutional arrangements for shared water resource management. For instance, the National Water Administration “Romanian Waters” (*Apele Romane*) is the authority responsible for implementing the WFD in Romania. Through its 11 Water Branches, this public utility prepares river basin management plans for each sub-basin, which then contribute to the preparation of the national Water Management Plan for Romania. *Apele Romane*, which is housed under the Ministry of Agriculture, Forests, Water, is also responsible for the management and extraction of freshwater resources and the discharge of treated wastewater in coordination with some 400 public service operators that support water supply and sanitation in Romania.<sup>25</sup>

In order to ensure consultation with key stakeholders during river basin planning exercises, Romania established 11 River Basin Committees in 2001 in accordance with the basin delineations mandated for each

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<sup>23</sup> European Parliament and the Council of the European Union. Water Framework Directive (WFD). Directive 2000/60/EC.

<sup>24</sup> International Commission for the protection of the Danube River (ICPDR) (2007).

<sup>25</sup> WaterTime (2004).

Water Branch. These committees are responsible for vetting and approving the draft plans prior to their finalization. Committee members include representatives from the ministries of waters and environmental protection; health; labour, social solidarity and family; country administrations, municipalities and local mayors, water user associations, industry, agricultural and local environmental non-governmental organizations (NGOs) or associations.<sup>26</sup> Romania also established the Inter-ministerial Water Council within the Ministry of Agriculture, Forests, Water and Environment to support coordination at the national level and reporting to the WFD. The president of the Water Council is the country's representative to the ICDRP.

In Ukraine, inter-ministerial cooperation exists to support the implementation of the Integrated Program of Protection Against High Water in Tisza River Basin (2002-2015), which was adopted in 2001.<sup>27</sup> The State Water Management Committee has the responsibility to implement and coordinate the programme with such inter-ministerial actors as; the Ministry of Ecology, responsible for hydro-stations, forecasting and monitoring systems; the Ministry of Agricultural Policy, responsible for erosion prevention; and the Ministry of Transport, responsible for road reconstruction after flood events.

### *3. Policy development and knowledge management*

There have been many scientific and technical implications of implementing the WFD for European Union member States. Compliance has been a particular challenge for the five countries that share the Tisza River Basin, since information must now be collected and disseminated at the basin level for the benefit of regional, basin-level, country-level and local-level stakeholders.

At the basin-level, this is supported through the preparation of the first Analysis of the Tisza River Basin report by the Tisza Group, which was issued in 2007. The findings are contributing to the preparation of the Tisza River Basin Management Plan. Interestingly, the analysis report indicates that there are several gaps in knowledge and information remaining that may impede the preparation of the integrated river basin management plan. This includes the identification of risks associated with not meeting 'good status' targets established in the WFD, as well as the need to prepare more effectively for extreme weather events, such as floods and droughts.<sup>28</sup>

To respond to this challenge at the national level, Romania is reforming its national water monitoring system, upgrading sampling processes, improving laboratory equipments and capacities to perform biological, chemical and hydro-morphological analyses required by the WFD, and involving specialized research institutes in the WFD implementation process. In Serbia, efforts are underway to update bilateral and multilateral agreements on Tisza River Basin waters shared with Hungary and Romania that were initially forged in 1955 prior to its independence.<sup>29</sup> This is requiring the development of a new set of monitoring and management tools to support policy development and shared water resource management in accordance with new national boundaries within a basin-level framework. Serbia is also preparing a new water law based on the WFD principles.

### *4. Capacity-building and awareness-raising*

In order to increase awareness about legal, institutional and policy developments associated with management and coordination within the Danube River Basin, the ICPDR secretariat launched the ICPDR Information System, which also provides links to the respective homepages of the Danube River Basin countries as well as to information on the various sub-basins of the Danube River Basin system. The secretariat's website also provides access to primary documents associated with shared water resource

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<sup>26</sup> Ibid.

<sup>27</sup> Deziron (2003).

<sup>28</sup> ICPDR (2008).

<sup>29</sup> Deziron op. cit.

agreements forged at the Danube Basin or sub-basin levels, including information and documentation related to the Tisza River Basin ([www.icpdr.org](http://www.icpdr.org)).

At the national level, the Ukraine, has sought to increase national capacities in flood protection and preparedness, which has included launching programmes to prepare plans and guidelines for flood control, improve forecasting and early warning systems, and develop new regulatory and institutional set-ups. As a downstream country, formulation of these plans and programmes needs to be conceived at the Tisza River Basin level to be able to appropriately establish risk parameters and response mechanisms. In another case, Slovakia is working to strengthen its organizational structure and management capacities in shared water resource management in a pilot river basin according to WFD requirements.

## 5. *Lessons learned*

The case study shows that there are various levels of decision-making involved in shared water resource management. These influence water governance structures and consultation mechanisms at the primary, secondary and tertiary basin levels depending on the characteristics of the main water body, its tributaries and the associated legal and institutional structures coordinating water and land use management at each of these levels. Effective communication and coordination needs to be encouraged by international organizations (such as ICPDR) with counterparts at the basin-level (such as Tisza group) and national level (such as members of the Romanian Water Council) in order to move from supra-national policy frameworks to national and local-level planning and implementation.

It is also interesting to find the central role being played by a water utility provider to support the implementation of the WFD in Romania. While the *Apele Romane* does not directly contribute to institutional arrangements to coordinate management in the Danube River Basin or the Tisza River Basin, its central role as the drafter of river basin management plans at the local and national level, and its obligation to vet its plans through River Basin Committees aligned in accordance with its 11 Water Branches, demonstrates the importance of the various levels of governance involved in assuring transparent, consultative, and integrated water resource management at the basin level.

On a final note, the approach of issuing common guidance documents for the implementation of regional legal agreements and policies provides an interesting approach that could be considered for adoption in the Arab region. Regional strategy documents and policy frameworks are oftentimes difficult to transfer to the national level in the absence of enabling frameworks that facilitate their adoption, adaptation, implementation and monitoring at the national level. Reporting mechanisms between regional and national institutions based on agreed upon targets, including deadlines and deliverables, can support this process.

## B. SADC PROTOCOL ON SHARED WATER RESOURCES

The Southern African Development Community (SADC) is a regional economic grouping of 13 countries in Southern Africa. Within this region, there are 15 river basins shared by two or more countries. The largest three river basins in the SADC region are the: (a) Congo/Zaire River Basin (3,670,000 km<sup>2</sup>), which is shared by Angola, Democratic Republic of Congo, Zambia, and other non-SADC countries; (b) Zambezi River Basin (1,359,000 km<sup>2</sup>), which is shared by seven countries, namely, Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe, and (c) Orange River Basin (848,000 km<sup>2</sup>), which is shared by Botswana, Lesotho, Namibia, and South Africa. These three basins are illustrated in figure 2.

### 1. *Legal framework*

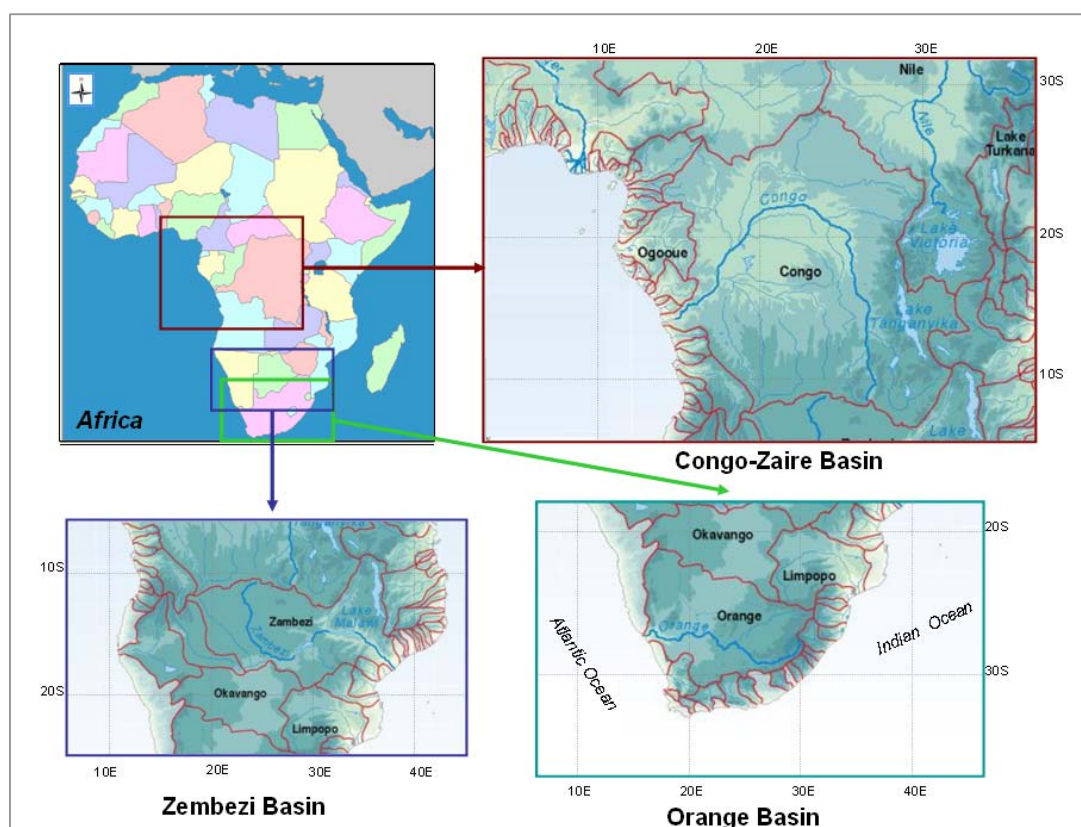
The SADC member countries signed the Protocol on Shared Watercourse Systems in 1995 which, among other provisions, provides the framework for the establishment of river basin institutions and aims to



achieve sustainable usage and development of the natural water resources of these watercourse systems. The protocol was ratified by SADC in 1998; revisions adopted in 2000 then entered into force in 2003.<sup>30</sup>

The protocol facilitates the planning and coordination of regional projects based on the IWRM principles and provides a framework for the peaceful settlement of conflicts and disputes. The protocol also provides for the establishment of joint technical committees. There are several institutions that have been established under this legal framework.

**Figure 2. Major South African shared River Basins**



Source: Wolf, 1999.

## 2. Institutional arrangements

Under the umbrella of SADC Protocol, the water sector is organized through various regional institutions operating in different countries and at various levels. The SADC Water Sector Coordinating Unit (WSCU) serves as a coordination body/secretariat for follow-up on the Protocol and its associated activities. The water sector is also overseen by the SADC Sectoral Committee of Ministers responsible for Water, the SADC Committee of Senior Water Officials, the SADC Water Resources Technical Committee and sub-committees, as well as water institutions established by the member countries.<sup>31</sup> There is also a Water Strategy Reference Group that works with the SADC secretariat and cooperating partners in the development and donor communities for thematic coordination in the water sector at the regional level. Sub-basin institutional arrangements also exist, such as the Zambezi Watercourse Commission.

<sup>30</sup> Granit (2000).

<sup>31</sup> Ibid.

At the basin-level, the United States Agency for International Development (USAID) has assisted SADC to develop guidelines for the management of its international river basins, to define roles and responsibilities of the various institutions proposed by the protocol, and to conduct a legal study on the relationship between SADC protocol and the United Nations Convention on Non-Navigational Uses of International Rivers. The preparation of the study is being supervised by the SADC Water Resources Technical Committee.<sup>32</sup>

At the national level, the United Nations Development Programme (UNDP) has sought to strengthen water management institutions such as National Directorate for Water Resources in Mozambique, the National Hydrological Services in Zambia and the Ministry of Water in Tanzania to assist countries to be able to implement the provisions in SADC protocol on management of shared water resources.<sup>33</sup> Angola, Malawi, Tanzania and Zambia and Tanzania have initiated sector reforms that seek to decentralize management of water resources to the catchment level.

### *3. Policy development and knowledge management*

The SADC Sectoral Committee of Ministers responsible for Water reviewed the Regional Strategic Action Plan on Integrated Water Resource Management in July 2009, which is expected to be the blueprint for water projects in the region.<sup>34</sup>

Resources for WSCU are generated from signatory members, the host country as well as international donors, such as the Swedish International Development Agency (SIDA) and the United Kingdom Department for International Development. To support WSCU, UNDP prepared a round-table conference on integrated water resource management within SADC countries. In addition, UNDP supported the preparation of country reports, a regional water resources strategy and a regional strategic plan.<sup>35</sup> A Water Resource Database for SADC was also launched in 2007 to provide information on water bodies in the region. However, while some CD-ROMs were prepared within the programme of support establishing this initiative, the database is not accessible on-line and it is unclear whether the database is being maintained.

The European Union is working to assist the Department of Water Affairs and Forestry in South Africa to establish an advanced hydrological and environmental monitoring network which aims at providing a mechanism for timely data exchange between the collecting agency and the users throughout the SADC region.<sup>36</sup>

### *4. Capacity-building and awareness-raising*

The donor community has substantially supported the SADC countries in developing their national capacities. The Regional Water Sector Programme, funded by the Denmark International Development Agency (DANIDA), launched SADCWATER, which seeks to establish IWRM processes and procedures in SADC member States.<sup>37</sup> The Danish are also sponsoring WaterNet, a regional network for education and training on IWRM targeting universities in the southern and eastern African regions.<sup>38</sup>

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<sup>32</sup> Soderstrom (1999).

<sup>33</sup> Ibid.

<sup>34</sup> SADCWATER (2009).

<sup>35</sup> Soderstrom op. cit.

<sup>36</sup> Ibid.

<sup>37</sup> SADCWATER, op. cit.

<sup>38</sup> More information on WaterNet is available at <http://www.waternetonline.ihe.nl/>.

During the preparation of the SADC regional strategic action plan, seven priority areas were identified as the main constraints and limitation at the national level: (a) insufficient legal and regulatory framework; (b) shortage of institutional capacities and capabilities; (c) inadequacy and impracticality of implementing sustainable development policies; (d) poor data collection, management and information dissemination; (e) lack of awareness-raising, education and training; (f) inadequate public and stakeholder participation; and (g) insufficient infrastructure development.<sup>39</sup> Despite significant resources being allocated to SADC members in the water sector, it is unclear whether this assessment was prepared and disseminated in a manner that will improve the coordination and delivery of capacity-building support to the region.

Nevertheless, it is evident that countries of the Zambezi basin have exerted efforts to strengthen their capacities on shared management of the resource. Several countries are involved in updating their national water legislation. For instance, Zimbabwe and Mozambique finalized new water laws, which are being applied.

Civil society is also now playing a crucial role in the capacity-building of local communities and individuals through innovative IWRM projects and awareness campaigns. This is partially due to the fact that the SADC region enjoys the presence of several well-established international NGOs, such as the International Union for Conservation of Nature, the Global Water Partnership Southern Africa Technical Advisory Committee and the Southern Africa Research and Development Center. These NGOs are actively involved in consultation processes and partnerships with the academic research institutions and private sector to identify the training and capacity-building needs at all levels (grassroots, middle management, senior leadership, top management) and are also engaged in promoting general public awareness on IWRM issues.

### *5. Lessons learned*

This case study shows that there are a number of institutions, stakeholders, development organizations and donors seeking to support the implementation of the SADC Protocol on Shared Watercourse Systems, only a handful of which have been identified in the brief presented above. As such, among the lessons learned from the SADC water sector experience is the challenge associated with coordinating donor assistance at the basin level among different donors, stakeholder groups and member countries. This illustrates the importance of coordinating and managing donor support in a manner that meets the identified needs of member countries. The situation also brings to question the effectiveness of these varied financial resources in improving intra-basin coordination and integrated water resource management planning and implementation at the basin level, as no coordinated monitoring matrix exist for measuring performance. Further examination of these difficulties could help to draw lessons for strengthening coordination in the Nile River Basin, and vice-versa.

The complexity of seeking to implement a framework policy that should be applied in different river basins that involve SADC as well as non-SADC members is also evident. This is something that has particular relevance for Arab countries that receive a significant portion of their shared water resources from non-Arab countries.

### **C. THE MEKONG RIVER BASIN**

The Mekong River Commission (MRC) was established in 1995 with the membership of Cambodia, Laos People's Democratic Republic, Thailand and Viet Nam. The mandate of the Commission is "to cooperate in all fields of sustainable development, utilization, management and conservation of the water and related resources of the Mekong River Basin" (figure 3).<sup>40</sup>

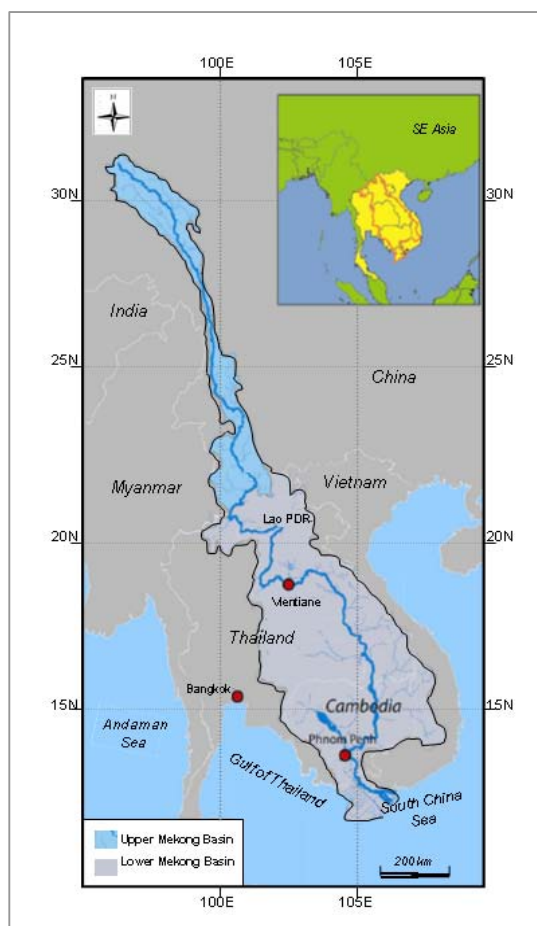
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<sup>39</sup> Tumbare (2005) and Earle, Lungu and Malzbnender (2008).

<sup>40</sup> Mekong River Commission (MRC) (2008).

Various issues, including fisheries management, the promotion of safe navigation, irrigated agriculture, watershed management, environment monitoring, flood management and hydropower projects are the primary concerns of MRC. A Basin Strategic Plan was developed for the period of 2006-2010 with the aim to promote and support coordinated, sustainable and pro-poor development, to enhance effective regional cooperation, and to strengthen IWRM capacity and environmental monitoring basin-wide.<sup>41</sup>

**Figure 3. Mekong River Basin**



Source: MRC, 2008.

### 1. Legal framework

The Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin established MRC in 1995. The agreement was complemented by procedural rules and rules for data and information exchange and sharing in 2001. In 2003 procedures were established for water use monitoring, notification and prior consultation. Procedures for the maintenance of flows on the mainstream were approved in 2006 and were based on assessments of acceptable minimum monthly natural flows and acceptable natural reverse flows. Draft procedures on water quality were also approved at the joint committee level in 2006 for consideration at the higher level. A series of technical guidelines have also been adopted to harmonize the implementation of the approved procedures.

<sup>41</sup> MRC (2006).

In addition to the structured approach being pursued at the regional basin-level, countries sharing the Mekong River area also seek to develop national instruments for improved water resources management. For instance, Thailand and Cambodia have drafted recently laws that contain modern IWRM principles, while Viet Nam and Laos have passed new water laws.<sup>42</sup> Although these laws have been passed, there are still some constraints with regard to limited capacities to implement and enforce them. For example, while modern legal instruments were adopted in Laos with the support of international organizations, available financial resources at the national level are very limited and thus most development projects and even some recurrent costs are being covered through donor support.<sup>43</sup>

## *2. Institutional arrangements*

To ensure reasonable and equitable use of the Mekong River System, National Mekong Committees were established in the four countries to develop procedures for water utilization and to coordinate MRC programmes at the national level. The purpose of these committees is to provide links with the national ministries and agencies which serve as the National Mekong Committee secretariat in each country. The MRC is financially supported by the four member countries and from donor funds. A formal consultation with donor and financing agencies is carried out annually.<sup>44</sup>

At the national level, a Water Resources Strategy for Viet Nam was formulated in 2004 and thereafter allowed for the establishment of the National Water Resources Council. The council has become increasingly active as the senior coordination body between all other national actors concerned with management of the Mekong River. The council is also playing an important role in advising the Government on whether to approve large river basin plans and projects.<sup>45</sup>

Apex bodies were also established in Thailand and Laos to advise Governments on water issues and to improve coordination and decision-making between the various water related sectors and ministries. Thailand is committed to establishing a river basin organisation for each of its 25 main basins.<sup>46</sup>

## *3. Policy development and knowledge management*

Mekong River countries have sought to espouse a common vision when developing national water policies, such as the application of IWRM principles related to governance structures and participatory decision-making. These countries were also able to improve national coordination by establishing apex bodies which sets policies and standards.<sup>47</sup>

As such, to implement the MRC agreement, member countries have undergone significant water sector reforms and have improved their capacities to manage the Mekong River System. For instance, in Viet Nam, water resources management recently has been transferred to the Ministry of Natural Resources and Environment to ensure integration of water management as a priority issue in national development strategies. The political support and consultation process were conducted through several rounds of discussion within the National Assembly. The water management and planning approach on the basin level is in line with the newly enacted water resources policies which facilitated the interlinking between MRC activities and national plans.

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<sup>42</sup> International Water Management Institute (IWMI) (2006).

<sup>43</sup> Ibid.

<sup>44</sup> Ibid.

<sup>45</sup> Quang (2002).

<sup>46</sup> IWMI op. cit.

<sup>47</sup> Ibid.

#### *4. Capacity-building and awareness-raising*

Under the umbrella of the MRC, the four countries that share the basin have made progress towards implementation of the agreement. This is in part thanks to the Integrated Capacity-Building Programme that was initiated to provide support to the National Mekong Committees in each country. The purpose of the programme was to enhance systems of administration, management and communications through a regional training programme involving a network of leading education and training institutions in the region and worldwide. Priority training areas were identified and included project management, information management and communication, environmental governance, research coordination and gender mainstreaming. Capacity-building in these areas is needed to strengthening core activities of MRC. In Cambodia, Thailand and Viet Nam, new water resource management departments encountered staffing difficulties. This is because these organizations are often staffed with professionals transferred from irrigation agencies to avoid substantial re-shuffling of staff, which poses difficulties for building technical capacity based upon existing expertise and promoting the recruitment of experts in newly emerging disciplines, such as professional knowledge of IWRM.

Nevertheless, significant progress has been made in terms of training and education for higher level officials. However, water allocation mechanisms, availability of water-related data and management of water quality data are areas that still require some improvement. In addition, networking and information management are still limited within MRC activities.<sup>48</sup> With respect to Cambodia as a downstream country, focus has been given to improving capacities on flood management and water resources information, but progress is hindered by political uncertainty and governance issues.

#### *5. Lessons learned*

The structured follow-up of the MRC agreement with approved procedures supplemented by technical guidelines echoes efforts pursued in implementing the WFD in the European Union. This coordination between political, policy-oriented agreements and the issuance of operational procedural guidelines and technical guidance provides a model that could assist ESCWA member countries as they look towards formulating and activating approaches to shared water resources as well as basin-level agreements in the Arab region.

This case study also shows the importance of complementing legal and institutional reforms with adequate training and retraining of staff, particularly when agreements introduce IWRM principles that have not been previously incorporated into approaches to planning and development. Such expertise not only involves a technical understanding about water quantity and quality, but also skills that allow for consultative decision-making and public awareness campaigns. Decision makers should consider tailoring these approaches to norms and cultures specific to their region to ensure the effective implementation of IWRM principles.

### **D. COLUMBIA RIVER BASIN**

The Columbia River Basin stretches from the north-western reaches of Canada and spreads southward through eight states in the northwest of the United States of America, as shown in figure 4.

#### *1. Legal framework*

The federal Governments of Canada and the United States signed the Columbia River Treaty (CRT) in 1961. The treaty features sharing of downstream benefits for hydropower and flood control in the United States that result from development and use of 19 km<sup>3</sup> of usable storage in the upstream reaches of Canada.

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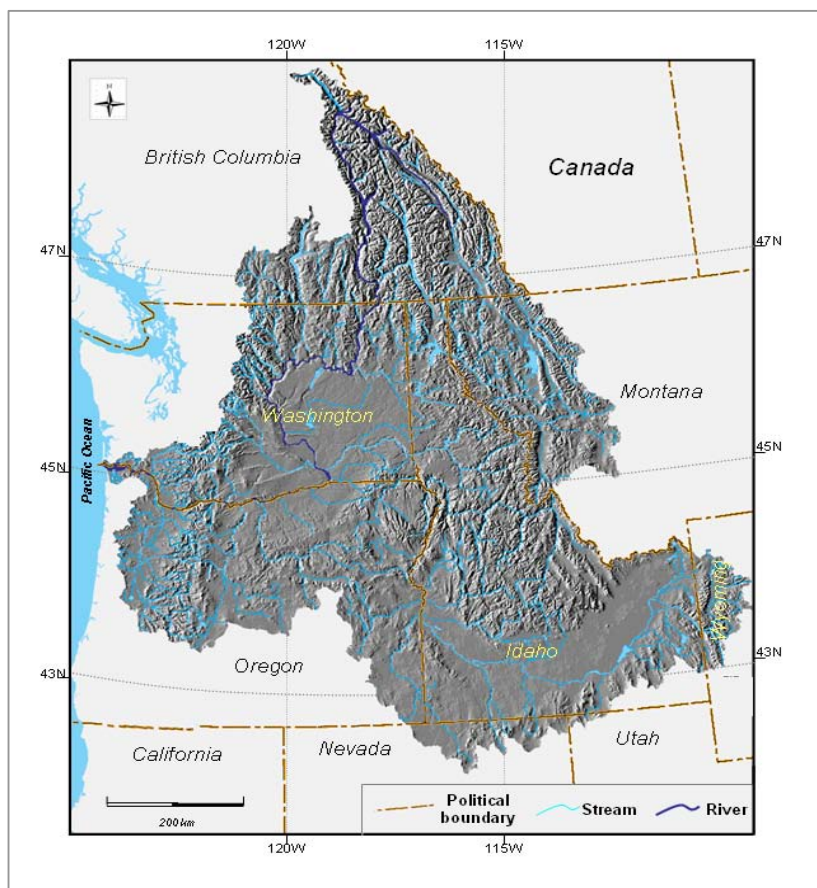
<sup>48</sup> Quang op. cit.

The implementation of the treaty required institutional and legal changes in both countries. Instruments for sizing the existing water structure and the volume of the reservoir storage were created to fulfil the basic requirements of the treaty.

## 2. Institutional arrangements

The Permanent Engineering Board and Committee were established by CRT to deal with tasks related to the management of the river. These tasks include the assembly of flow records, formulation of flood control operating plans and creation of annual reports. They are also to report differences that may arise between stakeholder entities, make periodic inspections and ensure that the objectives of the treaty are being met from both sides and make recommendations for reconciliation as needed. The Permanent Engineering Board and Committee are comprised of two members and two alternate members assigned from each country, as illustrated in figure 5.<sup>49</sup>

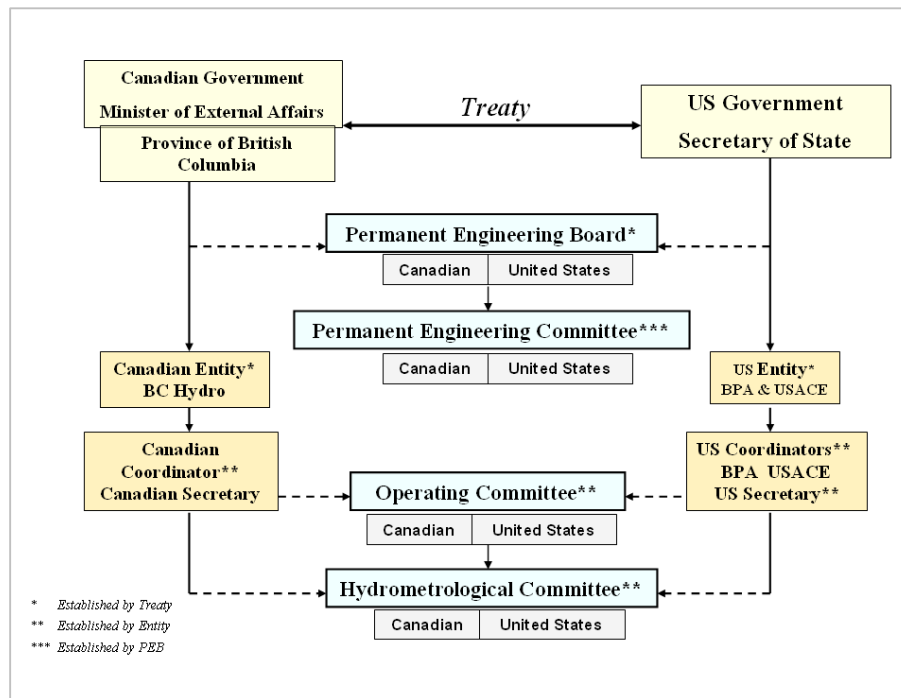
**Figure 4. Columbia River Basin**



Source: USACE Technical Management Team, 2007.

<sup>49</sup> USACE (2007).

**Figure 5. Institutional mapping of Columbia River Treaty**



Source: Muckleston, 2003.

To comply with the institutional and organizational terms of the treaty, the two Governments relied upon several entities. Two organizations from the United States side carried out the responsibilities towards implementation of the treaty, the United States Army Corps of Engineering (USACE) and Bonneville Power Administration (BPA). USACE have wide ranging experience in flood control within the Columbia River system. Within the context of CRT, the Army Corps of Engineers are involved in shared water management of the Columbia River through the operation of dams and large-scale production of hydroelectric energy. It was reported that during the years following the finalization of CRT, the hydroelectric generating capacity on the United States side was greatly increased as a result of enhance river regulation and management. The BPA is also responsible for the shared management of the Columbia River system in cooperation with Army Corps of Engineers. It also oversees reservoir and river flow management within the Columbia River system.

In Canada, there are two entities in charge of shared management of the Columbia River System: the British Colombia Hydro and Power Authority and the Ministry of Environment, Lands and Parks. The Hydro and Power Authority is responsible for the day-to-day implementation of the Treaty in coordination with the USACE and BPA. The Hydro and Power Authority also operates the reservoirs and therefore plays a key role in the joint management of the Columbia River system. The Ministry of Environment, Lands and Parks administers the quantitative and qualitative aspects of the British Columbia Water Act, in addition to administration of resident fisheries. Other responsibilities of these entities include the development of coordinating plans, the exchange of information, the establishment and operation of a hydro-meteorological system and the annual preparation of operating plans.<sup>50</sup>

<sup>50</sup> Muckleston (2003).



### *3. Policy development and knowledge management*

In general, the objectives of the CRT have been met as a result of organizational and administrative characteristics, particularly frequent communication through conference calls, telecommunications and bimonthly meetings between personnel with common technical backgrounds. Much of the day-to-day management was accomplished by the operating and hydro-meteorological committees that were formed from both sides at the technical level. Forecasting the quantity and timing of flows was undertaken by these committees, which also assessed depth of snow pack, accumulated precipitation and other meteorological parameters. Advanced and sophisticated models were used to frequently reassess these data.

### *4. Lessons learned*

The organizational and administrative setup of CRT enabled the two countries to address water related issues in an organized manner and avoid problems associated with approaches that lack specificity and accountability. The treaty enabled these countries to reconcile the concerns of hydropower and flood control that exist in this drainage basin due to its population density the demand for power. In addition, this agreement shows some flexibility, as it contains provisions for periodic review and assessment to consider unforeseen circumstances. This flexibility allows innovative management by CRT entities to accommodate values other than hydropower and flood control.

Experts have also indicated that the mutually beneficial management of a shared water resource is most likely to be attained when riparian countries have a long history of harmonious relations and have created a successful and effective permanent structure to resolve problem over shared water resources as shown in this case.<sup>51</sup> Creating an enabling environment for shared water resource management through effective institutions and clear areas of coordination is among the lessons learned from this case.

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<sup>51</sup> Ibid.

### **III. SHARED WATER RESOURCE MANAGEMENT IN THE ARAB REGION: A BASIN-LEVEL PERSPECTIVE**

The major international river systems in the Arab Region are shared by two or more countries located both within and beyond the region. These rivers include the Tigris, the Euphrates, both shared by Iraq, Turkey and the Syrian Arab Republic; the Orontes (or Al-Assi), shared between Lebanon, Turkey and the Syrian Arab Republic; the Jordan (including the Yarmouk), shared between Jordan, Lebanon, Palestine and the Syrian Arab Republic; and the Nile with ten riparian countries of which Egypt and the Sudan are Arab States.

Despite efforts to establish formal agreements to manage the shared water resources, these agreements, when they exist, remain incomplete, inequitable and lack effective institutional and legal frameworks, particularly when political will and commitments are absent or insufficient. Cooperation and coordination at the regional and inter-regional levels concerning usage and management of these shared water resources is frequently hindered by the prevailing political tensions and the ongoing conflicts in the region. The consequences can reach far beyond sharing the river itself as they may contribute to political and armed conflicts. In the absence of a joint authority/commission or binding legal regime, the overarching challenge in managing shared waters is how to manage the water resource effectively and in an environmentally, socially, and economically sustainable manner.

Groundwater aquifers are sometimes the only source of freshwater, particularly in regions under arid and semi-arid climatic conditions (such as the case in many Arab countries). They also represent a substantial source for water security at the national and regional levels. At the regional level, some shared groundwater aquifers are renewable, like the aquifers underlying the border areas between the Syrian Arab Republic and Turkey; Lebanon and Palestine; Jordan and the Syrian Arab Republic; northwest Iraq and the Syrian Arab Republic. Others are non-renewable aquifers containing fossil water such as the Nubian Sandstone Aquifer shared by Chad, Egypt and the Libyan Arab Jamahiriya; the North-Western Sahara Aquifer System shared by Algeria, the Libyan Arab Jamahiriya and Tunisia; and the Basalt aquifer underlying Jordan and Saudi Arabia. Additional deep non-renewable aquifers underlie Kuwait, Iraq and Saudi Arabia; Iraq and Jordan; and Iraq and the Syrian Arab Republic.<sup>52</sup>

#### **A. NILE BASIN INITIATIVE**

The Nile Basin Initiative (NBI) was formally launched in February 1999 by the Ministers of Water Affairs of the 10 countries that share the Nile River, namely Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, the Sudan, Tanzania and Uganda (figure 6). Together, these ministers make up the Nile Basin Council of Ministers (Nile-COM). The NBI is a programme that aims to develop water resources in a sustainable and equitable way, ensure cooperation and implementation of joint projects between riparian countries, and promote economic integration at the basin scale.<sup>53</sup>

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<sup>52</sup> ESCWA (2002).

<sup>53</sup> NBI (2007a).

## 1. Legal framework

<sup>54</sup> NBI (2006) and NBI (2007b).

## *2. Institutional arrangements*

Nile-COM is the highest political authority of the NBI and was established in 1999. It was scheduled to meet yearly at the level of Ministers of water resources of member countries. The Technical Advisory Committee (Nile-TAC) is the supporting entity where proposals and suggestions are prepared for consideration by Nile-COM members. The chairmanship of the Nile-COM and Nile-TAC rotates between countries on an annual basis. Both bodies are supported by the permanent secretariat (Nile-SEC) based in Entebbe, Uganda to ensure effective administration, financial and logistical arrangements. The activities of the Secretariat are financed by the riparian countries to prove commitment and foster ownership of the NBI process.

A separate project was initiated to strengthen basin-wide institutions and coordinate the implementation of the Shared Vision Programme. In addition to the above projects and in order to initiate concrete action on the ground two Subsidiary Action Programs were initiated at the sub-regional level: the Eastern Nile Subsidiary Action Program between Egypt, Ethiopia and the Sudan and the Nile Equatorial Lakes Subsidiary Action Program, which benefits Egypt and the Sudan along with the other six Equatorial Lakes countries, namely Burundi, the Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda.

The International Forum for the Nile Basin was established to act as a powerful network comprises civil society organizations in the ten countries riparian to the River Nile. The Forum aims at implementing several projects and programmes and participating in the activities of the NBI. The operation of the Forum is mainly supervised by a steering committee consisting of ten members (one representative from each country in the Nile Basin) with a permanent secretariat based in Entebbe. National Forums were consequently founded in the ten member countries to facilitate the effective participation of all stakeholders at the local and national levels and to evaluate the impacts of the NBI activities on the public at large.<sup>55</sup>

## *3. Policy development and knowledge management*

The shared vision guiding the NBI is “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources”. The Shared Vision Programme comprises eight projects working on the regional and national levels. These projects are related to water resources planning and management, efficient water use for agricultural production, transboundary environmental action, regional power trade, confidence-building and stakeholder involvement, socio-economic development and benefit-sharing, and applied training.

In many of the Nile Basin countries, policies on water and environmental management and agricultural and hydropower plans were developed in respective ministries. Cross-sector cooperation at the shared basin level is still at a developing stage. Broad access to and sharing of data and participatory decision-making are among the aims of NBI, which has established networks between various national and local actors in the region, including NGOs and other stakeholders. However, the cultural and economic specificities of the basin have prevented this participatory approach from being fully implemented.<sup>56</sup>

## *4. Capacity-building and awareness-raising*

Several donors established partnerships with the NBI to support its capacity-building and development activities, including the World Bank, UNDP, the Canadian International Development Agency, the European Commission and other multi-lateral and bilateral donors. The investments required to support and finance the first phase of the programme are estimated at \$3 billion.<sup>57</sup>

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<sup>55</sup> Arab Office for Youth and Environment (AOYE) (2008).

<sup>56</sup> NeWater (2005).

<sup>57</sup> NBI (2006).

Donors make their contributions to the NBI through the Nile Basin Trust Fund (NBTF). The World Bank manages the trust fund, while the NBTF Committee is responsible for overseeing its operation and ensuring that the available resources are used to meeting the NBI programme objectives. This Committee is comprised of representatives from contributing agencies, the NBI, and the World Bank. Formal NBTF Committee meetings are held once a year in one of the Nile Basin countries.

Capacity-building and awareness-raising is also supported by the Nile Basin Society within the framework of the Confidence Building and the Stakeholder Involvement Program of the Nile Dialogue involves all progress stakeholders, including NGOs and civil society, in consultative processes. The participating NGOs are selected by local NGOs based on their experience and their capabilities to represent a group of NGOs.

Another project was implemented to establish the basic governance structure for civil society organizations, as called for in the Nile Basin Discourse (NBD). A series of consultative workshops convened by the steering committee initiated National Discourse Forums in most basin countries and achieved some progress towards developing plans of action. A discourse desk was established in Entebbe with a facilitator and was financially supported by the World Bank, the International Union for Conservation of Nature, and the Worldwide Fund for Nature.<sup>58</sup> The operation of these civil society forums was facilitated by short-term donor-funded projects. The sustainability of these projects is ultimately dependent on the availability of donor funds and various criteria for success as illustrated in box I detailing the experience of a regional network.

#### **Box 1. The Nile Basin Capacity Building Network for River Engineering**

The Nile Basin Capacity Building Network for River Engineering (NBCBN-RE) was established in the year 2000 to strengthen capacity of water professionals and experts and to create an environment to promote cooperation among the Nile Basin countries. The network was geared by a web-based platform to enable water resources specialists, planners, managers, researchers, to share their best practices and exchange experiences and information through joint applied research on issues of common interest in the field of river engineering. The network provides opportunities to strengthen water institutions by sharing advanced models and databases and providing education and applied training in the fields of river engineering and water resources management. The network also provides support to activities of the Nile Basin Initiative (NBI) by establishing strong partnerships among research and government authorities and by developing regional water knowledge base for the ten Nile Basin countries.

This regional knowledge network is fully owned by the Nile Basin countries and hosted by the Hydraulics Research Institute (HRI) in Egypt with the support of UNESCO-IHE in Delft. The network development procedure was initiated by the establishment of network nodes in each Nile Basin country. Each node is a local network of water sector professionals from a particular country. This setup was intended to develop and sustain a local capacity in the fields of interests for each country and to assure proactive participation in the overall network development and in sharing knowledge and information over the regional network. The nodes hosting institutions included research and academic institutes, universities and ministries of water and environment. Research clusters were identified and formulated as a group of professionals from a number of the Nile Basin countries (5 to 7 countries) to carry out research activities jointly and to enhance their capacities in a specific research topic in river engineering and water resources management. One country is taking the leading role as a host of the research cluster, based on its relative capacity and performance in this research area, while the others are effectively contributing as research cluster member. Six regional research clusters are currently functional as follows: GIS and Modeling (Egypt), River Structures (Ethiopia), Flood Management (Kenya), River Morphology (the Sudan), Hydropower Development (Tanzania) and Environmental Aspects (Uganda).

The NBCBN-RE is led by a Steering Committee comprised of the 10 country coordinators of focal institutions and a representative of Nile-TAC to ensure the link with the NBI. During the past years significant progress and achievements took place by the network to develop a knowledge mapping for experts and capacities in the ten Nile Basin countries, to build a digital library of research reports, to publish documents and regular newsletters on a powerful web-based platform, to offer fellowships for regional and international courses, including academic degrees, and to facilitate links to international and regional projects and NBI activities.

*Source: Nile Basin Capacity Building Network for River Engineering, 2006.*

<sup>58</sup> More information about the Discourse Desk is available at: [http://www.nilebasinidiscourse.net/structure\\_EN.php](http://www.nilebasinidiscourse.net/structure_EN.php).

A new institutional strengthening Project is being carried out from 2008 to 2011 to strengthen and harmonize NBI corporation management capabilities on issues such as administrative and financial systems, monitoring and evaluation, reporting, planning and resources mobilization. This activity aims to design appropriate NBI institutional and legal settings to operationalise the national focal points, to set up working arrangements with local institutions and to mainstream IWRM functions in NBI. Enhanced stakeholder involvement and improved communication between NGOs and civil society organizations through media networks is also a main target to be reached. The project is designed to develop new institutional settings in four specific areas as shown in table 4.

TABLE 4. ACTIVITIES FOR NBI INSTITUTIONAL STRENGTHENING (2008-2011)

Sub-component	Main activities/expected outputs
(a) NBI Corporate Management	<ul style="list-style-type: none"> <li>• Overall NBI governance and coordination</li> <li>• Including effective NBI National Offices</li> <li>• Corporate management within NBI bodies</li> <li>• Harmonized administrative systems</li> </ul>
(b) Water Resources Development	<ul style="list-style-type: none"> <li>• Project planning, identification and preparation</li> <li>• Facilitating implementation – including resources mobilization</li> <li>• Operationalising NBI policies</li> </ul>
(c) Knowledge-based Water Resource Management	<ul style="list-style-type: none"> <li>• Formulation of agreed NBI policies on integrated water resource management</li> <li>• Consolidated knowledge base – acquisition, management and access</li> <li>• Scenario evaluation, decision support systems and modelling</li> </ul>
(d) Stakeholder Involvement and communications	<ul style="list-style-type: none"> <li>• Basin-level involvement and communication associated with overall NBI policies, strategies and programmes</li> <li>• Informed dialogue with a confident basin community</li> <li>• Project-level community and stakeholder involvement.</li> </ul>

Source: NBI, 2007.

### 5. Findings and recommendations

The implementation of NBI activities during the past decade reveals the difficulty of implementing a regional programme in the absence of a large agreement with adequate institutional arrangements. There is still a need to ensure ownership of NBI projects by riparian countries without losing sight of the regional dimension. In addition, connections between national programmes and policies are still to some extent weak due to insufficient in-country coordination at various levels. Cooperative development within the Nile Basin is further constrained by the non-functional monitoring networks and inadequate human resources.<sup>59</sup>

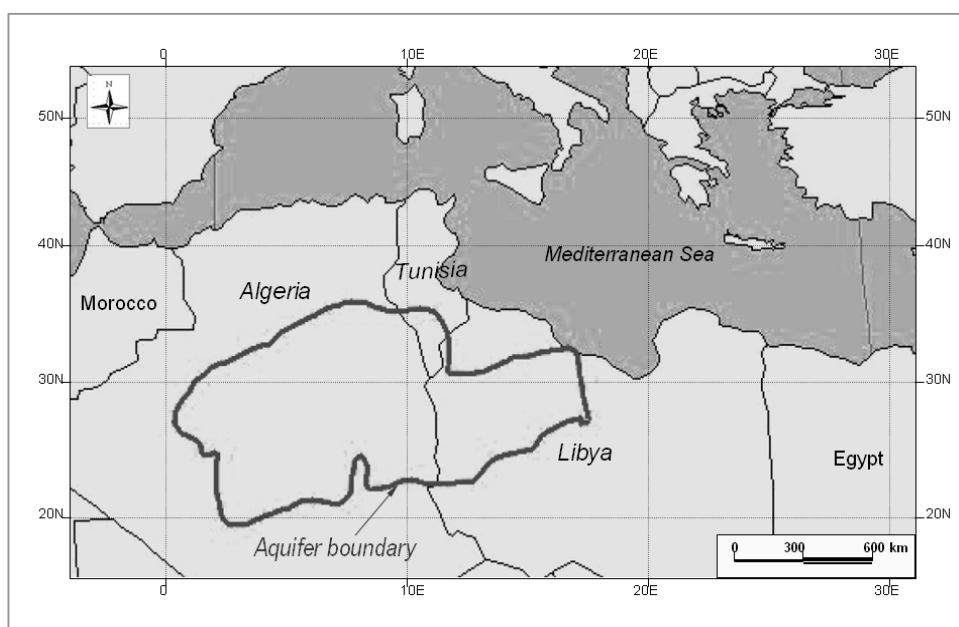
In view of the above challenges, there is an utmost need to coordinate and incorporate the recommendations of NBI institutions in national policies and to ensure ownership by member countries. This will require intensive institutional capacity-building to clearly define roles and responsibility of the various NBI bodies and the initiation of well-targeted training and capacity-building to fulfil these requirements.

<sup>59</sup> El-Atfy (2007).

## B. NORTH-WESTERN SAHARA AQUIFER SYSTEM

The North Western Sahara Aquifer System (NWSAS), shared by Algeria, the Libyan Arab Jamahiriya and Tunisia (figure 7), contains mostly non-renewable water resources. The NWSAS covers an area of over 1 million km<sup>2</sup> (700,000 km<sup>2</sup> in Algeria, 80,000 km<sup>2</sup> in Tunisia and 250,000 km<sup>2</sup> in the Libyan Arab Jamahiriya) and includes two main deep aquifers layers: the Intercalary Continental and the Terminal Complex. About 8,800 water extraction points and springs exist in the Saharan Aquifer System. There have been high withdrawal rates reaching 2.5 bcm annually for the past 20 years, significantly exceeding the renewal capacities of the system which represent only 1 bcm per year.<sup>60</sup> During the last thirty years, withdrawals from NWSAS grew from 0.6 to 2.5 bcm annually. Due to the rapid increase of withdrawal rates, the aquifer system is currently facing many risks such as water salinity, natural discharge depletion and piezometric level drawdown.

**Figure 7. North Western Sahara Aquifer System**



Source: Fezzani et al. (2005).

### 1. Legal framework

The three countries that share the aquifer signed an agreement at the ministerial level on the adoption of the consultation mechanism in Algeria in 2005. This agreement led to the establishment of an institutional framework supported by a technical structure at the regional and country levels.

### 2. Institutional arrangements

The establishment of the institutional arrangements at the regional and national levels evolved from the following key steps:

- Three workshops were organized by the Sahara and Sahel Observatory (OSS) in 2002 to build trust between country representatives on the technical level and to facilitate the joint management of NWSAS. The establishment of the technical structure to improve the technical capacity of NWSAS countries was discussed at these workshops. The steering committee recommended that

<sup>60</sup> Sahara and Sahel Observatory (2008).

the level of involvement in this structure should be scaled up from the technical level to the decision-making and political level;

- A consultation mechanism was established by mid-2007. This consultation mechanism was the result of several discussions and meetings during which the mechanism's configuration, operation and funding were defined;
- In November 2007, the structure coordinator was appointed to OSS for a term of one year. Funding obligations are to be shared equally by the three countries to ensure ownership, commitment and sustainability of the established regional structure.

It was ultimately decided that the regional structure would operate at the level of the Director-General and include a representative from the institutions in charge of water in each of the three member countries. A steering committee was formed in each country to act as a national focal point and as an ad hoc committee for scientific evaluation and orientation.

### *3. Policy development and knowledge management*

National databases in the three countries were harmonized and adapted to support a new data collection, integration and updating system, and for the calibration of the simulation models in the focal institutions. A project was implemented by OSS from 1998 to 2002 in collaboration with the three countries sharing the NWSAS to improve the scientific base and knowledge of the aquifer system. The outcomes of this phase of the project were mainly hydrogeological data collection, analysis, and synthesis; establishment of a common database and an information system; development and utilization of NWSAS mathematical model and the regional sub-models. The second phase of the project (from 2002 to 2006) established a permanent consultation mechanism. During the current phase, which started in 2007, the socio-economic and environmental aspects and utilization of modern technologies such as remote sensing for estimating irrigation water consumption are being addressed.<sup>61</sup>

### *4. Capacity-building and awareness-raising*

From the technical point of view, the project succeeded to build the capacity of the three member countries by; enhancing existing databases, creating simulation models and GIS maps, performing hydrogeological data analysis and implementing information systems. A common database was developed for the NWSAS data in the three countries.

### *5. Findings and recommendations*

This case study reflects the proactive role that regional organizations, such as OSS, can play as a facilitator to enhance the management of the shared groundwater resources through consultative and participatory approaches. The efforts of this organization were complemented by the commitment and effective involvement of the national institutions in the three countries sharing this water resource.

## **C. NUBIAN SANDSTONE AQUIFER SYSTEM**

The Nubian Sandstone Aquifer System (NSAS), with is approximately 2.17 million km<sup>2</sup>, is considered as one of the world's largest fossil aquifers. It is shared by four countries, namely, Chad, Egypt, the Libyan Arab Jamahiriya and the Sudan (figure 8). Over-exploitation of the aquifer has emerged as a problem driven by many physical and socio-economic factors, including population growth and economic development, although the aquifer is located in an area remote from human settlements in each of the four countries.

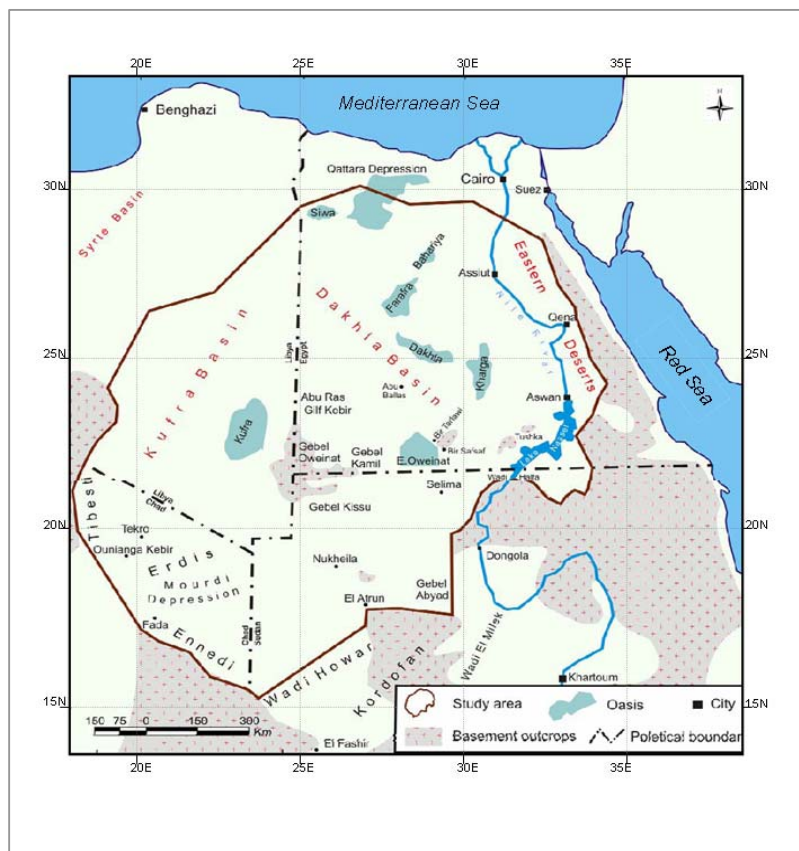
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<sup>61</sup> Ibid.



Currently the greatest utilization of this aquifer is being carried out by the Libyan Arab Jamahiriya which pumps groundwater from the aquifer to feed the Great Man-Made River, with an average discharge of about 2.37 bcm per year. Limited aquifer utilization plans are foreseen in Egypt, and no significant utilization of this aquifer is envisaged by Chad or the Sudan.<sup>62</sup>

**Figure 8. Nubian Sandstone Aquifer System**



Source: Sefelnasr, 2007.

### 1. Legal framework

The Center for Environment and Development for the Arab Region and Europe (CEDARE) developed a framework for cooperation, exchange of experiences and sharing of information under the umbrella of a regional programme to encourage sustainable management of the NSAS. Within this framework, the institutional capacity of the four countries was assessed, a regional information system was established, and regional maps and a mathematical model were developed.<sup>63</sup>

In order to establish a sustainable mechanism of regional cooperation for the management of the NSAS, CEDARE prepared two agreements which were endorsed by representatives of the four countries. The first agreement concerned the monitoring and exchange of groundwater information of the NSAS. The four NSAS countries agreed to share the information consolidated throughout the project. The second

<sup>62</sup> ESCWA (2008a)

<sup>63</sup> Abou-Zeid (2008).

agreement concerned the continuous monitoring of the aquifer and data sharing by updating the regional information system.

## *2. Institutional arrangements*

As an exclusive instrument on shared groundwater, a joint authority to assess and develop the NSAS was established in 1999. The original objectives of the joint authority are to: (a) oversee strategic planning, (b) develop a NSAS monitoring programme; and (c) exchange data and information on the respective water resources and current and future extraction.<sup>64</sup> Additionally, institutional capacity was strengthened through providing the national institutions responsible for the management of the Nubian aquifer with training courses as well as equipment and state-of-the-art software for groundwater management. This was the base for establishing national offices for the joint authority in the four countries.

## *3. Policy development and knowledge management*

The International Fund for Agricultural Development, the Islamic Development Bank and CEDARE joined forces and initiated a two year project to develop a regional strategy for the aquifer utilization. The role of CEDARE was to motivate and coordinate with the four countries and to establish this regional programme. The project was composed of two phases: (a) the assessment of the groundwater resources of the Nubian aquifer and the development of a regional strategy for the utilization of the aquifer and (b) the study of socio-economic aspects of the development of the Nubian aquifer.

Thereafter, several meetings were carried out and a regional programme document was formulated in 1995.<sup>65</sup> The programme sought to foster cooperation between the four countries in the following fields: hydrogeological studies; environmentally sound agricultural and agro-pastoral development; policies and programmes for the restoration of disrupted ecological balance and combating desertification.

## *4. Capacity-building and awareness-raising*

A project initiated by the International Atomic Energy Agency (IAEA) in 2007, entitled “IAEA/UNDP/GEF Nubian Project” aims to establish rational and equitable management of the NSAS for sustainable socio-economic development and the protection of biodiversity and land resources.<sup>66</sup> The project steering committee has met with the joint authority, UNESCO, UNDP and IAEA to encourage cooperation with CEDRE and the joint committee within the framework of the project activities.

## *5. Findings and recommendations*

This case study shows that it is important to institutionalize the regional and national entities and focal units established during projects funded by donors to ensure sustainability and continuous management and development of the shared aquifer jointly between all member countries, following the end of the project. This will build trust and ownership feeling among all stakeholders and will mobilize local funds for financial sustainability.

## **D. NAHR EL-KABIR**

The El-Kabir River is a shared water course delineating the northern boundary of Lebanon with the Syrian Arab Republic as it collects its flow from tributaries in both sides and it drains to the Mediterranean

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<sup>64</sup> ESCWA, op. cit.

<sup>65</sup> ESCWA, (2002).

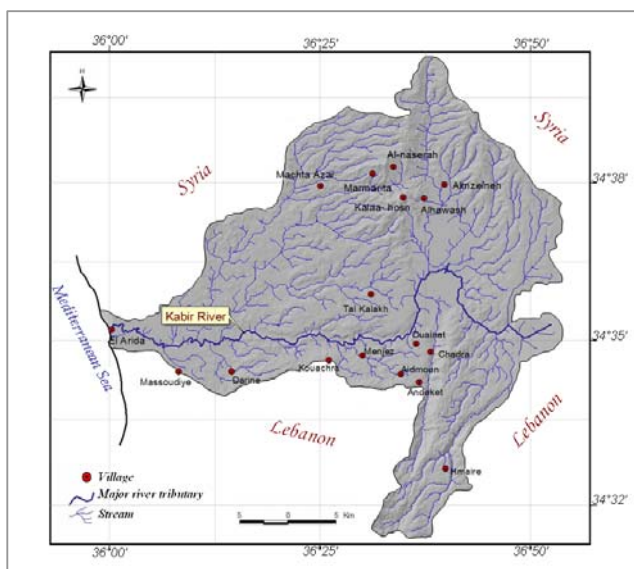
<sup>66</sup> More information about the Nubian aquifer project, a joint initiative of IAEA/UNDP/GEF is available at: [http://www.naweb.iaea.org/napc/ih/Nubian/IHS\\_nubian.html](http://www.naweb.iaea.org/napc/ih/Nubian/IHS_nubian.html).

Sea. The river flows for 56 km along the border between Lebanon and the Syrian Arab Republic from East to West direction. The El-Kabir basin covers an area of about 950 km<sup>2</sup>, 60 per cent of which is in the Syrian Arab Republic (figure 9).

### 1. Legal framework

An agreement was established between both Syrian and Lebanese sides to share the El-Kabir River flow by building a storage dam at the main course of the river. The agreement stated that the river flow, which is estimated to be an average of 150 million m<sup>3</sup> on an annual basis, would be shared by allocating 60 per cent to the Syrian Arab Republic and 40 per cent for Lebanon based on the annual incoming flows. The storage capacity of the dam is estimated by 70 million m<sup>3</sup>. The joint Syrian and Lebanese Committee for Shared Water Resources has been supervising issues related to sharing the El-Kabir River.

**Figure 9. El-Kabir River Basin between Lebanon and the Syrian Arab Republic**



Source: Shaban et al. (2005).

### 2. Institutional arrangements

The basin is administrated on the Syrian side by two water resources directorates based in Homs and Tartous which are equipped by technical and human resources. They are sharing and monitoring climate, surface and ground water data. In Lebanon, there is no clear national structure that is responsible for monitoring programmes.<sup>67</sup> Currently the Ministry of Energy and Water is building its capacity to establish monitoring stations, as there is only one climate station within the basin and one hydrometric station at the outlet. The other stations located on the main course of the river are shared by both countries.<sup>68</sup> There is a need to strengthen coordination in Lebanon with other organizations responsible for local monitoring programmes (such as the Litani River Authority) and research institutions such as the National Council for Scientific Research active in the region.

<sup>67</sup> ESCWA, (2008b).

<sup>68</sup> Ibid.

### *3. Policy development and knowledge management*

There are eighteen hydrometric stations distributed within the El-Kabir River basin in Lebanon and the Syrian Arab Republic, seventeen of them are manually gauged.<sup>69</sup> It is essential to upgrade existing manual stations to automated stations in order to improve the quality of data, especially when potential large water withdrawals are planned by both riparian countries. There is also a need to establish a water quality gauging station, particularly at the main stem of the river to monitor the pollution loads particularly increasing bacteriological contamination and nutrient loads. A groundwater monitoring stations network is also proposed at 32 sites to define the interaction between surface and groundwater and to define the special distribution of groundwater level and water quality at these locations.

### *4. Capacity-building and awareness-raising*

There are some management challenges affecting the basin. These challenges are mainly due to limited interagency cooperation due to competing organizational objectives, gaps in technical capacity and limited availability of reliable data. There is also currently no comprehensive basin management plan in place.

Geographic, hydrologic and land use data is available using GIS and remote sensing. These technologies can support the preparation of basin-wide management plans. Bilateral cooperation and joint actions across all levels of government and the public will be essential for better basin management in the two countries. Adequate capacity to deal with and manage water demands, flood events or other water crises that may occur in the basin should also be strengthened. The Lebanese and Syrian Governments are working to enhance national capacity for water resource planning by providing training on decision support systems such as WEAP. Training on this tool has been provided by ACSAD and BGR in Damascus, and in partnership with ESCWA in Beirut.

### *5. Lessons learned*

Institutional cooperation for on-going water quantity and water quality monitoring and for data sharing will be needed in the basin. Water and environment agencies in both countries will need to coordinate activities to enhance effectiveness and minimize costs. It is strongly recommended that institutional arrangements be strengthened to formulate a comprehensive basin development plan and to begin joint implementation of measures to manage demand in the two countries based on sound information and analysis.

## **E. KEY CHARACTERISTICS OF SHARED WATER RESOURCES IN THE ESCWA REGION**

In the ESCWA region, physical, hydrological and hydrogeological data are collected to measure and utilize shared water resources. Modern techniques and recent studies have provided increasingly reliable data. Tables 5 deals with shared surface water resources in the ESCWA region and provides hydrologic data, outlines the legal and institutional arrangements that govern these resources, itemizes joint projects, and lists the main issues at play for each basin. Table 6 follows the same format and presents data on shared groundwater resources in the ESCWA region.

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<sup>69</sup> ESCWA, 2008b. op. cit.

TABLE 5. KEY CHARACTERISTICS OF SELECTED SHARED SURFACE WATER RESOURCES  
IN THE ESCWA REGION

Basin	Riparian Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>The Nile</i>	<i>Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, the Sudan, Tanzania and Uganda</i>	<ul style="list-style-type: none"> <li>• Average discharge is 300 million m<sup>3</sup>/day</li> <li>• Rainfall ranges from 800-1800 mm/year</li> <li>• Evaporation is 1400-1700 mm/year</li> <li>• Main tributaries: White Nile, Blue Nile and Atbara</li> <li>• The Nile basin area is 3.1 million km<sup>2</sup></li> <li>• The basin lies 0.4% in Burundi, 0.7% in Congo, 10.5% in Egypt, 11.7% in Ethiopia, 0.8% in Eritrea, 1.5% in Kenya, 0.7% in Rwanda, 63.6% in the Sudan, 2.7% in Tanzania and 7.4% in Uganda<sup>d/</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Bi-lateral agreement between Egypt and the Sudan in 1959</li> <li>• Cooperation through Hydromat project from 1967-1992</li> <li>• Technical cooperation for the promotion of the development and Environmental protection of the Nile Basin (TECCONILE) from 1993-1999</li> <li>• The Nile Basin Initiative (NBI)</li> <li>• Establishment of Nile-COM, Nile-TAC and Nile-SEC in 1999</li> </ul>	<ul style="list-style-type: none"> <li>• Shared Vision Programme comprised of eight projects working both on a regional and national levels (see case study)</li> <li>• Long historical records of river flows and other hydrologic parameters</li> <li>• There are on-going projects to establish a decision support systems for water resources management and to conduct EIA<sup>b/</sup></li> <li>• Development of modern technological and analysis systems using GIS, remote sensing and flow forecasting models</li> <li>• Current limitation in water quality data and information</li> </ul>	<ul style="list-style-type: none"> <li>• Downstream impacts of interventions and pollution</li> <li>• Potential win-win situations through implementation of the shared vision projects</li> <li>• Final endorsement of the legal and institutional framework for cooperation on the Nile (Cooperative framework – D3)<sup>e/</sup>, pending encompasses obligations and institutional structure</li> </ul>
<i>Euphrates and Tigris</i>	<i>The Islamic Republic of Iran, Iraq, the Syrian Arab Republic, and Turkey</i>	<ul style="list-style-type: none"> <li>• The Euphrates average annual discharge is 33.5 bcm/year, while the Tigris discharge is 50 bcm/year</li> <li>• The Euphrates basin lies in Turkey 28%, 17% in Syria, 40% in Iraq and 15% the Islamic Republic of Iran. The river is 2781 km long, divided between Turkey (1,230 km), Syria (710 km), and Iraq (1,060 km)<sup>d/</sup></li> </ul>	<ul style="list-style-type: none"> <li>• The protocol relating to the Utilization of the Waters of the Euphrates and Tigris was signed between Iraq and Turkey in 1946</li> <li>• The Joint Technical Committee between Iraq and Turkey to negotiate water quotas and issues was formed in 1980 with the participation of Syria from 1983<sup>f/</sup></li> </ul>	<ul style="list-style-type: none"> <li>• No joint projects have been conducted, but propositions to find a solution were introduced</li> <li>• Iraqi and Syrian proposals for water allocation as follows: <ul style="list-style-type: none"> <li>(a) each riparian will notify the other riparian of its water demands on each river separately</li> <li>(b) total potential water supply of each river will be calculated</li> <li>(c) if the total demand exceeds the total supply of a given river, the “overdraft” amount will be deducted proportionally from the demand of each riparian country</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• According to the 1987 Protocol, Turkey will let a discharge of more than 500 m<sup>3</sup>/sec at the Syrian border during the time when it fills the Ataturk dam<sup>b/</sup></li> <li>• According to the Syrian-Iraqi agreement of the year 1989, the Iraqi quota of running water along the Syrian border is 58% of the Euphrates water<sup>b/</sup></li> </ul>

TABLE 5 (continued)

Basin	Riparian Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>Euphrates and Tigris</i>	<i>The Islamic Republic of Iran, Iraq, the Syrian Arab Republic, and Turkey</i>	<ul style="list-style-type: none"> <li>The Tigris basin is distributed between Turkey (12%), Syria (0.2%), Iraq (54%) and the Islamic Republic of Iran (34%). The catchment area is situated in Turkey (21%), Syria (0.3%), Iraq (31%) and the Islamic Republic of Iran (48%). The river is 1,850 km long, with 400 km in Turkey, 32 km in Syria and 1418 km in Iraq. Turkey provides 51%, Iraq 39%, and the Islamic Republic of Iran 10% of the annual water volume of the Tigris<sup>g/</sup></li> </ul>		<ul style="list-style-type: none"> <li>Three-staged plan for optimal, equitable and reasonable utilization of rivers water, as follows:               <ol style="list-style-type: none"> <li>Inventory studies for water resources (stage 1)</li> <li>Inventory studies for land resources (stage 2)</li> <li>Evaluation of water and land resources (stage 3)<sup>g/</sup></li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Negotiations over the water issues involved both the technical and decision-making levels have been suspended since the 1990's. This is well pronounced when Turkey began filling the Ataturk Dam reservoir<sup>h/</sup></li> </ul>
<i>The Jordan</i>	<i>Israel, Jordan, Lebanon, Palestine and the Syrian Arab Republic</i>	<ul style="list-style-type: none"> <li>Main Rivers are the Yarmouk (40% of total flow) and the Jordan</li> <li>The river originates from the highlands of Lebanon, Jordan, the Syrian Arab Republic and Palestine where the most important tributaries are El-Hasbani and Banias. Thus water flow to Tabray Lake, then re-originate from the Lake as the Yarmouk River</li> <li>Its total length is 251 km</li> <li>Catchments area = 18,300 km<sup>2</sup></li> <li>Water allocation is divided as follows: the Syrian Arab Republic (45 million m<sup>3</sup>), Israel (394 million m<sup>3</sup>) and Jordan (774 million m<sup>3</sup>)</li> </ul>	<ul style="list-style-type: none"> <li>In 1987 a revised Treaty between Jordan and the Syrian Arab Republic on the Yarmouk River was concluded and a Joint Commission was established to follow up on its implementation</li> <li>The Jordan-Israel Peace Treaty was signed in 1994 and a Joint Water Commission was formed and comprised of three members from each country<sup>j/</sup></li> </ul>	<ul style="list-style-type: none"> <li>The Jordan Industrial Joint Gateway Project is a planned industrial park/free trade zone that straddles the Jordan River between Israel and Jordan<sup>j/</sup></li> <li>The GLOWA Jordan River (GLOWA JR) project, a joint project of German, Israeli, Jordanian and Palestinian partners, is addressing vulnerability of water resources to climate change (2001-2008)<sup>k/</sup></li> </ul>	<ul style="list-style-type: none"> <li>Israel has been continuously working in the demilitarized zone between the Syrian Arab Republic and Israel</li> <li>The National Water Carrier has a capacity to transport 1.7 million m<sup>3</sup> water from the north to south of Israel, includes water from the Jordan River<sup>l/</sup></li> </ul>

TABLE 5 (continued)

Basin	Riparian Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>Nahr El Kabir Al Janoubi</i>	<i>Lebanon and the Syrian Arab Republic</i>	<ul style="list-style-type: none"> <li>• Catchment area = 950 km<sup>2</sup>, where 295 km<sup>2</sup> is situated in Lebanon (31%), and 655 km<sup>2</sup> in the Syrian Arab Republic (69%)</li> <li>• Average annual precipitated water is 250 million m<sup>3</sup></li> <li>• Average annual discharge is 215 million m<sup>3</sup></li> </ul>	<ul style="list-style-type: none"> <li>• All agreements are assigned by the two countries through a Joint Committee established to follow up on the implementation of water use from the river</li> <li>• A joint technical committee was formed to manage shared waters</li> <li>• An agreement was signed in 2002 between the two countries for equitable and reasonable utilization of the water resource (60% of the annual flow to the Syrian Arab Republic and 40% to Lebanon)</li> </ul>	<ul style="list-style-type: none"> <li>• A dam (Adline-Noura Et-Tahat) is proposed for constructed to irrigate about 5000 ha. Both countries can utilize their quota from the storage upstream from this dam<sup>m/</sup></li> <li>• A joint research programme on Watershed management was carried out between the Syrian Arab Republic and Lebanon (2001-2003). The study was funded by the International Development and Research Centre (IDRC), and other partners were: the General Organization for Remote Sensing, the Syrian Arab Republic and National Council for Scientific Research, Lebanon<sup>n/</sup></li> <li>• A joint project was carried out between Lebanon and the Syrian Arab Republic funded by the Arab League Educational, Cultural and Scientific Organization (ALECSO) (2004). It was on the use of remote sensing and GIS techniques to study the coastal environment between Lebanon and the Syrian Arab Republic</li> <li>• A study was carried out by ESCWA with ACSAD for the characterization of hydro-geological parameters of surface and groundwater in the basin<sup>o/</sup></li> </ul>	<ul style="list-style-type: none"> <li>• No conflicts exist. However, some local issues, such as water pollution, are present. The two countries are jointly working to resolve this problem.</li> </ul>

TABLE 5 (continued)

Basin	Riparian Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>Al-Assi River (Orontes River)</i>	<i>Lebanon, the Syrian Arab Republic and Turkey</i>	<ul style="list-style-type: none"> <li>• Catchment area = 36,000 km<sup>2</sup>, where 190 km<sup>2</sup> is situated in Lebanon</li> <li>• Average annual precipitation is 650 million m<sup>3</sup> (within Lebanon)</li> <li>• Average annual discharge is 512 million m<sup>3</sup> (from Lebanon)</li> <li>• River source is in Lebanon and is mainly from El-Laboueh spring (1.6 m<sup>3</sup>/sec), springs of Jbab El-Homer (400 m<sup>3</sup>/sec) and Ayoun Orghoush springs (200 m<sup>3</sup>/sec)</li> </ul>	<ul style="list-style-type: none"> <li>• A Joint Committee between Lebanon and the Syrian Arab Republic was established to follow up the implementation of water use from the river</li> <li>• Bilateral agreement was signed between Lebanon and the Syrian Arab Republic (Act. No. 15, 1994) to divide the annual share as: 80 million m<sup>3</sup> to Lebanon when the river discharge is 400 million m<sup>3</sup> or greater. The Lebanese quota is thus 20%</li> </ul>	<ul style="list-style-type: none"> <li>• There are a number of projects taking place along the river course. However, these projects are executed within a country following consultation with the other riparian country. This includes two dams built in Lebanon on the river</li> </ul>	<ul style="list-style-type: none"> <li>• Some local problems mainly related to water pollution exist</li> </ul>
<i>Wazzani-Hasbani River</i>	<i>Jordan, Lebanon, the Syrian Arab Republic and Palestine</i>	<ul style="list-style-type: none"> <li>• The catchment of the river is not well defined, but it is about 680 km<sup>2</sup> in Lebanon</li> <li>• The river is fed mainly by snowmelt and springs of the Hermoun mountain chain in Lebanon</li> </ul>	<ul style="list-style-type: none"> <li>• There are no legal agreements between the neighbouring countries regarding this river</li> </ul>	<ul style="list-style-type: none"> <li>• No common projects on the river course, except for a direct pumping to feed the local villages in Lebanon</li> </ul>	<ul style="list-style-type: none"> <li>• Underlying conflict due to political tensions</li> </ul>

a/ (UNEP, 2000).

b/ More information available at: <http://www.nilebasin.org/>.

c/ Kaya (1997).

d/ Naff and Matson (1984).

e/ Kliot (1994).

f/ Turkish Ministry of Foreign Affairs (1995).

g/ Ibid.

h/ ACSAD (1997).

i/ Hudes (1998).

j/ Sultan and Lenchner (2000).

k/ More information on GLOWA JR available at: <http://glowa-jordan-river.de/>.

l/ Haddadine (2001).

m/ ESCWA (2005a).

n/ Cadham (2006).

o/ ESCWA (2008b).



TABLE 6. KEY CHARACTERISTICS OF SELECTED SHARED GROUNDWATER RESOURCES  
IN THE ESCWA REGION

Aquifer System	Member Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>The Nubian Sandstone</i>	<i>Chad, Egypt, the Libyan Arab Jamahiriya and the Sudan</i>	<ul style="list-style-type: none"> <li>Area = 2.17 million km<sup>2</sup></li> <li>The aquifer area is divided as: 816 x 10<sup>3</sup> km<sup>2</sup> (37.6%) in Egypt, 754 x 10<sup>3</sup> km<sup>2</sup> (34.75%) in the Libyan Arab Jamahiriya, 233 x 10<sup>3</sup> km<sup>2</sup> (10.7%) in Chad and 373 x 10<sup>3</sup> km<sup>2</sup> (17%) in the Sudan</li> <li>The total freshwater storage is 373 x 10<sup>3</sup> bcm distributed as follows: 155 x 10<sup>3</sup> bcm (41.5%) in Egypt, 137 x 10<sup>3</sup> km<sup>3</sup> (36.7%) in the Libyan Arab Jamahiriya, 48 x 10<sup>3</sup> bcm (12.8%) in Chad and 34 x 10<sup>3</sup> bcm (9.1%) in the Sudan<sup>2/</sup></li> <li>The aquifer is non-renewable</li> </ul>	<ul style="list-style-type: none"> <li>The Joint Authority between the member countries was established in 1999 and focal point institutions were identified</li> <li>Two agreements were signed in 2000 between the four countries to share the data that were consolidated during the two-year joint monitoring project</li> </ul>	<ul style="list-style-type: none"> <li>In 1997 CEDARE and the International Fund for Agricultural Development initiated a two year project to develop a regional strategy for the utilization of the aquifer</li> <li>Information system and regional maps were developed for water levels, water quality, groundwater extractions, lithology information and socio-economic variables</li> <li>A regional monitoring network was established (60 wells) and new monitoring sites were recommended (14 wells)</li> <li>Simulated scenarios for drawdown, influence zones, vulnerability to pollution, etc. were produced</li> <li>The guidelines for assessing the state of the aquifer report were recently developed<sup>2/</sup></li> </ul>	<ul style="list-style-type: none"> <li>The data sharing and exchange project was not yet implemented due to lack of funds</li> <li>No significant regional activities have taken place following the completion of the regional project in 2000 due to lack of funds and inability to mobilize local financial resources</li> </ul>
<i>Eastern Mediterranean Carbonate</i>	<i>Jordan, Lebanon, the Syrian Arab Republic and Palestine</i>	<ul style="list-style-type: none"> <li>Area = 48,000 km<sup>2</sup> of limestone and dolomite</li> <li>These carbonates rocks are well karstified</li> <li>They are classified into two major hydrogeologic formations. The upper one is attributed to the Middle Cretaceous and the lower is due to Jurassic</li> <li>The aquifer is renewable</li> </ul>	There is no obvious legal or institutional arrangement for these shared resources. This is because the stored water is renewable, and the running water flows directly to the sea, with less groundwater intervening	A joint project entitled was carried out between Lebanese and Syrian experts (2000-2002). It was implemented and funded by the Lebanese National Council for Scientific Research and the General Organization for Remote Sensing in the Syrian Arab Republic	No conflict issue exists for the groundwater in the area; however, focuses are only on surface water in this region

TABLE 6 (continued)

Aquifer System	Member Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>Jabel el Arab Basaltic</i>	<i>Jordan, Saudi Arabia and the Syrian Arab Republic</i>	<ul style="list-style-type: none"> <li>The aquifer is part of Horan and Rab Mountain basin and covers an area of 15,000 km<sup>2</sup></li> <li>Total rainfall is estimated at 3500 million m<sup>3</sup></li> <li>Secondary porosity of the fracture systems in the basalt is the major hydrologic characteristic</li> <li>Groundwater level varies from less than 50 m in depressions and Yarmouk basin to over 400 m in the mountainous area</li> <li>Salinity varies from 200 mg/l in the Western part to 2200 mg/l in a number of areas in the Eastern Mafraq and Azraq plain</li> <li>It is a renewable aquifer</li> </ul>	<ul style="list-style-type: none"> <li>A memorandum of understanding for mutual cooperation in management of the aquifer was drafted between Jordan and the Syrian Arab Republic but has not yet been signed</li> <li>No formal agreement exists between the countries for managing the shared aquifer</li> <li>There is a joint committee between the Syrian Arab Republic and Jordan</li> </ul>	<ul style="list-style-type: none"> <li>A study was initiated by ESCWA and BGR in 1994 to establish a hydrological information database using GIS and remote sensing techniques. The main results of the study comprised 15 maps to provide regional information needed in planning of groundwater resources</li> <li>Many efforts were followed to update available information and to test groundwater and hydrological models to be used for the aquifer system</li> </ul>	<ul style="list-style-type: none"> <li>The tilting of basaltic masses in the south-west direction creates a hydrologic flow regime from Syrian territory towards Jordan</li> <li>There is increased groundwater salinity due to irrigation and intrusion of brackish water due to over-abstraction</li> <li>Over-abstraction has diminished or halted the discharge of springs<sup>c/</sup></li> </ul>
<i>Tabouk and Saq</i>	<i>Iraq, Jordan, Saudi Arabia and the Syrian Arab Republic</i>	<ul style="list-style-type: none"> <li>Both aquifers (non-renewable) are composed mainly of sandstone with shale facies in Tabouk formation</li> <li>The groundwater storage in Tabouk aquifer is 205bcm, and it is 280bcm in Saq aquifer</li> </ul>	<ul style="list-style-type: none"> <li>No legal and institutional arrangements exist</li> </ul>	<ul style="list-style-type: none"> <li>The Disi/Amman Water Conveyor project has been carried out to supply Amman through 350 km conveyor. Thus, the quota of Jordan can rise to 150 million m<sup>3</sup>/yr<sup>d/</sup></li> </ul>	<ul style="list-style-type: none"> <li>The abstraction from Saudi Arabia is 700 million m<sup>3</sup>/yr, whilst, Jordan abstraction is about 80 million m<sup>3</sup>/yr. In 1997 the Jordanian Government has taken the following steps: <ul style="list-style-type: none"> <li>(a) Notified the authorities of Saudi Arabia of their intention to exploit groundwater underlying Jordan</li> <li>(b) Carried out a risk assessment study, financed by the World Bank, to induce the abstraction south of the Saudi Arabia<sup>e/</sup></li> </ul> </li> </ul>

TABLE 6 (continued)

Aquifer System	Member Countries	Key hydrologic characteristics	Legal and institutional arrangements	Joint projects and available information	Main issues
<i>Wajid</i>	<i>Saudi Arabia and Yemen</i>	<ul style="list-style-type: none"> <li>It is a non-renewable aquifer and composed mainly of sandstone and has 225 bcm of groundwater storage</li> </ul>	<ul style="list-style-type: none"> <li>Initial arrangements are underway to manage the Wajid sandstone aquifer between Saudi Arabia and Yemen<sup>f/</sup></li> </ul>	<ul style="list-style-type: none"> <li>Mainly used for agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Water consumption in Yemen is expected to increase from 98 million m<sup>3</sup> in 1980 to 640 million m<sup>3</sup> in 2010<sup>g/</sup></li> </ul>
<i>Wasia-Biyada and Cretaceous</i>	<i>Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen<sup>h/</sup></i>	<ul style="list-style-type: none"> <li>It is composed largely of sandstone, where groundwater is non-renewable</li> <li>Groundwater storage is 590 bcm</li> </ul>	There are two joint committees, one between Oman and the United Arab Emirates and another between Yemen and Oman	A study was initiated by ESCWA and BGR in 1994 to establish a hydrological information database, and to select pilot areas for investigation. These areas are: the shallow aquifer between Oman and United Arab Emirates as well as the deep aquifer between Yemen and Oman <sup>i/</sup>	<ul style="list-style-type: none"> <li>There is a rapid increase in salinity of groundwater from 4000 mg/l to 30.000 mg/l in north-east direction<sup>j/</sup></li> <li>The over-abstraction affected groundwater quality and led to saltwater intrusions, such as in Oman<sup>k/</sup></li> <li>Also, there is an obvious advancement of saline water interface, which reached in some cases up to 130 m, such as in Bahrain<sup>l/</sup></li> </ul>
<i>Umm Er Radhuma</i>	<i>Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates</i>	<ul style="list-style-type: none"> <li>These non-renewable aquifers composed of limestone and dolomite rocks, which are highly fractured</li> <li>The groundwater storage in Umm Er Radhuma aquifer is 190 bcm, and it is 45 bcm in Dammam aquifer</li> </ul>			

<sup>a/</sup> Salem and Pallas (2002).

<sup>b/</sup> ESCWA (2008a).

<sup>c/</sup> Kansoh, Muller and Klingbeil (2003).

<sup>d/</sup> Salman (1999).

<sup>e/</sup> Ibid.

<sup>f/</sup> Klingbeil (2004).

<sup>g/</sup> Al-Fusail, Al-Selwi, Said and Bader (1991).

<sup>h/</sup> Al Awali and Abdulrazzak (1993).

<sup>i/</sup> Kansoh, Muller and Klingbeil op. cit.

<sup>j/</sup> Pike (1985).

<sup>k/</sup> Bakir (2000).

<sup>l/</sup> United Nations Environment Programme/ESCWA (1991).

## **IV. SHARED WATER RESOURCE MANAGEMENT IN THE ESCWA REGION: A COUNTRY-LEVEL PERSPECTIVE**

### **A. EGYPT: THE NILE WATER SECTOR**

The Nile River supplies almost all water in Egypt. According to the agreement with the Sudan signed in 1959, Egypt's share of the water available from the Nile is 55.5 bcm per year. The Nile Water Sector of the Egyptian Ministry of Water Resources and Irrigation, in cooperation with other riparian countries are responsible for the management of the river.

#### *1. Historical background of cooperation and Nile Water Sector institutions*

The establishment of the first ministry responsible for Nile Water Affairs in Egypt dates back to the year 1878 and was referred to as Ministry of Public Works which reflects the importance of management of the Nile Water to Egypt. In 1905, the General Inspectorate for Egyptian Irrigation was founded in the Sudan and was staffed by a number of irrigation engineers, technicians and administrative staff to monitor water levels and discharges and to carry out hydrographic surveys and pilot studies. In 1948, the General Inspectorate for Nile Control was established at the Ministry of Public Works to collect and analyse the hydrological measurements of the Upper Nile and to forecast the seasonal Nile flows in order to devise various scenarios of water demands and uses during these periods. These data are published in the Nile Basin Encyclopaedia and updated every five years.

Following the signatory of the 1959 agreements between Egypt and the Sudan on their respective shares of the Nile waters, there was a need to establish a technical authority to support this work. Initially these units were placed under the Ministry of Public Works, but the sector is now managed under the Ministry of Water Resources and Irrigation. The following details the development phases of this authority since its establishment:

- In 1960, the authority was named as Egyptian Panel for the Permanent Joint Technical Committee for the Nile Water. Both entities previously formulated, namely, General Inspectorate for Nile Control and the General Inspectorate for Egyptian Irrigation were set under the Egyptian Panel to embrace all mandates and responsibilities related to the Nile Waters within and outside the country;
- In 1967, the Egyptian Panel was reorganized as the Egyptian Technical Body for Nile Waters;
- In 1971, the authority was transformed to the Egyptian General Authority for Nile Waters;
- Since 1976, the authority has been called the Nile Water Sector (NWS), which is a main sector in the Ministry of Water Resources and Irrigation (MWRI).

#### *2. Institutional arrangements*

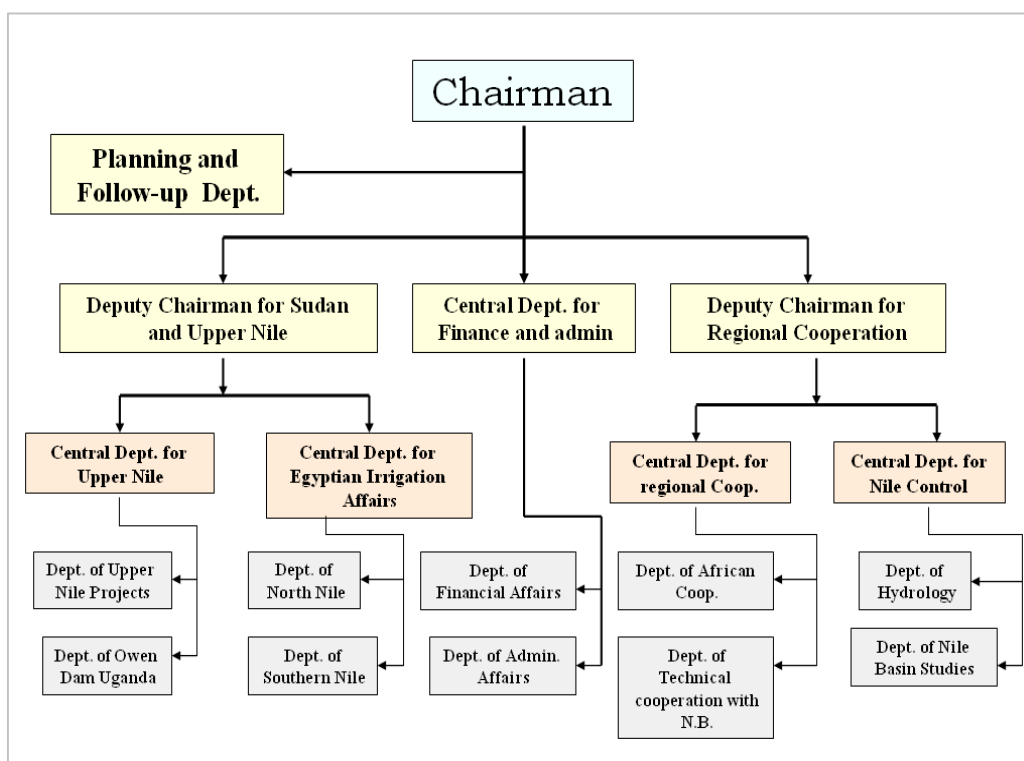
The main mandate of NWS is to preserve Egypt's water share in accordance with the historical agreement with the Sudan in 1959. In addition to defending Egypt's interests in Nile waters, NWS is also developing new water resources through Upper Nile Projects, cooperating with Nile countries under NBI and adapting innovative ideas for shared benefits and successful basin-wide projects.

Currently, NWS has four main substantive areas organized into central departments, as illustrated in figure 10. When compared with the previous Egyptian General Authority of Nile Water, it is clear that NWS has been restructured. The activities of NWS departments include:

- Nile Control, divided between the Hydrology and Nile Basin Studies units, which are responsible for forecasting the annual inflows to Egypt, preparation of supply scenarios using mathematical modelling for the operation of the High Aswan Dam during low and high flow years. These units study rates of water evaporation from the dam reservoir and carry out hydrological study and research on Upper Nile reaches in the Equatorial Lakes and Ethiopian Mountains in coordination with research centres and academic institutions;
- Regional Cooperation, which includes units for African Cooperation and Technical Cooperation with Nile Basin countries to follow up NBI projects and to strengthen bilateral cooperation with the Nile riparian countries through mutual agreements and joint projects such as weed control in the Equatorial lakes in Uganda, construction of groundwater wells in Kenya and Tanzania, cooperation with the Government of Southern Sudan to manage water resources and exchange of experts in the fields of irrigation and dam engineering with Ethiopia and Rwanda, etc;
- Egyptian Irrigation Affairs, which has North Nile and Southern Nile Departments that are coordinated with the Sudan and are involved in measuring, collecting, recording and analysing all hydrological records (including water levels gauges, rainfall discharge measurements, topographic survey and sediment sampling) of the whole Nile Basin, including Atbara, Blue Nile, Sobat and the White Nile;
- Upper Nile Projects department and the department for the Owen Dam in Uganda support the joint operation of the dam in accordance with the agreement signed between Egypt and Uganda in 1953.

These central departments also work with irrigation departments in other countries riparian to the Nile River, to strengthen cooperation between the Nile Basin countries and to provide technical support when needed for joint hydrological and morphological projects.

**Figure 10. Institutional structure of the Nile Water Sector**



### *3. Policy development and knowledge management*

Many water resources studies were carried out by NWS mainly focusing on flood forecasts and lag time estimates, evaporation losses and the development of water supply scenarios for future water policies. This work is done in close cooperation with the Planning Sector in the MWRI, which has a flood forecasting unit equipped with advanced technology knowledge management tools, including, GIS, remote sensing, stochastic models, decision support systems, etc.

Because of the long history of involvement of NWS in monitoring of the Nile Water, 13 volumes of the Nile Basin Encyclopaedia have been produced and published to describe all hydrology of the Nile and to present analysed hydrological data and information.

### *4. Cross-sector cooperation at the national level*

National committees were established to involve other ministries and organizations concerned with the NBI multi-disciplinary projects. The High Committee of Nile Water chaired by the Prime Minister is the highest authority which deals with political, and to some extent, technical issues of the Nile Water. Ministers of Irrigation, Foreign Affairs, International Cooperation, Defence and National Security are the main actors involved in this committee. A legal committee also exists comprising of experts from Irrigation, Foreign Affairs and National Security to discuss the legal aspects associated with the bilateral and multilateral agreements with the Nile Basin Countries. Experts on International Law and International Relations from the universities frequently contribute to the preparation and review of legal provisions and statements and actively participate in official national delegations during negotiation and conflict resolution meetings. Several preparatory discussions have taken place between national partners to reach a joint consensus on various technical, political and legal issues prior to the regional meetings. Also, national coordinators were nominated from other sectors to act as a focal and coordination unit for the NBI shared vision projects (for example, national coordinators from Ministries of Environment, Electricity and Power, etc.).

The national offices for NBI were established in the member countries with funds secured from national budgets. In Egypt, the NBI national office was established in the NWS in 2005 and mandated with the following specific tasks:

- Coordinate and follow up all activities and projects of NBI with all concerned actors at the national level, including focal points, projects coordinators, steering committee members, national experts, etc. Coordination meetings are held three times each year;
- Strengthen connections between the NBI secretariat and the Subsidiary Action Programme coordination units at the regional scale;
- Provide technical support to the members of national delegations and technical and advisory committees such as NILE-TAC by providing data and information on NBI projects to facilitate their active participation;
- Organize national workshops and forums to disseminate NBI and regional cooperation activities to other concerned governmental and non-governmental stakeholders nation-wide;
- Organize preparatory meetings for national delegates and experts to ensure a common vision and coordinated action plans prior to participation in key regional meeting with representatives of other riparian countries;
- Provide technical and logistical support to NBI regional meetings and workshops carried out within the country.

The establishment of these national offices serves to enhance coordination, communication and exchange of experience and knowledge on national, regional and sub-regional projects among all stakeholders active in NBI, including ministries, local organizations, civil society, NGOs, private sectors etc. An example of involvement of NGOs at the national level in Egypt is shown in box 2.

**Box 2. Involvement of NGOs at the national level in Egypt**

National forums for civil society were established in the Nile Basin countries to ensure participation of all society organizations, NGOs and the public at large in protection of the Nile River. An International Forum was established to coordinate and integrate all national and local efforts put in place by the National Forums. The General Assembly of the International Forum recommended during a meeting in January 2008 to foster and strengthen partnership with the NBI projects and activities carried out by the national governments and to mobilize other financial resources to ensure the effective operation and sustainability of the International and National Forums. The coming phase of activities will focus on building capacities of the National Forums in the Nile Basin Countries through advanced training to localities and end users in issues related to water and land management, food security, technology utilization in agriculture, etc.

The National Forum in Egypt was launched in 2003 with a wide range of participation of the NGOs, local civil society representatives, women and youth groups, media, etc, and many national and local workshops took place in most Governorates on the Nile River. There are several activities undertaken by the National Forum in Egypt, among others: establishment of 17 local forums in the Nile Governorates to ensure implementation of the local projects and involvement of grass-root level stakeholders in consultation and evaluation processes; organization of more than 35 workshops and consultation meetings at the national level to synchronize local activities and action plans implemented in various governorates, convening a survey with local communities, farmers and other end-users to identify main challenges and constraints encountered to protect the water quality of the Nile River and carrying out awareness campaigns to clean the Nile River from main pollutants in 15 Governorates through the local media and newspapers. The main problems faced by the National and local forums of civil society are mainly due to lack of funds and technical capacity which adversely affect sustainability of local projects, lack of integrity and harmony of the local activities with the national water and environmental action plans implemented by the central Government agencies, insufficient training programmes provided at the local level to improve skills and capabilities to plan, implement and monitor local projects, and more importantly the need to stimulate the political support and increase willingness to strengthen the civil society and community organizations through effective partnerships and joint projects.

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*Source: Compiled by ESCWA, with reference to AOYE, 2008.*

## *5. Main challenges and constraints*

There are, however, some challenges faced by NWS, including a shortage of staff skilled in legal and international affairs. Information and data exchange at both the national and regional levels are weak and there is a need for standardization and harmonization of data and information systems, decision support systems and national water policies. Institutional and legal arrangements must be drafted ensure ownership by riparian countries and to embed the regional perspectives in the national priorities. The national offices for NBI in various countries still need to be strengthened by highly-qualified permanent technical and legal staff. Countries should allocate financial resources to invest in ongoing capacity-building through advanced on-the-job training for better management of the Nile Basin.

## *6. Future outlook, priorities and plans*

A new institutional structure has been proposed for NWS to address the regional requirements of NBI projects. New departments are envisaged for planning and follow-up, legal affairs, general relations, information and documents and departments for the eastern and southern Nile sub-basin projects. Also, NWS has ambitious plans to continue to provide NBI with technical, political and financial support to facilitate a number of projects in such sectors as water resources, agricultural, environmental and hydro-power, projects and to ensure shared benefits and no-harm concepts between the Nile Basin countries. Additionally, efforts are made to update and modernize the studies and information related to Upper Nile projects to augment Egypt's supply of the Nile water through the enhancement of technological facilities in the NWS and to develop integrated information systems in coordination with other institutions inside and outside the Ministry of Water Resources and Irrigation. Technical staff must be involved in capacity-building

programmes, supporting these initiatives through proactive participation in national and regional training workshops (the applied training component of the NBI, for example). Skilled workers are needed in new fields such as international laws (including academic degrees), legal and institutional reforms, conflict resolutions and formulation of joint agreements, socio-economic aspects, IWRM and sustainable development, etc.

## B. THE SUDAN: SHARED WATER MANAGEMENT ISSUES

### 1. *Legal framework*

The Sudan has been an active partner in historical bilateral agreements such as the 1902 Agreement with Ethiopia on the Blue Nile, the Sobat and Lake Tana and the 1959 Nile Water Agreement with Egypt. A Permanent Joint Technical Committee was formed to follow up the implementation of the agreement with Egypt. Also, the Sudan has participated in several cooperative institutional frameworks. These include the Hydromat project on the Equatorial lakes from 1967 to 1992 and TECCONILE which was established in 1992 and formulated an action plan composed of twenty-two projects, some of which are currently being implemented. As a result of one of these projects the Council of Ministers of the Water Resources Affairs of the Nile countries agreed to form a panel of experts with three members from each country. The main task of this panel is to plan a basin wide cooperative framework which would lead to equitable utilization of the Nile water and shared benefits for all riparian countries. The Sudan is a key member in the technical advisory committee for NBI and endorsed the 1997 United Nations Watercourse Convention. A joint committee was formed recently with Ethiopia for information exchange and cooperation in the fields of watershed management, wildlife protection and hydropower generation.

### 2. *Institutional arrangements*

The key institution responsible of shared water resources management in the Sudan is the Directorate of Water Resources in the Ministry of irrigation and water resources, which was established in 1992. Since then, a new national water policy has been under development following a holistic approach and involving key sectors and stakeholders. The policy addresses issues of public awareness, holistic approaches to management, sustainable development, capacity-building, institutional development and research, environment and regional cooperation with other riparian countries.

Institutionally, the establishment of the National Council for Water Resources is a key step to enhance water governance. The Council is headed by the Minister of Irrigation and Water Resources and has representatives from the different water sub-sectors, comprising experts on legal, financial and international relations, research and training and concerned private sector entities. The main objectives of the Council are to formulate water resources development policies, strategies and legislation and coordinate and integrate the activities of all water related sectors and stakeholders. With respect to shared water resources management, the Council draws up plans and programmes with defined priorities. The Council formulates and submits recommendations in relation to shared water resources issues with other riparian countries and reviews legislation on development and protection of water resources.<sup>70</sup>

### 3. *Policy development and knowledge management*

The Sudan is hosting one regional project of the eight projects under NBI Shared Vision Plan, namely the Nile Transboundary Environmental Action Project. The project was officially launched in May 2004. The project supports the development of a basin-wide framework for actions to address high priority transboundary water issues and environmental challenges in the Nile River basin. The project has five components, including; institutional strengthening to facilitate regional cooperation through improved

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<sup>70</sup> Hamad (1997).



communication, knowledge exchange and dissemination of information, enhanced tools for environmental management, a component for basin-wide water quality monitoring and capacities for the management of water quality.<sup>71</sup>

#### *4. Capacity-building and awareness-raising*

The Nile Transboundary Environmental Action Project strengthened partnerships between national and regional institutions together with NBI institutions through joint activities. The National Nile Basin Development Forum was conducted in 2008 and institutions were trained on the Nile River awareness kit. Also, the project formed a regional water quality working group which included representation from Southern Sudan and prepared a plan for institutionalizing and operating five transboundary monitoring stations in consultation with the Directorate of Water Resources. In addition, water quality monitoring instruments and equipment for the laboratory of the Government of the Sudan and the Government of Southern Sudan were procured.

#### *5. Findings and recommendations*

There is a need to improve cooperation between different levels of government and to upgrade water quality analysis and protection, particularly in the Sudan. In addition, monitoring systems, data analysis and databases need to be enhanced. Other environmental issues still exist such as soil degradation, desertification, deposition of silt and changes in water quality. These issues will require a regional effort to be addressed, and regional integrated projects, joint applied research and training and exchange of information are recommended.

### **C. JORDAN: THE MINISTRY OF WATER AND IRRIGATION**

Jordan is known as a water-scarce country, since the availability of renewable freshwater does not exceed 200 m<sup>3</sup> per capita per year. Jordan is counted among the ten most water-deprived countries in the world. Water resources in Jordan have remained at a somewhat stationary level, while demands imposed by a growing population have increased. The situation has been exacerbated by the impact of climate change and the decrease in precipitation, with precipitation levels not exceeding 50 mm in 2008. Added to these challenges, Jordan shares most of its fresh surface and groundwater resources with neighbouring countries, and urges the effective management of these scarce resources to avoid conflicts.

Sharing water resources is a crucial issue in the water sector of Jordan. Major attention has been given by Jordanian officials to this topic, because they believe that the current distribution of water resources with riparian countries has deprived Jordan of a portion of its rightful share of water. Jordan has a unique surface water source, namely, the Yarmouk River. The Yarmouk River is the principal source of surface water in Jordan providing approximately 50 per cent of the country's the total available surface water.<sup>72</sup> It is shared by Jordan, Lebanon, Palestine and the Syrian Arab Republic. Conflicts exist at the upper part of this river before the water reaches Lake Tiberias (figure 13). There are also four major aquifers that are located in Jordan, which constitute about 80 per cent of the country's groundwater reserve. These include the Amman-Wadi Sir aquifer, Basalt aquifer (shared with the Syrian Arab Republic), the Ram-Disi-Saq aquifer (sandstone aquifer shared with Saudi Arabia), and the Hamad aquifer (carbonate rocks aquifer and shared with the Syrian Arab Republic, Iraq and Saudi Arabia).

#### *1. Legal framework*

With respect to the cross-boundary water flows of the Yarmouk River, the following is a summary of joint agreements signed by the Government of Jordan:

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<sup>71</sup> UNDP Sudan (2009).

<sup>72</sup> ESCWA (2005b).

- *Jordan-Israel:* Water allocation from the Yarmouk River follows a scheduled regime between both countries. For instance, in the winter season 10 million m<sup>3</sup> are diverted from Lake Tiberias to Jordan, which has the right to store 20 million m<sup>3</sup> of water in the Lake, and can retrieve this amount in summer plus 25 million m<sup>3</sup> as an extra quota. The Jordanian-Israeli Joint Committee was formed in accordance with the Peace Agreement in 1994, Annex No. 2;
- *Jordan-Syrian Arab Republic:* The agreement in this case refers to water allocation from Al-Wehda Dam on the primary course of the Yarmouk River, which has a capacity of 110 million m<sup>3</sup>. Jordan's quota is 11 million m<sup>3</sup> (10 per cent). The Protocol between these countries was established in 1986, modified from the previous Protocol of 1956, and established a joint committee between the two countries. Cooperative efforts were strained in recent years when Jordan did not receive its specified water quota.

## 2. Institutional arrangements

### (a) *Institutional arrangement - national*

The Ministry of Water and Irrigation in Jordan is the responsible institution for water-related affairs. It was established in 1992 and is the official entity responsible for the overall monitoring of the water sector, water supply and sanitation, planning and management, the development of strategies and policies and research and development. The Ministry of Water and Irrigation has been supported by several donor funded projects in the fields of IWRM, water master planning and restructuring the water sector to cope with newly emerging issues at the regional and global levels.

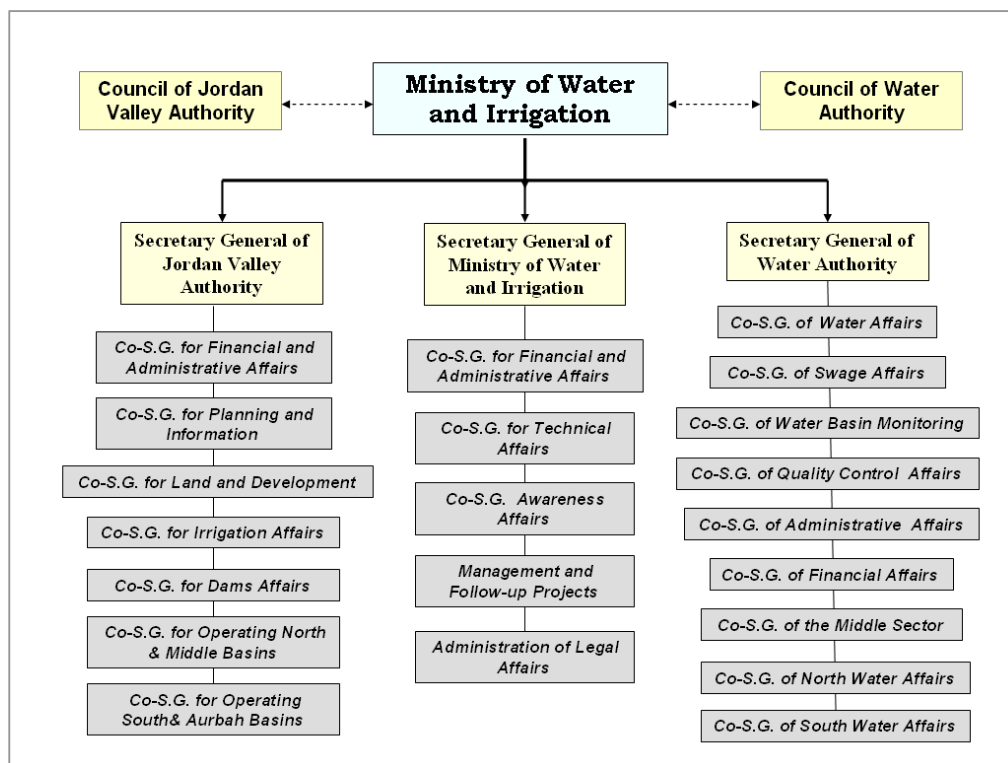
The Ministry of Water and Irrigation embraces two key authorities namely, the Water Authority of Jordan which is in charge of domestic water and wastewater systems and the Jordan Valley Authority, responsible for the use of water resources and socio-economic development of the Jordan Valley, including assessment of water resources, planning, construction, operation and maintenance of irrigation systems and projects and settlement of disputes arising from the use of water resources. The Ministry of Water and Irrigation is managed through the Council of the Water Authority and the Council of the Jordan Valley Authority. The institutional structure of water sectors in the Ministry of Water and Irrigation lies under the responsibility of three major Secretaries-General. These are the Secretary-General of the Water Authority, the Secretary-General of the Ministry of Water and Irrigation and the Secretary-General of the Jordan Valley Authority (figure 11). However, the Water Authority is concerned mainly with water supply projects, infrastructure, and the management of the companies working in the water sector, while the Jordan Valley Authority is in charge of planning, strategies and water policies for the Greater Amman.

### (b) *Joint protocol and establishment of joint committees on shared water resources issues*

Even though the Jordanian water strategy emphasizes that the rightful shares of international waters should be defended through bilateral and multilateral negotiations and agreements, there is no single entity or department within the institutional structure of the Ministry of Water and Irrigation dedicated to the management of shared water resources. Joint committees constitute the mechanism to negotiate with the riparian countries. The members of the joint committees are selected by the Cabinet.

The selected members of the two joint committees on the Jordanian side are experts in such key water subjects as water management, economics, water quality issues, etc. and are represented at the level of Secretary-General. Legal experts are not involved in these committees. Also, the Ministry of Water and Irrigation and the established joint committees have very little interaction with the other governmental organizations and the private sector in Jordan. Technical support from foreign experts or projects may be requested when needed. In some cases regional sub-committees are formed to help study detailed technical aspects, but these sub-committees often function on a temporary basis and are subject to frequent changes in their memberships.

**Figure 11. Institutional structure of the Ministry of water and irrigation in Jordan**



### *3. Policy development and knowledge management*

The availability of data and information, including hydrologic records and measures, is an essential tool needed in negotiation processes between the riparian countries. According to Jordanian experts, data on shared water resources are limited, except for some research studies which are infrequently comprehensive. There is an urgent need to have a complete hydrologic and hydrogeologic database for shared surface water and groundwater. To achieve this, the Ministry of Water and Irrigation is currently preparing project proposals, which need to be implemented jointly with other riparian countries to monitor shared water resources.

Shared water resources data in Jordan is limited, but includes hydrologic measures on the Yarmouk River, and more certainly the flow rate records, which are continuously taken between Jordan and Israel in order to monitor the water quota for each country. An electronic monitoring system has been connected to the diverting channels of the Yarmouk River at Al-Adayssa Dam. Exchange of data and information enables the two parties to record real-time river flows. In case of any discrepancy in the recorded measures, the members of the committee then communicate to verify the accuracy of measurement. This collaboration, however, needs to be extended to cover shared groundwater resources.

### *4. Capacity-building and knowledge management*

To enhance capacities on shared water resources management in Jordan, the development of a database and information system to monitor shared water resources it is highly recommended. These data are an important tool to facilitate the negotiation processes. This will include, in principal, accurate flow measures of the Yarmouk River and the spatial distribution (namely 3-dimentional analysis) of groundwater reservoirs. It is also proposed to improve water management in the Yarmouk River with the Syrian Arab Republic by evaluating the hydrological records and water allocation regime, implementing data exchange and re-assessing the mechanism of the established agreement. Furthermore, it is recommended to widen or replicate the current cooperative efforts of networking and communication between the riparian countries to

involve Israel, Jordan, Lebanon, Palestine and the Syrian Arab Republic as counterparts for the joint management of shared water resources. The objective of the proposed cooperation is to increase water supply to Amman by 50 million m<sup>3</sup> per year and to add another 30 million m<sup>3</sup> per year for agriculture, through increasing the capacity of Al Wahada Dam Lake from the current 110 to 225 million m<sup>3</sup>, which would largely depend on the flooding regime.

Jordan has taken steps to build its own capacity by collecting data on the Basalt Aquifer shared with the Syrian Arab Republic and to establish a joint agreement for the utilization of the aquifer. These data will need to be complemented by data and information from the Syrian side. Data will need to be collected to establish agreements on the Hamad Carbonate Aquifer which Jordan shares with Iraq, Saudi Arabia, and the Syrian Arab Republic, so that utilization of groundwater from this aquifer can take place.

#### *5. Jordanian perspectives for shared water resources management*

Jordan has future plans to enhance the management of its shared water resources to face the existing challenge of limited water supply. These plans include not only the transboundary surface water of the Yarmouk River, but also other shared aquifers. For instance, there is an intention to establish a governmental unit to deal with legal aspects of shared water resource management and negotiations with the riparian countries. Also, there are projects under preparation to carry out joint monitoring and management of shared waters.

A joint and comprehensive study needs to be carried out to assess the Ram-Disi-Saq aquifer shared between Jordan and Saudi Arabia. The two countries created a draft agreement in 2007 for the utilisation of this aquifer. The draft includes a proposed Buffer zone about 10 km wide along the border between the two countries and would introduce tools to assess future projects and water utilization from the aquifer. The proposed agreement also includes a provision that would allow Jordan to begin to increase the volume of water they extract from the Disi aquifer. Jordan would be permitted to drill 65 wells and extract water at a rate of about 100 million m<sup>3</sup> per year to address anticipated water shortages in Amman.

Generally, more efforts are needed to build capacities of experts dealing with shared water resources issues. Additional training to improve their knowledge and skills would increase their capacity to deal with issues such as negotiation, conflict resolution, information management, hydro-geological studies, joint monitoring, use of modern technologies such as GIS and remote sensing, etc.

#### **D. LEBANON: STATUS OF IMPLEMENTATION ON THE MANAGEMENT OF SHARED WATER RESOURCES**

Lebanon is reputed to be rich in water resources as it receives considerable amounts of precipitation reaching on average 1,500 mm/yr. Nevertheless, this does not reflect the actual status of water availability, as Lebanon is a water stressed country. Water shortage has become a national geo-environmental issue affecting rural development, water quality and supply and sanitation services in the country.

##### *1. Shared water resources*

About 60 per cent of the Lebanese border is shared with the neighbouring countries, while the remaining 40 per cent is along the Mediterranean Sea. Hence, the 794 km perimeter of Lebanon is comprised of 387 km with the Syrian Arab Republic (49 per cent), 86 km with Palestine (11 per cent) and the remaining 321 km as coastline. The surface and groundwater of Lebanon is shared with neighbouring countries. The three rivers shared by Lebanon and its neighbours are the:

- *Al-Assi River*, which has a total catchment area of about 36,000 km<sup>2</sup> of which only 190 km<sup>2</sup> is within Lebanon. The river originates in the Lebanese mountains and flows northwards towards the Syrian Arab Republic and Turkey;

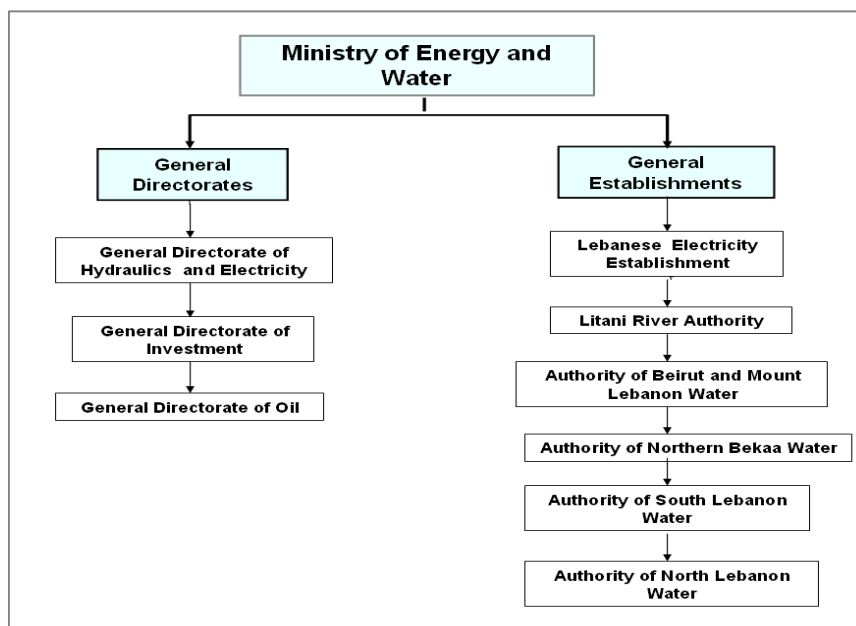
- *Al Kabir River*, which has a catchment area of 950 km<sup>2</sup> of which 295 km<sup>2</sup> is within Lebanon. This river constitutes the political boundary between Lebanon and the Syrian Arab Republic in the North;
- *Wazzani-Hasbani River*, which flows from Lebanon to the south, has a catchment area of about 680 km<sup>2</sup> in Lebanon and is fed primarily from snowmelt and springs from the Hermoun mountain chain.

The border between Lebanon, Palestine and the Syrian Arab Republic is primarily composed of exposes carbonate rocks. Some 90 per cent of this border is thus composed mainly of limestone and dolomite, which are water bearing formations. These rocks are highly fractured and karstified and found to be transected by about 50 major faults.<sup>73</sup> Along the Lebanese border, there are 73 shared springs, where water flows in or out of Lebanon and where their catchments are sometimes shared with the neighbouring countries.<sup>74</sup>

## 2. Institutional arrangements

The Ministry of Energy and Water (MoEW) is the main Government institution in Lebanon concerned with the management of shared water resources. The MoEW was established in 1948, with a framework composed of two fundamental divisions: the General Directorates and the General Establishments. Under each of them a number of sub-divisions exist (see figure 12). Except for the Lebanese Electricity Establishment, each of the General Establishments is responsible for water resource management and is dedicated to specific geographic areas. The oldest and largest of these establishments is the Litani River Authority, which was established in 1954.

**Figure 12. Institutional structure of the Ministry of energy and water in Lebanon**



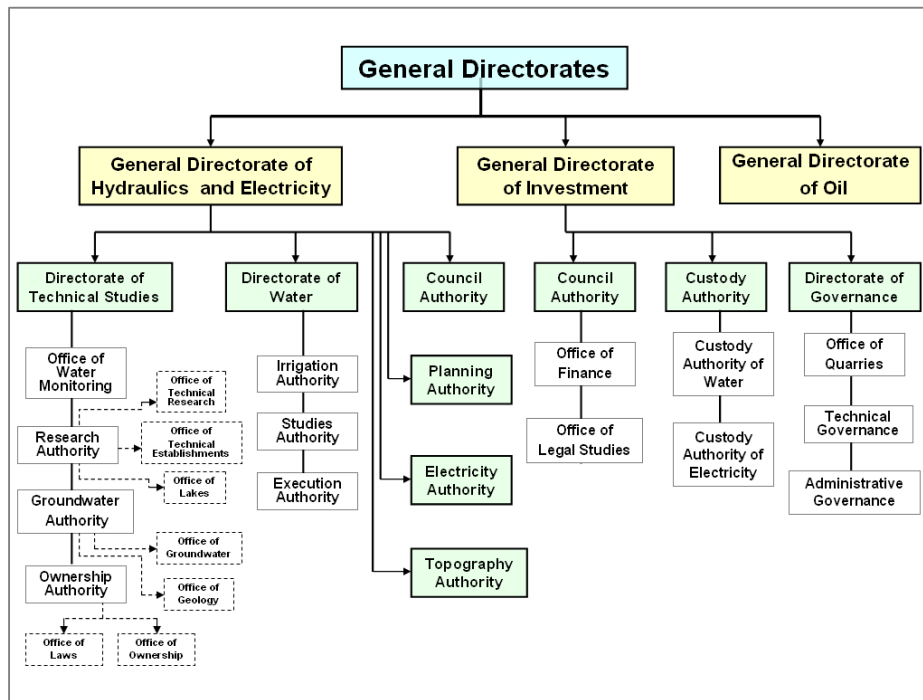
Source: MoEW, 2008.

<sup>73</sup> Shaban and Douglas (2008).

<sup>74</sup> Ibid.

There are three General Directorates within in the MoEW responsible for water and electricity, and oil, namely, the General Directorate for Hydraulic and Electricity, Investment, and Oil (figures 12 and 13). Under each Directorate, a number of authorities and departments exist. Within the framework of the MoEW, there is no division or unit solely concerned with shared water resources management. However, the Directorate of Hydraulic and Electricity is the most concerned division. Regional cooperation is normally done through the formation of ad hoc bilateral committees to oversee shared water issues between Lebanon and the Syrian Arab Republic.

**Figure 13. General directorates of the Ministry of energy and water in Lebanon**



Source: MoEW, 2008.

The Directorate of Hydraulics and Electricity in Lebanon is the key governmental institution responsible for shared water resources management. A team was formed and is composed of a number of experts in different disciplines (including international relations, environment, hydrology, etc) to deal with shared water resources issues. This team represents the Lebanese side of the Joint Committee of both countries. Normally, there is frequent communication and joint meetings arranged between the two parties through this Committee (approximately ten times per year). The higher committee which consists of the General Director of Hydraulic and Electricity in Lebanon and the Deputy Minister of Irrigation in the Syrian Arab Republic meets about three times per year.

### 3. Shared water resource management issues

#### (a) Lebanon-Syrian Arab Republic water issues

The status of shared water resources between Lebanon and the Syrian Arab Republic is stable and subject to informal agreements since 1948. The collaboration between Lebanon and the Syrian Arab Republic on shared water resources is based on the principles of the United Nations Watercourse Convention. Therefore, both countries established a common understanding for optimum utilization of water resources in the two shared rivers (Al-Assi River and El-Kabir River). No agreements on groundwater exist,

and thus each country independently exploits groundwater from shared aquifers. This can be attributed to the fact that the existing renewable aquifers (carbonate rocks and basalts) are located in area with relatively high precipitation rates which can store water in large quantities.

(b) *Lebanon-Israel water issues*

The political situation between Lebanon and Israel has had a negative impact on the management of their shared water resources. In fact, some researchers consider these resources as the major reason for the political conflicts in the area.<sup>75</sup> Water resources shared by Lebanon and Israel include the Wazzani-Hasbani River and the Litani River. The catchment area of the Wazzani-Hasbani River originates in Lebanon and flows into Israel. This area, which includes a number of springs and water-bearing rock formations, falls within the mountain chains of Sheba'a and Hermoun which are currently occupied by Israel. No cooperation exists regarding the management of these resources. In addition, Israel wants to make use of water from the Litani River, but the current political situation is not conducive to negotiations.

4. *Policy development and knowledge management*

Water monitoring is the chief tool being used to collect information on shared water resources in Lebanon, and plans are underway to increase capacity in this area. Data on the Wazzani-Hasbani River are scarce due to the political situation in the area. However, a flow-meter has been installed by the Litani River Authority on the Wazzani pumping station in Lebanon. In addition, there are a number of flow-meters mounted along the El-Kabir and Al-Assi Rivers. These devices register the river flow and are operated by the Litani River Authority. In addition, a number of hydrologic studies have been carried out on El-Kabir and Al-Assi Rivers, including the delineation of the catchment area. It is most likely that more data are available on water resources shared between Lebanon and the Syrian Arab Republic, but the information needs to be collected from the various sources and managed in a shared database.

5. *Present and future outlook for shared water resource management in Lebanon*

With reference to the policy followed by the Lebanese Government, represented by the MoEW, Lebanon supports collaborative projects with their Syrian counterpart on the management of shared waters. There are several Lebanese-Syrian joint programmes and projects that have been completed or remain on-going in this area, including:

(a) Projects implemented separately by each country, within its territory, and locally funded, but based on established agreements between both parties. For instance:

- Two dams are under construction on Al-Assi River within the Lebanese territory. One for water harvesting (to collect 37 million m<sup>3</sup> for irrigation) and the other for water diversion. This was achieved in coordination with the Syrian side;
- A number of water harvesting structures have been established in Lebanon, such as the Lake of Al-Kouwashra on the catchment of El-Kabir River.

(b) Projects implemented separately by each country (within its territory) and funded by donors, and based on established agreements between both countries:

In cooperation with the German organization Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), water harvesting structures and flood control system were

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<sup>75</sup> Amery (1993).

constructed on Al Qaa watershed. Following this, a Spanish funded project executed by UNDP is underway along the eastern (Anti-Lebanon) mountain chain.

(c) Projects implemented jointly by both countries on a selected shared water resources and funded by both countries:

- A project to construct a dam along El-Kabir River (at Adline- Noura At-Tahta) is under consideration. It aims to irrigate 5,000 hectares of agricultural land;
- A research project was jointly carried out between Lebanon and Syrian experts from 2000 to 2002 on remote sensing applications to study the hydrogeology of eastern Lebanon.

(d) Projects implemented jointly by both countries with a selected shared water resources and funded by foreign sources:

A joint research programme on Watershed Management was carried out between the Syrian Arab Republic and Lebanon from 2001 to 2003 and was funded by IDRC.

Based on the previous discussion and future outlook, the management of shared water resources requires increased capacity-building and institutional-strengthening. The existing joint committee lacks experts in international law and negotiations, which reduces the national delegation's effectiveness during negotiation processes. The establishment of a unit for providing technical expertise to support the work of the joint committee could be an important step increasing capacity in this area. Such a unit should be institutionalized within the MoEW. The knowledge and capacity of the experts in the MoEW should be enhanced through training on legal aspects and international laws, negotiation skills and conflict resolution. In addition an information management system needs to be established to store and manage all hydro-geological data and measurements of shared water resources. This would assist the Government to manage shared water resources in a more equitable and sustainable manner.



## **V. THE CURRENT CAPACITY OF THE WATER SECTOR FOR SHARED WATER RESOURCE MANAGEMENT IN THE ESCWA REGION**

Regional cooperation is unlikely to be achieved through technical activities and projects without illustrating the benefits of participation in the development of joint visions and policies. Sustainable regional cooperation can be achieved by supportive national policy and institutional reforms coupled with empowerment and capacity-building of regional institutions. There are many challenges and gaps yet to be faced in the ESCWA region to achieve sustainable regional cooperation. Lack of coordination in national water policies and legislation across the region, insufficient linkage of national policies to regional and international frameworks, lack of harmonization of IWRM practices especially in the fields of water allocation, water quality protection and environmental sustainability are among the key issues that hinder the sustainable management of shared water resources in the region. These weaknesses can be categorized as technical (including lack of data and information, inaccuracy of model results and insufficient expertise and capacity to analyse data and information), political (lack of political will and peace and security due to armed conflicts), legal (inadequate regional legal framework and resistance to legislative reforms at the national level to recognize international and regional agreements) and institutional (weak and fragmented national institutions and incoherence in objectives and policies, etc.). The following are the key issues in ESCWA member countries based on the results of the survey and consultation with stakeholders in the selected countries.

### **A. LEGAL FRAMEWORK AND ENFORCEMENT INSTRUMENTS**

Management of shared water resources requires legislative reforms of national water laws to recognize the regional agreements and to enable the establishment of cooperation mechanisms. It can be assumed that legislative and institutional reforms at the national level are precondition for enhanced management of shared water resources at the regional level.

Water-related legislations in the ESCWA countries are often inadequate and need to be modernized. The lack of credible, comprehensive and effective enforcement in many ESCWA member countries has led to a marginal success in compliance with water-related and environmental legislation.<sup>76</sup> There is a lack of legal instruments particularly in the areas of water use rights, water quality standards, groundwater use, demand management, resource conservation, private sector participation, and institutional responsibilities for water sector functions at national, regional or basin, and local levels.

Other issues associated with the implementation of IWRM plans in the ESCWA countries, are mainly attributed to the lack of inspection capabilities and infrequent monitoring by water institutions, lack of procedures for investigating violations and assessing penalties and lack of empowerment and authority of inspecting bodies to discourage violations through court actions.

### **B. INSTITUTIONAL CAPACITIES**

Effective management of shared water resources requires the building of strong water institutions in the ESCWA countries. Water related policies planning and implementation are commonly fragmented among many institutions. In many cases, there is no specialized entity or division in water ministries and agencies that is adequately staffed to regulate water use and manage disputed issues across the borders of the country. The task of strengthening institutional capacity on shared water resources management is a major challenge facing the Governments. Most of existing instruments are related to short-term activities/projects and lack sustainability and empowerment, and often based on ad-hoc committees or focal points. The donor agencies are focussing their efforts to strengthen the regional river institutions with little attention given to enhancing national institutional capacities in riparian countries. However, the inability of negotiating riparian

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<sup>76</sup> ESCWA (2007).

countries to formulate a powerful and operational institutional set-up and a clear set of obligatory legal agreements often causes concerns by some of these donors to continue their support on the long term. Also, discontinuity of key experts and engaging new people in negotiation processes frequently leads to gaps in decision-making on key transboundary issues. In addition, loss of knowledge base and insufficient communication and resources foundation are among other relevant constraints. Overall, serious gaps exist in policy and legislation formulation between both national and regional levels.

In recent years, ESCWA countries have become aware of the importance of stakeholder involvement and participatory management approaches in developing water policies and implementing action plans. This has been clearly stated in written policies but in practice many challenges still exist. Inappropriateness and overlap of roles and functions of current water-related institutions and lack of coordination and integration means among concerned stakeholders are the key limiting factors of the implementation of IWRM plans. Many essential elements are available but not integrated as in the case of most countries where comprehensive water management policies exist. There are also lacking and inconsistent planning procedures at different levels and actors. No enforcement mechanisms of bi-lateral and multi-lateral agreements are materialized. Multitude of agreements, projects and actions require more coordination.

In most cases, there are conflicts of interest among various sectors at local and national scale and perhaps regionally between riparian countries. For instance, drinking water and industry are the most competing sectors with agriculture at the local and national levels. Also, conflicts may exist in policies, and among implementing sectors, having different priorities such as hydropower generation, agricultural developments for food security, protection of environment, trade in agricultural and agro-industrial commodities for economic growth, maximization of the economic value of water, etc. It is obvious that countries vary significantly in the intensity and effectiveness of implementation of their national water policies and strategies. The main constraints regarding implementation of national policies in terms of shared water resources management have to deal with the limited capacity and available resources and the inability to implement the written policies due to inappropriate institutional settings and lack of enforcement mechanisms. In addition, there are obvious inconsistent and incomplete tasks and responsibilities of authorities/organizations. No clear boundaries exist between national and regional responsibilities and there is no inter-ministerial (sector) coordination and lack of information exchange. Therefore, the need for harmonization of policies should increase with the expected intensified water stress in the coming years in the region. Furthermore, lack of decentralization (bottom-up approaches) and absence of communication channels and public consultation are other key obstacles that limit the ability of local governments, NGOs and civil societies to participate in decision-making. Furthermore, inefficient local administrative structures and lack of capacities of water end-users minimize the opportunities to launch basin-wide and national policies at the lowest levels.

### C. POLICY DEVELOPMENT AND KNOWLEDGE MANAGEMENT

The lack of adequate national and regional databases to support water resources management decisions in shared water resources is a major limitation in the ESCWA region. For sustainable development of shared water resources, it is essential to make a quantitative estimation of available water resources based on complete and accurate data and information. Although information is needed on the regional/international level to support negotiation and decision-making processes in management of shared water resources, they will be needed also on the national level to allow each riparian country to position itself and to play a proactive role along with other riparian countries. Limited data collection is mainly caused by insufficient financial, technical and institutional capacity required to produce these data. Moreover, there is a lack of detailed and legally approved procedures for data and information exchange in many ESCWA countries, which downgrade the reliability of data shared between the riparian countries.

Although several national monitoring programmes are currently functioning in the countries sharing water resources, the programmes are incompatible and the data they produce is not transferable between countries. Data collection and monitoring programmes are often carried out by various authorities without

coordination and integration which leads to inefficient utilization of available technical and financial resources. Moreover, the frequency of data collection is variable because there are no standard procedures in place for data collection either at the national or regional level. The variation in data collection frequency and technique between countries sharing the same water resource often creates problems in data exchange. The availability of information is particularly poor for water quality due to the past focus on river flows to acquire a certain quota and due to the different priorities and capacities between riparian countries, in general. In addition, there is a lack of permanent stations for the monitoring of water quality in transboundary rivers and shared aquifers and there is a shortage of equipment and tools required for the establishment of chemical and bacteriological laboratories that should carry out regular analysis of water quality and produce national and regional annual status reports. Water quality monitoring networks are established by agencies responsible of water, environment and health. These agencies often do not exchange or share the results of this activity at the national level. Socio-economic data are also limited due to the lack of integration of water and environmental policies and strategies with other key sectors at the national level. There is a profound need to establish a systematic operational hydrological network to collect reliable data and to develop information systems to facilitate data accessibility, analysis and exchange between riparian countries. Focus should be given to combining information and data that are available from the national Governments, and as well as on the gathering and exchange of additional information at the regional scale.

#### D. CAPACITY-BUILDING AND AWARENESS-RAISING

##### 1. *Technical and human capacities*

Water institutions in the ESCWA region have severe shortage of qualified staff on issues related to management of shared water resources. Involved personnel are commonly engineers or environmentalists, as in most countries of the ESCWA region; ministries of water and environment are the key actors in management of transboundary water. There is a severe shortage of other professions such as agronomists, economists, sociologists, legal and international law experts, etc. in water institutions. Multi-disciplinarily efforts need to be mobilized for the mainstreaming of economic, social, and legal dimensions in the developed regional activities of management of shared water resources.

In most cases, only representatives from the water sectors are given responsibility to enter into negotiations with other riparian countries. Agreements only among the water experts are unlikely to succeed since these officials are usually not capable to speak on behalf of other sectors. The official negotiators occasionally do not have the mandates to elevate draft agreements to the proper level for approval and endorsement. The national official delegations should be represented by three or four ministries or organizations from each country responsible for voicing technical as well as political priorities, which is not the current practice in the ESCWA region.

##### 2. *Budget and financial resources*

The required investments for building capacities of water institutions to develop and manage shared water resources are high and not affordable by many Governments in the region. The lack of financial resources and low investment opportunities due to lack of effective economic instruments impede the sustainable management of these resources. International cooperation funds are also insufficient to meet regional water management needs. There are no clear modalities or incentive systems to encourage the involvement of private sector and financial institutions in order to invest in the basin-wide and regional projects. Cost recovery and cost sharing through public-private partnerships are some attempts to mobilize funds and budgets, but they still need significant legal and regulatory arrangements in the ESCWA countries.

## **VI. POTENTIAL MEASURES FOR IMPROVED SHARED WATER RESOURCE MANAGEMENT IN THE ESCWA REGION**

There are several approaches to enhance the management of shared water resources in the region. Many countries recognize that common positions which protect mutual interests would encourage regional stability and reduce conflicts and debates between them. Additionally, there are many national efforts to develop water policies which focus on augmenting water supply through cooperation with riparian countries, modernizing laws and regulations and reforming national institutions to cope with regional initiatives and developments. It is important to identify mechanisms and instruments to support the use of water as a catalyst for regional cooperation rather than a source of potential conflict. Joint management and development of shared water resources requires advanced skills in water resources management fields, forceful institutions, significant budgets and effective cross-border cooperation. Ultimately, a strong regional water strategy which embraces the standards of international water law, promotes equitable and reasonable utilization and participation, provides mechanisms and platforms for consultation and information exchange and, last but not least, accounts for the shared benefits in water resources development, use and protection for each country is an ideal model that should be developed for effective co-management of shared water resources in the ESCWA region. The following are the proposed potential measures required to enhance the management of shared water resources in the ESCWA region.

### **A. RECOMMENDATIONS BASED ON METHODOLOGICAL FRAMEWORK**

#### *1. Legal framework*

##### *(a) Strengthening legal settings and capacities*

The establishment of a legal framework for shared water resources management is of utmost importance at the regional level to manage the scarce water resources in the region both in terms of quantity and quality. It is necessary to adjust existing national laws to facilitate the development of a regional legal framework and to improve capacities of the ESCWA countries on issues related to management of shared water resources. Capacity-building is recommended in such areas as international law, negotiation skills, conflict resolution, and so on. The legal and regulatory systems at the national level should deal with all water uses, monitoring of water quantity and quality, water allocation for various functions and sectors, and water rights with clear recognition of obligations towards regional water resources management. In many countries in the ESCWA region, water-related laws are insufficient, outdated and run contrary to principles of international law pertaining to international waters.

A regional legal framework should be developed for shared water resources in the ESCWA region taking into consideration the diverse legal and institutional arrangements in riparian countries as well as the geographic, hydrologic and socio-economic specificities of each shared water resource. The legal framework should embrace the principles of equitable and reasonable use and the no harm rule to ensure beneficial outcomes for all member countries. In addition, the required instruments and mechanisms to ensure cooperative implementation of shared benefits projects, to resolve conflicts and exchange information and to encourage public participation, should be addressed in the regional legal framework. Financial and technical arrangements for joint action and for risk reduction and management, ranging from floods and droughts to climate change vulnerability assessments should also be addressed.

There is a need to improve the capacity of member countries on legal issues related to shared water resources management. This can be achieved through training and introducing specific curricula in academic institutions, universities and research centres by offering tailor-made courses and subjects on international water laws and principles, water conflicts and cooperation mechanisms and negotiation procedures. A database of publications and research studies on legislative aspects of management of shared water resources should be made available in water institutions and ministries by assembling all relevant materials, academic publications, workshop papers and text books. Specific attention should be given to the water

resources shared with neighbouring countries to deal with relevant issues based on the special characteristics of each resource. Regional and international organizations in and outside the region (such as ESCWA, UNESCO, CEDARE, etc.) have developed a wealth of information, reports, glossaries and guiding reports and manuals on how the countries should deal with the legal aspects of their shared water resources, which can be utilized. Setting up joint/combined curricula and degrees on management of shared water resources and international laws in universities and academic institution will build and develop human capacities within water agencies to deal with legal issues in the ESCWA region. Consequently, these agencies will then be capable of defending their country's position and negotiating its water rights. Institutional arrangements are also needed to establish legal units or departments in concerned institutions responsible for the management of shared water resources. This will lead to the development of practical awareness of such common legal norms and principles as the United Nations Watercourse Convention, United Nations General Assembly Resolution on the Law of Transboundary Aquifers and Helsinki Rules among others.

(b) *Ratification of watercourse conventions*

Endorsement of water related agreements and conventions such as the United Nations Watercourse Convention should be considered to facilitate management of shared water resources by countries in the ESCWA region. These principles may be supplemented by other provisions and concepts with respect to limiting transboundary impacts as stated in the 1992 UNECE Water Convention, enhancing public participation (Aarhus Convention, 1998) and improving water and health conditions (Protocol on Water and Health, 1999).

A regional multilateral interdisciplinary forum should be established with the support of relevant regional and international organizations to discuss general principles and minimum standards for the sustainable management of shared water resources, with the participation of all concerned actors. The forum would aim to exchange and share experiences and successful ideas from the ESCWA region and from other regions.

## 2. *Institutional arrangements*

(a) *Enhancing coordination and harmonization of policies and stakeholders participation*

In the region, management of shared water resources, which is a complex process that requires many skills and a network of capable institutions, is currently undertaken by the engineers of public sector institutions. There is a vital need to go beyond engineering and to incorporate economic, social, environmental and legal skills in the management of these resources. There is a need to harmonize policies concerning quantity allocation, which can be done through the establishment of surface and groundwater abstraction control mechanisms in different countries. Better integration of policies related to water quality and environmental protection is also needed to ensure sustainability. This could be achieved by strengthening cooperation between ministries responsible for water resources, environment, agriculture, health and utilities to ensure consistent priorities and policies at the national level. In addition to central Governments and regional commissions where present, local governments, civil society and NGO's, particularly in more decentralized countries, should be involved in management of trans-boundary waters. In practice many local NGO's participate in advisory bodies such as national water councils and river basin councils and are often represented in the meetings but other water and agricultural associations do not frequently attend.<sup>77</sup>

In most cases, NGOs and the public do not strongly participate in planning, implementing and evaluating water policies at the country and the regional levels. National officials may be resistant to NGO participation if it threatens their power and influence, and NGOs frequently lack the resources and capacity to participate in shaping water policy. Most local NGOs in the region are inexperienced and hampered by

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<sup>77</sup> NeWater (2005).

inadequate funding. Public participation and attention to water policy is also weak. This is partly caused by the absence of adequate activities aimed at providing information and developing stakeholder participation. Another reason that should be quoted here is the specific nature of the cultural and socio-economic settings in the countries sharing water resources in the ESCWA region. In the light of the above challenges, countries should enhance communication with stakeholders, and promote stakeholder involvement by facilitating their active participation. Countries should consider sharing authority and responsibility for resource management, providing forums, public hearings and platforms for the discussion of shared water resources issues. In addition countries may choose to institutionalize stakeholder groups such as water boards and water user associations, and to support capacity-building of community based organizations and NGOs for the management of water resources through partnerships and implementation of pilot projects. By identifying and utilizing existing skills and building new ones, capacity to evaluate and assess shared water resources management priorities will be improved within the national or local context.

It is recommended that greater support to be given to civil society organizations engaged in building effective capacity in member countries to establish partnerships with similar entities in other riparian countries. Financial support should be made available to assist the development of civil society networks to include local authorities in order to support regional institution-building processes and to reflect the views and priorities of local communities. This will build confidence and prevent of conflicts between users at the local, national and regional levels. Mismanagement of shared water resources can have a significant impact on the basin-wide sustainability. To ensure effective public participation, legal arrangements are needed to enable active participation in decision-making processes, to ensure rights of access to information and involvement in integrated management of international waters. Decentralization of water management should be pursued to bring river basin management concepts as close as possible to the public and to accommodate variations in local conditions and preferences in national and basin-wide water policies.

(b) *Enhancing governance and partnerships with donor communities*

Donor agencies have been quite instrumental in facilitating the process of developing regional agreements and mechanisms and continue to play an important role through providing financial support as well as know-how for introducing IWRM practices. Several donors are active and have made significant contributions through infrastructure projects, institutional development and capacity-building and in the management of shared water resources. Donor funds are usually directed towards countries that can create and sustain an enabling environment, which is characterised by good governance, openness and willingness to cooperate at a regional level by synergizing national priorities with decisions taken on policies and programmes at the basin-wide scale. The donor community usually plays a fundamental role in introducing institutional reforms to national organizations in developing countries to help them cope with newly emerging IWRM issues at the regional and global levels. Furthermore, donor assistance can provide training opportunities for the staff of national and regional institutions to improve their knowledge and skills and ability to deal with new market and economic conditions and to work out regional priorities for donor support.

The donor community should coordinate the assistance they provide by establishing a more effective and formal platform that would espouse a common vision on goals, objectives and accomplishments. The donor community supports the preparation of national directives for institution-building and reform and the set up of new regulatory and financial systems. However, these efforts are sometimes controversial and may be met with resistance by water sector officials when their interference in decision-making is explicit or implied. Thus, the donor community should address sensitive political and cultural issues with caution to build trust, ensure transparency and develop effective partnerships. Local governments should assume leadership and guidance to ensure that all donor-supported programmes are implemented within the local political, social, cultural and economic context. Ultimately, donors and recipient countries should coordinate funding programmes and budgets, in order to ensure a coherent approach and long-term solutions.

### *3. Policy development and knowledge management*

#### *(a) Developing national interests for a regional shared vision and benefit sharing*

The issue of national sovereignty dictates that riparian countries achieve consensus over shared water resources. The process of developing shared visions and embarking on joint actions is time consuming and resource intensive. A regional shared vision can be developed by involvement of riparian countries in joint projects, which achieve shared benefits for all parties. Due to the latest food crises and instability of market prices, agricultural production of staple foods likely be given greater priority in the region, even though the agricultural sector contributes little to GDP and demands large volumes of water. To cope with anticipated water shortages, shared water resources management may facilitate a regional shift towards more efficient agricultural projects that seek out “more crop per drop”. In addition, the concept of virtual water may help to inform water allocation decisions under water scarce conditions. That is, water stressed countries may offset their water needs by focusing on activities that require little water and importing irrigated or rain-fed crops from water-abundant countries through more liberal trade and investment regimes. For example like Qatari investments in the Sudanese agricultural sector. This approach may also encourage regional integration and specialization on a regional scale to achieve food security.

#### *(b) Enhancing knowledge and information systems*

Member countries should direct their efforts to strengthening their capacity to collect, store, manage and share information on water quantity (surface and groundwater) and water quality. A hydro-meteorological network needs to be established for regular monitoring and ‘snap-shot’ data collection. Advanced training should be provided to staff on the installation and use of the needed equipment. For groundwater, drilling of observation wells and installation of flow meters should be promoted to facilitate monitoring of groundwater abstractions at as many locations as reasonably possible, based on pre-designed criteria. Water quality monitoring systems also need to be established and upgraded. These systems range from gauging stations to equipment for water testing and accredited laboratories. These systems will help build capacities to improve data analysis and interpretation. Capacity-building of qualified staff and experts on water quality management issues is crucial as there is a severe shortage in capabilities to analyse data related to sources of pollution and their impacts on water resources which has great importance, particularly in the shared waters context. It is highly recommended to develop a regional information management system to ensure that a common hydrological data format and procedures are adopted between all countries riparian to a shared river basin or aquifer. The exchange of hydrologic information could generate a range of benefits, including an improved ability to conduct flow forecasting which would result in greater preparedness for floods and droughts.

In some basins, information sharing and basin-wide strategic assessments may be adequate to facilitate optimal cooperative management. Hence, to build trust and confidence between the member countries sharing the water resource, there is a need to embark on joint monitoring, evaluation and assessment of the status of shared water resource to identify problems and challenges need to be jointly tackled by the riparian countries. Based on this assessment, local, national and regional planning is undertaken and policies and strategies are developed. It should be noted here that ineffective cooperation between member countries could be caused by unilateral and independent actions and non-transparent national plans; therefore adaptation of national plans for mutual beneficial outcomes is essential. Transparency and accountability are the key drivers and prerequisites for effective exchange of information, particularly when the information is of a sensitive nature. Information regarding pollution resulting from accidents or mismanagement, operational data and information on hydropower generation, upstream extractions or infrastructure construction that could affect the flow regime and other key irrigation development projects should be shared with riparian countries. The exchange of such information will help basin planners in each country avoid conflicting projects, accurately analyse the costs and benefits for planned activities and understand the impacts of activities within and beyond the borders of their country.

The use of high-technology tools and instruments is necessary to facilitate monitoring, analysis and management of shared water resources at the basin level. Remote sensing can provide spatial data and information, even in near-real time. These data are required for many applications in river basin management. In combination with GIS, remotely sensed data can be used in land use and cover classification and monitoring of change in land management practices, delineation of areas vulnerable to flood, desertification and drought, tracing of pollutant movements in large water bodies, and so on. A GIS database linked and interfaced with remote sensing digital outputs, can be set-up with access granted to all river basin commissions and national authorities. A digital database, hence, can be developed as the main sources of information for a decision support systems at the basin-level which would encompass hydrological river basin models that can be utilized in developing regional policies and strategies for sustainable management of shared water resources.

Priority should be given to capacity-building activities pertaining to the acquisition, management and dissemination of information such as training in surveying, mapping of water resources, GIS and remote sensing analysis tools. Advanced forecasting and prediction modelling of extreme events in river basins due to the emerging issue of climate change and its potential impacts on the availability of water resources with attendant socio-economic implications need to be developed cautiously with the ability to adapt to changes in the ESCWA region. Research analysing the interaction between climate change and the water sector through large scale research programmes should be promoted and intensified by the research institutions and universities. Academic and tailor made courses that are practical and targeting specific water resources management functions and issues should be encouraged. The training campaigns should have the potential to respond to newly emerging technical needs and to be geared towards on-the-job training to facilitate implanting these activities into the basin-wide projects. Both local as well as international training should be encouraged through long-term partnerships with research and capacity-building agencies active in the field of shared water resources management.

(c) *Enhancing the role of research and academic institutions*

There is a need to develop a set of measures for improving knowledge of members of bilateral commissions and national focal points through training and skills improvement of staff from national institutions and experts from the working groups on different issues. Research and academic institutions can provide facilities and expertise for such training and capacity-building programmes. Research and studies can be conducted for application of models of IWRM within the shared water resources context. Efforts should be made to strengthen knowledge networks at national, regional, and global levels to deliver education, training, and information support and to identify and prioritize capacity-building demand. Furthermore, it is essential to empower alliances of capacity-building institutions to share expertise and meet capacity-building needs for improved management of water resources. Region-specific educational materials should be developed on a case-by-case basis and multidisciplinary training courses need to be organized. Research activities may focus on relevant shared water resources management issues such as the causes of water conflicts, best practice and innovative management techniques. Also, research institutes can provide countries facing difficulties in managing their shared water resources with international forums and networks which can establish dialogues and facilitate the exchange of knowledge and experience related to water management and security. The training initiatives should target a broad audience, including water and non-water professionals, decision makers and diplomats, civil society and local communities, trainers at different levels, and students and researchers.

(d) *Development of economic and financial instruments to ensure sufficient funding*

Countries should improve coordination with the donor agencies to ensure the sustainability of institutional development projects rather than relying on short-term financing for capacity-building on shared water resource management. New inter-riparian financing mechanisms should be explored to provide funds for building national capacities and cost recovery on shared water resources services, such as navigation and/or joint implementation of investment projects on hydropower generation. The feasibility of these



mechanisms will largely depend on the creation of robust institutional and legal structures for monitoring agreements among various parties in order to minimize the risks associated with these new developments. Involvement of private sector and regional financial institutions should be encouraged to participate in sociated with these projects.

(e) *Improving communication with stakeholders and information dissemination*

Without sufficient and effective communication channels with stakeholders at all levels, management of shared water resources is difficult to achieve. The establishment of conventions and agreements for communication and information exchange for decision-making should not be politically driven but should be based on existing and developing scientific and technical cooperation for effective data sharing and analysis. Under certain circumstances dissemination of information to the stakeholders and to the public in general remains very limited, which is mainly due to the fact that information is treated as confidential by national actors and may only be released. Agreements and protocols between countries sharing the same water resource should include provisions for better data and information exchange. Regional basin organizations can also be important structures and platforms for information exchange as they offer opportunities for periodic meetings between the responsible national ministries.

#### 4. *Capacity-building and awareness-raising*

(a) *Capacity-building on conflict resolution and negotiation skills*

Effective joint management of shared water resources in the ESCWA region, as other regions, is a major challenge requiring treaties, institutions and political commitment to discuss and reach consensus on sensitive issues, options and alternatives between riparian countries. Negotiation processes usually take a long time because of their complex nature particularly when various aspects are taken into consideration. Socio-economic conditions, environmental and political considerations and water management issues can complicate the process. Distrust between countries can frustrate international cooperation efforts and impede data sharing. This can be addressed by on the ground verification of data and setting up of a permanent joint monitoring network. The development of common analysis methods and procedures for data and information sharing and exchange may also encourage mutual trust. An unbiased, mutually respected outside institution is often called in to help riparian countries negotiate solutions to complex transboundary water problems.

The political situation, the minimum required water quotas, the trade-offs between parties seeking social and economic gains from transboundary projects, ecosystems and water pollution threats, and transparency are the key issues that influence the fate of negotiation processes and agreements in the ESCWA region.<sup>78</sup> In this regard, ESCWA has played an important role in building capacity of the member countries on dispute and conflict resolution, building trust, and improving negotiations skills on shared water resources issues through the organization of several training workshops and preparation of manuals and documents in order to enable the member countries to better handle negotiation processes and procedures.<sup>79</sup>

(b) *Promoting training and technical and managerial capacity-building*

For stakeholders to participate effectively in shared water resources management, their capacity should be enhanced. Postgraduate education and curricula development on management of international waters should be included in universities and research institutions programmes. For professionals, regional training is more cost effective than training of staff overseas. The peculiarities of individual riparian countries should be recognized in designing interventions to enhance capacity. The quantitative aspect of

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<sup>78</sup> ESCWA (2005c).

<sup>79</sup> ESCWA (2004).

training is essential to create sufficient technical and managerial capacity to operate and manage regional and national institutions and to be embarked into negotiations processes and regional projects. Furthermore, it is beneficial to establish cooperative links among accredited educational institutions to jointly offer courses based on their specialties and expertise. Cooperation and twinning between regional and national institutions would foster mutual learning and capacity-building with respect to operational management, planning and conflicts prevention.

## B. PROPOSED INSTITUTIONAL ARRANGEMENT

In order to strengthen shared water resource management in the ESCWA region, a proposed institutional arrangement is offered for application at the regional and national levels within a shared water basin. The proposed structure is illustrated in figure 14 and detailed below.

### 1. *Regional level*

River basin commissions with decision-making powers should be established to facilitate intergovernmental coordination and communication between riparian countries. These authorities can also be made responsible for specific operational tasks such as joint operation and management of infrastructures, monitoring of water quantity and quality, and water protection projects.

It is proposed to establish two committees at the basin-level: a Technical Committee and a High Committee. The High Committee would be the decision-making body and would be composed of Ministers of Water Resources from the riparian countries. The Technical Committee would deal with all technical, legal, and institutional issues related to management of the shared water resource and would propose recommendations to the High Committee for consideration and approval. The proposed responsibilities of the basin-level Technical Committee are listed below:

- Ensure coherence between regional agreements and national water resource policies, and facilitate the implementation of joint and shared benefit projects;
- Promote the formulation of integrated shared water resource master plans in accordance with the national IWRM plans of the member countries;
- Facilitate information exchange and utilization of available national data relevant to the integrated development of the shared water resource;
- Develop proposals on improving water legislation of the countries and promote creation of unified legal framework and operational guidelines and regulations;
- Prepare proposals for the establishment of sustainable financial mechanisms to support the implementation of different programmes and projects;
- Develop monitoring procedures for the execution of regional development plans and utilization of shared water resources;
- Coordinate among national focal points or offices to ensure effective communication, coordination and integration of national initiatives and programmes within the regional context;
- Establish monitoring systems and networks for water quantity and quality control of shared water resources.

## 2. National level

It is proposed to establish a national structure within each country, depending on the existing institutional set-ups in the water institutions. This set up would consist of a National Committee and a National Coordination/Focal Unit. The National Committee would include officials and professionals from governmental institutions and ministries, including ministries of agriculture, energy, environment, foreign affairs and finance, in addition to representatives from NGOs, the private sector and academia, as shown in figure 14. The National Coordination/Focal Unit would facilitate coordination between the different sectors represented in the National Committee. The main tasks of the National Coordination/Focal Unit would thus be as follows:

- Provide national inputs on decisions and issues dealt with in management of the shared water resource;
- Supply national inputs to inventories on river basin or aquifer issues;
- Provide and formulate hydrological and spatial data;
- Facilitate contact between basin-level commissions and national institutions and stakeholders;
- Assist in the identification of national capacity requirements for implementation of IWRM;
- Facilitate the organization of national stakeholder awareness and involvement campaigns;
- Ensure that the committees are truly representative so that group interests are taken into consideration;
- Build confidence and mutual trust among various members of national offices from the other riparian countries;
- Ensure involvement of stakeholders in the regional participatory and consultation process;
- Assist in nomination of national experts and officials to represent the country in regional events and negotiation processes;
- Facilitate the exchange of information and expertise between riparian countries;
- Prepare technical missions and study tours;
- Recognize positions and interests of various actors;

The National Coordination/Focal Unit would be composed of the following sub-units:

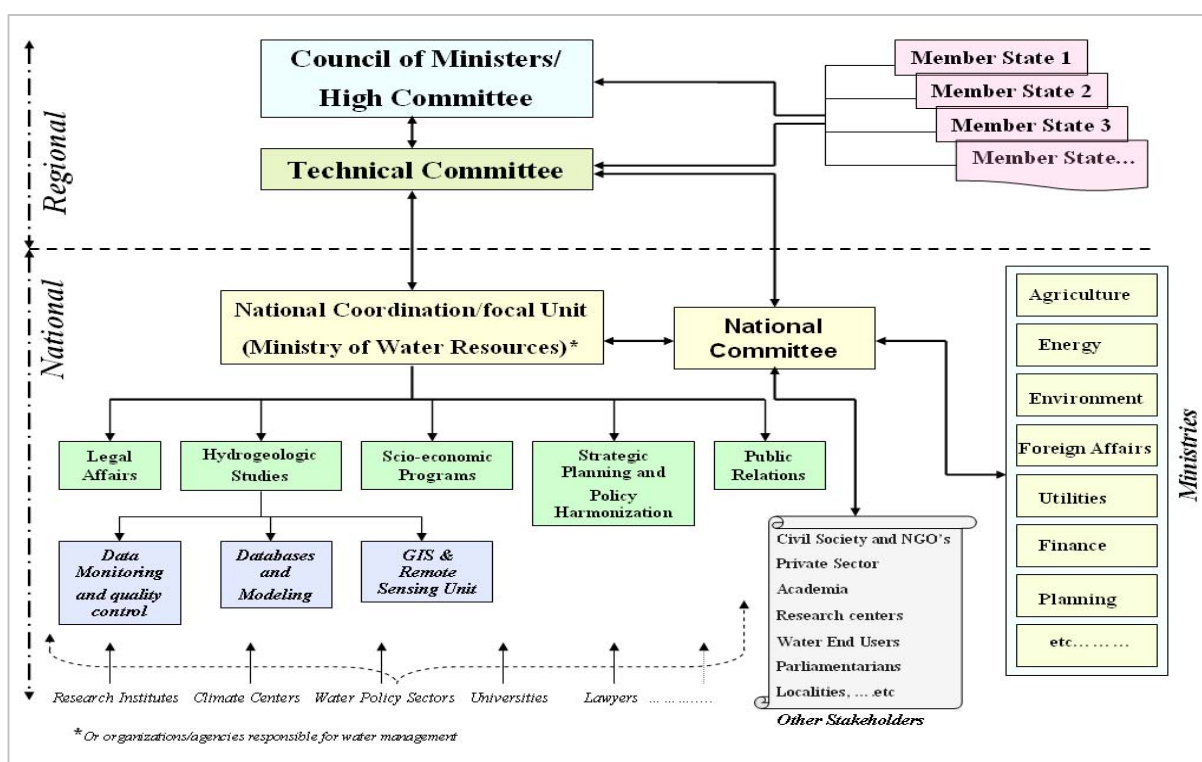
- *Legal affairs*: to follow up all legal aspects related to negotiation processes and formulation of agreements with other riparian countries and to ensure harmonization of national laws with the principles of international laws on shared water resources utilized in the regional agreement provisions;
- *Water studies*: to coordinate and collect hydrological and hydro-geological (surface and subsurface) studies on shared water resources in coordination with research centres, universities, and other concerned institutions. Additional sub-sections can be established to carry out studies on water quality and quantity such as: data monitoring and quality control, databases and modelling and GIS and remote sensing;

- *Socio-economic affairs*: to address social and economic issues of shared water resources such as social impacts of agricultural mega-projects and re-allocation of water among competing sectors, cost recovery and economic value of water, polluter's pay principles, etc.;
- *Planning and policies*: to adapt strategies and policies on shared water resources and to ensure harmonization of national and regional policies, in coordination with planning sectors in water institutions;
- *Public relations*: to facilitate communication among all actors both at the national and regional levels.

These sub-units could complement their capacity with expertise from universities, research centres, water policy sectors and lawyers, to ensure a multi-disciplinary approach to the formulation of regional policies and strategies.

The National Committee would connect directly to the National Coordination/Focal Unit. It would be composed of designated representatives from key ministries such as ministries of agriculture, energy, environment, foreign affairs, utilities, finance, planning, etc. and also other stakeholders, namely, civil society, NGOs, academia, research centres, water end users, parliamentarians, when needed. As such, the committee would serve as an effective platform for national consultation to reach a common position among all concerned actors and identify national priorities and concerns in the area of shared water resources management. Country representatives to the basin commission would be selected from the members of the National Committee.

**Figure 14. Proposed institutional set-up for enhanced management of shared water resources at the basin-level**



## VII. CONCLUSION

The management of shared water resources has become increasingly challenging amidst increasing water scarcity and requires a variety of instruments to ensure the protection, equitable and sustainable use of these shared resources. If shared water resources are not effectively and wisely managed, they could prove to be a limiting factor for sustainable development and can be a source of conflicts between the riparian countries. Joint management of the shared water resources can assist in building confidence, mutual trust and capacity among riparian countries. The capacity to manage water at the national level is a fundamental component of ensuring the sound management of shared water resources at the regional level.

This study identified some of the main challenges facing ESCWA countries as they seek to manage their shared water resources. Lack of sufficient capacities is one of the key constraints that hinders the efficient management and utilization of shared water resources. Moreover, there is very limited coordination and coherence among regional and national water policies and legislation in the region. The situation thus needs to be improved through enhancing legal, institutional and technical capacities and promoting participatory processes based on IWRM principles. The study proposed an institutional arrangement for improving management in the sector based on the findings from a number of international, regional and national case studies and experiences presented in this report. The following are the key conclusions and recommendations of the study.

### A. LEGAL FRAMEWORK

ESCWA member countries should consider adopting an appropriate legal framework on shared waters to enhance management of shared water resources. This can be prepared in coordination with concerned regional and international organizations in the ESCWA region. The regional legal framework should embrace principles of equitable and reasonable use and the no harm rule to lead to the win-win situation of all member countries. The principles espoused in the regional framework can then be incorporated into basin-level agreements. There is a need to adapt national laws to be in harmony with the regional legal framework for facilitating the management of shared water resources based on regional specificities and concerns.

The ESCWA countries should be also encouraged to ratify watercourse agreements and conventions such as the 1997 United Nations Watercourse Convention and other agreements to enhance management of shared water resources in the region.

### B. INSTITUTIONAL ARRANGEMENTS

There is a need to involve a wide range of stakeholders in shared water issues to facilitate multi-level and interdisciplinary dialogue in resource management. Inter-ministerial cooperation and policy integration at the national level can help to ensure the effective joint management of shared water resources at the basin level. There is a need to include economic, social, environmental and legal experts with water resources officials during the implementation of basin-wide, multi-disciplinary projects such as hydro-power generation and agricultural and food security projects.

Commissions and committees for the management of shared water resources should be established both regionally and nationally to enable the involvement of all actors. Links with decision-makers at the sub-national and municipal levels of government should also be fostered to support consultative processes and facilitate implementation of associated agreement and projects, which are largely dependent on local-level ownership to be effective. This can be done through establishment of national committees and local focal units as proposed in the institutional arrangements.

### C. POLICY DEVELOPMENT AND KNOWLEDGE MANAGEMENT

Joint monitoring should be promoted by the riparian countries to collect data, carry out assessments and build trust among riparian countries.

Regional policies and strategies should be developed based on the assessment of water resources coordinated with the national policymaking processes. Policies should consider measures and alternative scenarios to accommodate possible changes and extreme events due to climate change and to reduce risks associated with floods and droughts to avoid possible conflicts between riparian countries.

Clear action plans need to be prepared for implementation of measures and policies, based on priority settings exercises. Plans should identify roles and responsibilities of all actors at the regional and national levels and ensure that consultation mechanisms, ranging from national committees and focal points to regional commission, etc. are able to engage key actors. An investment plan should also be prepared to secure financing needed for implementation.

Comprehensive hydrological and hydrogeological studies on shared water resources are still lacking, they must be carried out through joint research programmes. Joint or internationally coordinated research can enhance the scientific and technical quality of outputs.

There is a need to develop basin information systems to share critical data and knowledge with a broad range of stakeholders, including water utilities, industries, private sector, fisheries, farmers and the public at large. Good communication facilitates ownership of basin management plans and encourages support for basin management activities. NGOs can play a key role in this respect.

### D. CAPACITY-BUILDING AND AWARENESS-RAISING

Regional organizations and basin-level commissions should pursue and coordinate efforts to build capacities of the riparian countries on issues related to shared water resources management. There is an utmost need to enhance the capabilities of staff on legal and international affairs, and to improve information availability and data exchange at both at the national and regional levels.

Once national and regional capacities are strengthened, shared water resources management should be extended to focus on joint development projects and investment programmes focused on water resources protection and use, and not only the allocation of water quotas. This calls for an integrated approach that requires building the capacity of water resource managers in IWRM principles and practices, as well as raising the awareness of senior decision-makers on the importance of ensuring the sustainable and equitable use of shared water resources through effective legal, institutional, policy and knowledge management instruments.

## Annex

### **Key topics and issues discussed with the experts and representatives of water ministries and agencies in the Arab region**

1. Do you share any water resources (surface and/or groundwater) with neighboring countries?
2. What are the existing sectors or departments involved in the management of shared water resources (surface or groundwater) in the ministry or agency? What are the roles and competences of these sectors in this regard?
3. What are the most important national policies and laws related to the management of shared water resources?
4. Is there any regional mechanism established (a joint body/apex, a joint committee/commission on temporarily or permanently basis, etc.) to strengthen cooperation among riparian countries for the joint management of the shared water resources? What is its role and function? What are the established institutional and legal settings? What are the most important challenges and opportunities regarding these settings?
5. As an alternative to the establishment of a regional mechanism, are there any official bilateral or multi-lateral agreements in effect (formal or informal) with neighboring countries? What are the most important ones? Are there any joint activities implemented among the riparian countries to achieve shared benefits of the water resource?
6. Are the legal and institutional arrangements at the national level sufficient for the management of shared water resources? (e.g. reform and reorganization of sectors and departments, modernization of laws and regulations to strengthen the principles of IWRM at regional and national scales, etc.)
7. What are other sectors functional in the management of shared water resources at the national level? Which parties are playing a role in regional negotiations and/or joint projects? (e.g. Ministries of Foreign Affairs, Agriculture, Energy and Electricity, Environment, etc.)? What is the role of NGOs in the management of shared water resources (if any)?
8. Is there any coordination and cooperation taken place among these sectors at the national level? Is there any mechanism established to support and ensure this cross-sector coordination?
9. Is there sufficient capacity (technical, institutional, legal, etc.) in different sectors or departments responsible for the management of shared water resources? Is multidisciplinary available in the concerned divisions (such as experts on international affairs and laws, economists, environmentalists, social science experts, etc.) or specialists in these areas are hired from outside the departments/ministry involved?
10. Are there sufficient capabilities to collect the required data and information by the concerned divisions and departments and to exchange them with other sectors within the country and among riparian countries in relation to management of the shared water resources? What are these data and information covering? Which factors help to facilitate the exchange of these data and information? (e.g. establishment of a regional mechanism and/or national focal points, engagement in joint investment projects on the basin/shared aquifer scale in other fields such as agricultural development, inter-grid electrical connections and networks, hydro-power projects, and political will and willingness to generate funds by member states, etc.).
11. What are the main problems and challenges faced by the member country to manage shared water resources at the national level?
12. What are the opportunities and proposed measures to strengthen national capacities in the field of management of shared water resources?

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