

ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

**REGIONAL COOPERATION BETWEEN COUNTRIES IN THE MANAGEMENT
OF SHARED WATER RESOURCES: CASE STUDIES OF SOME COUNTRIES
IN THE ESCWA REGION**

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Executive summary

The problem of water scarcity in the Economic and Social Commission for Western Asia (ESCWA) region is growing more complex as a result of the region's continuous increase in population growth and the resulting increase in demand for water. Because most of the ESCWA region is categorized as arid or semi-arid, reliance on groundwater resources has become essential to meeting water needs in some member countries. The region is considered one of the most arid in the world, and demand resulting from population increase and economic growth has increased the pressure on water resources. Total water demand is forecast to increase by 50 per cent between 2000 and 2025. Furthermore, the ESCWA region's share of renewable water resources is the lowest in the world, with available water per capita per annum falling below the water poverty threshold of 1,000 m³ per capita per annum, compared to the worldwide average of 7,243 m³ per capita per annum.

A number of ESCWA member countries share such water sources as rivers, aquifers and other resources with other countries either inside or outside the ESCWA region. The majority of the region's surface water comes from three rivers, namely, the Nile, the Tigris and the Euphrates, all of which have their sources outside the region. Cooperation in the management of shared water resources is clearly important in resolving the problem of water scarcity in the region. The ESCWA region also has four major shared aquifers: the basalt aquifer shared by Jordan and the Syrian Arab Republic, the Palaeogene aquifer shared by Oman and the United Arab Emirates, the Disi sandstone aquifer shared by Jordan and Saudi Arabia, and the Nubian Sandstone aquifer shared by Chad, Egypt, Libyan Arab Jamahiriya and the Sudan.

Sound planning for the integrated management of shared water resources is required if they are to be preserved. However, dialogue between countries sharing rivers and aquifers is often difficult. It can be facilitated by the involvement of a suitable institution that is prepared to invite the parties to engage in technical dialogue aimed at bringing about integrated shared water resource management. The region has witnessed conflict resulting from disagreement over the quantitative and qualitative distribution of water from shared resources. In addition, poor water management in the region has aggravated the problem posed by the scarcity of those resources.

The experience of Lebanon and the Syrian Arab Republic represents a pioneering example in the field of shared water resources. The two countries have made considerable progress compared to other countries of the region, especially with regard to the Al-Kabeer Al-Janoubi river basin. The first section of this report deals with the water situation in Lebanon and the Syrian Arab Republic and with initiatives in water resources management taken by the two countries. Particular attention is given to the Agreement for Sharing the Water of the Al-Kabeer Al-Janoubi River and for Building a Common Dam on the main river course. The positive and negative aspects of the Agreement are discussed, as are the modalities of its application. The report then proceeds to discuss awareness-raising efforts in the Akkar area, the environmental situation there, and environmental considerations in the management of shared water resources.

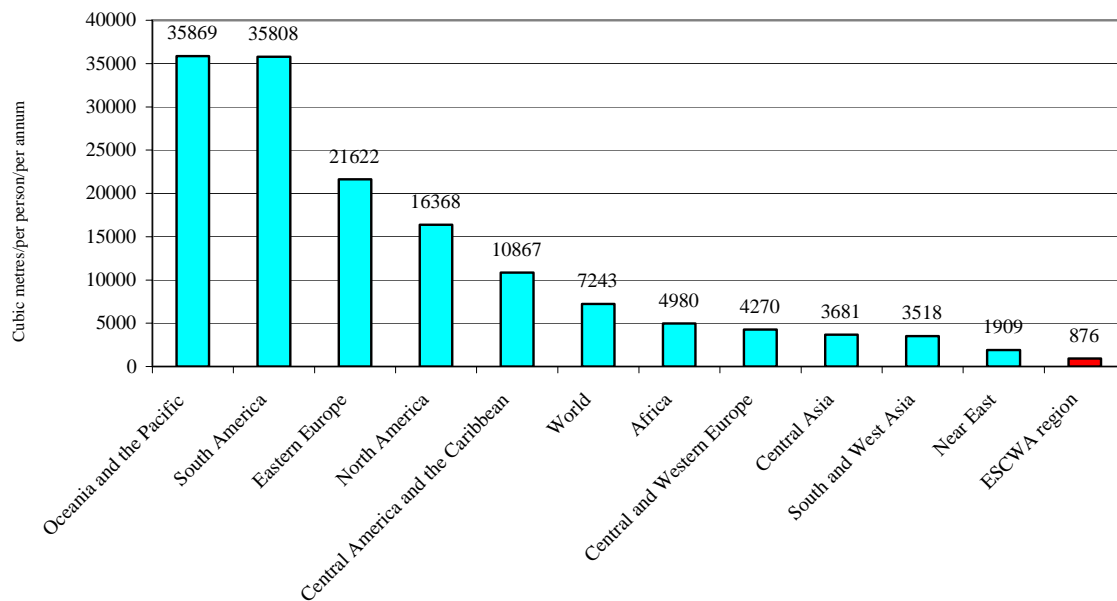
In the light of those considerations, ESCWA is working to support regional cooperation in the management of shared groundwater resources through the case study of the basalt aquifer shared between the Syrian Arab Republic and Jordan. The groundwater resources in the study area are the essential source of drinking water in the region's cities and rural areas as well as of water for irrigation. Intensive water pumping in Jordan, which provides the drinking water for Amman and for the southern region of the Syrian Arab Republic, has had negative consequences for water quality and quantity. This report therefore concentrates on the evaluation of the aquifer with the aim of increasing the necessary water resources available to the two countries, having regard to the economic and social objectives that depend on its exploitation. Finally, the current state of cooperation regarding the joint management of the basalt aquifer is evaluated and recommendations are made urging the region's riparian countries to reach mutual understanding and develop agreements regarding cooperation in managing shared water resources.

Introduction

The ESCWA region is characterized as arid and semi-arid. It suffers from an increasing shortfall in available water as a result of its continuous population growth. Available water per person falls below the water poverty line of 1,000 m³ per person per annum. In eight ESCWA member countries the water share per person is below 500 m³ per annum. In six member countries it is below 200 m³ per annum, placing those countries among the 15 most water-poor countries in the world.

Because of population growth, demand for water is forecast to rise by 50 per cent between 2000 and 2025, resulting in a grave situation regarding water resources. Despite the steps being taken by the countries of the region to address that challenge, it is likely that demand for water will outstrip the traditionally available resources. The ESCWA region suffers from the scarcity or unavailability of additional water resources, and the situation is aggravated by their unsustainable usage. Scarcity is not the only problem the region faces in managing its water resources: increasing pollution and wastage are amongst the principal problems resulting in the degradation of surface water and groundwater quality.

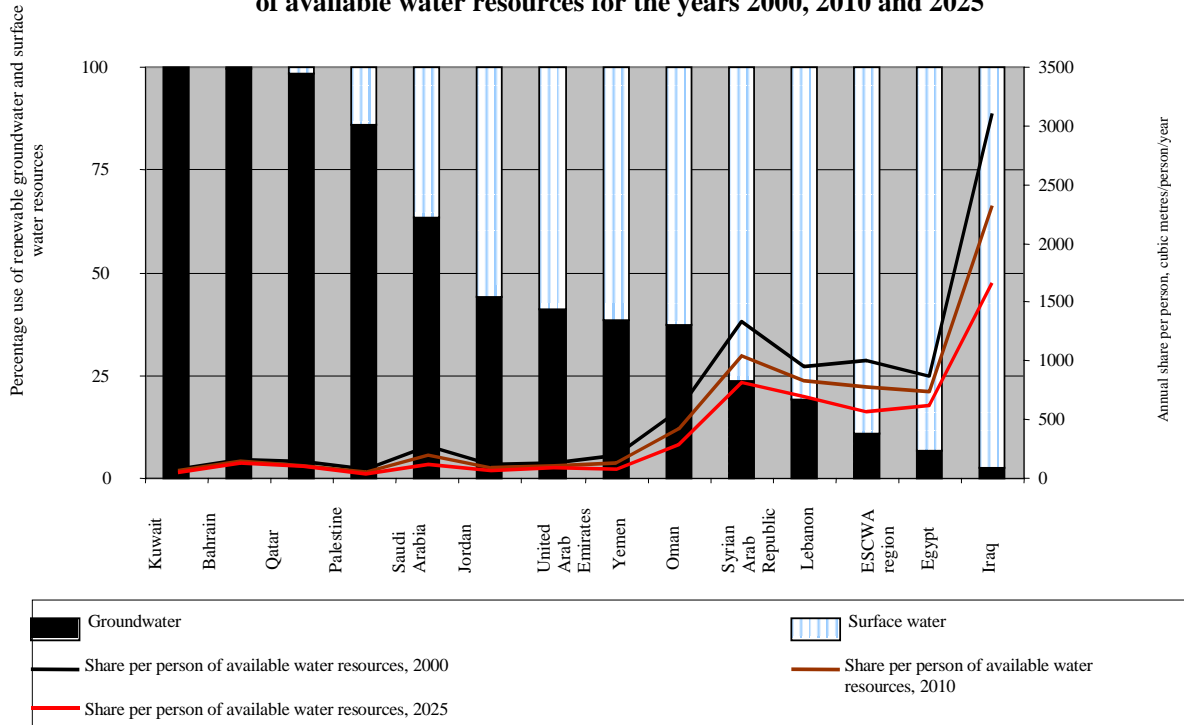
Figure I. Renewable water resources (m³ per person per annum)



Source: ESCWA, *Development of a framework for the implementation of national strategies for integrated water resource management in the ESCWA countries*, 2005 (forthcoming).

The ESCWA region's share of renewable water resources is the smallest worldwide, standing at 876 m³ per person per annum, as shown in figure I, which is below the water poverty line. The global average is 7,243 m³ per person per annum. The bulk of available surface water in the ESCWA region comes from three principal rivers, namely, the Nile, the Tigris and the Euphrates, all of which have their sources outside the region. The Syrian Arab Republic is a case in point: it relies on other countries for 70 per cent of its surface water. This points to the importance of cooperation in the management of shared water resources for the resolution of the problem of water scarcity in the region. Groundwater provides, on average, 11 per cent of the annual renewable water resources used in the region, ranging from less than 3 per cent in Iraq to approximately 100 per cent in Kuwait. Figure II shows the percentage use of groundwater and surface water in all countries of the region, as well as the share of available water resources per person in the year 2000 and the predicted share per person in the years 2010 and 2025.

Figure II. Percentage use of renewable groundwater and surface water resources in the ESCWA region and the actual and projected annual share per person of available water resources for the years 2000, 2010 and 2025



Source: ESCWA calculations.

Given the difficulty of rehabilitating water resources once they have become polluted and, in particular, groundwater resources if polluted water seeps into the aquifers, the sound management of such resources is essential in order to preserve their contents. In the case of shared rivers and aquifers, that requires cooperation between the riparian countries in their management. Such approaches are a necessary part of a sound mechanism for cooperation on the management and sustainability of shared water resources, in line with the Millennium Development Goals, the recommendations of the World Summit on Sustainable Development (Rio + 10), which was held in Johannesburg, South Africa, in 2002, and the recommendations of the third World Water Forum. Having regard to the limited achievements in the field of regional cooperation on the management of shared water resources, and pursuant to resolutions 233 (XXI) and 244 (XXII) adopted at the twenty-first and twenty-third ESCWA sessions held in Beirut in 2001 and 2003 respectively, ESCWA has acted to improve cooperation in the management of shared water resources. In that regard it has carried out numerous studies and has prepared guidelines on qualitative and quantitative capacity-building for negotiating and reaching mutual understanding on the management of shared water resources. Two studies are outlined below, concerning the Al-Kabeer Al-Janoubi river shared by Lebanon and the Syrian Arab Republic and the basalt aquifer shared by Jordan and the Syrian Arab Republic. Particular attention is given to aspects of cooperation between countries sharing water resources, the agreements that have been concluded on the subject, the current status of negotiations between the countries and the enhancement of already ratified agreements. In addition, proposals are made regarding the implementation of the integrated management of shared water resources in order to achieve sustainable development.

The question of the sustainable development of shared water resources is one of the priorities of the work programme of the Sustainable Development and Productivity Division for the years 2004 and 2005. The programme includes building the capacity of member countries for the preparation of national strategies for integrated shared water resource management and building the negotiating capabilities of the competent bodies in the legal, technical and institutional spheres. It includes a capacity-building programme for the

preparation of evaluative studies on cooperation between concerned countries in the management of shared water resources. This report presents two case studies on shared water resources in the ESCWA region:

Part one: a study of the Al-Kabeer Al-Janoubi river shared by Lebanon and the Syrian Arab Republic. The state of cooperation between the two countries in the management of shared water resources is evaluated, particularly in relation to the agreement on the Al-Kabeer Al-Janoubi river signed in 2002. The environmental, social, economic and institutional aspects impacting on the agreement are discussed with a view to implementing sustainable management of the Al-Kabeer Al-Janoubi river and the adoption of the principals of integrated management of water resources in the basin. Recommendations are made regarding the enhancement and implementation of the agreement.

Part two: a study of the basalt aquifer shared by Jordan and the Syrian Arab Republic. The state of cooperation between the two countries in the management of the shared basalt aquifer is discussed. In previous years, cooperation in that field was the object of considerable efforts under the aegis of ESCWA aiming at concluding the agreement for integrated management of the shared aquifer. Recommendations are made regarding the adoption and implementation of the agreement.

PART ONE

**CASE STUDY OF THE AL-KABEER AL-JANOUBI RIVER SHARED
BY LEBANON AND THE SYRIAN ARAB REPUBLIC**

I. STATUS OF WATER RESOURCES IN LEBANON AND THE SYRIAN ARAB REPUBLIC

A. AVAILABLE WATER RESOURCES AND USE THEREOF IN THE TWO STATES

Renewable water resources in the Syrian Arab Republic are estimated at some 21,475 million cubic metres. Rainfall constitutes 70 per cent of the country's renewable water resources, and replenishes the rivers, springs and aquifers which are the primary source of water for irrigation. Groundwater makes up approximately 5,100 million cubic metres of that country's water resources; of this, 3,500 million cubic metres are used annually.¹ The per capita annual water share stood at approximately 1,438 m³ in 1998. While the share per person is thus over the water poverty line of 1,000 m³ per person per year, it is forecast to decline to 770 m³ per person per year by 2025 because of continuous population growth and the limited available sources of water.

The Syrian Arab Republic lies in a semi-arid region characterized by the scarcity of its water resources. The high rate of population growth, along with rapid urban development and economic growth, have led to increased demand for water and an increase in unsustainable consumption patterns, resulting in ongoing deterioration of water sources which threatens their suitability for use and their long-term sustainability. The resulting exhaustion of water sources in the north of the Syrian Arab Republic has in turn led to depletion of the quantities of water available in the south. Similarly, the inefficiency of irrigation systems, coupled with the lack of effective mechanisms for integrated water resource management, has resulted in depletion of the available water sources.

Farmers have resorted to the use of groundwater along with surface water for crop irrigation. Several aquifer groups are found in the Syrian Arab Republic, with water quality ranging from 500 to 5,000 parts per million (ppm). Misuse of groundwater is leading to increased salinity² and declining water levels, which in turn lead to drought. The situation is particularly severe in the north-eastern region, where water shortage has reached levels of about 90 per cent. Field surveys indicate that the water level in wells is declining by between one and three metres annually.³ Increased pollution has also been recorded, with Lake Assad presenting high levels of pesticide pollution as well as incidences of fertilizer and salts deposits. Water wastage in the capital, Damascus, has been estimated at 50 per cent.⁴

The Syrian Arab Republic relies on other countries for 70 per cent of its surface water, its principal sources being the Tigris and Euphrates rivers. It is thus liable to be exposed to drought should the upstream country, in this case Turkey, implement a hydrological project—along the lines of, for example, the Southeast Anatolia Project—impacting on the water levels flowing into Syrian territory.

The Syrian Arab Republic is divided into seven hydrological basins. The Euphrates is its largest river. Turkey has undertaken to guarantee the Syrian Arab Republic a thorough flow of 500 m³/second, but only 42 per cent of that arrives, representing the country's current share. The Tigris rises in the eastern Taurus mountains in Turkey. A final agreement has not yet been reached on the right of the Syrian Arab Republic to exploit the waters of the Tigris and the Euphrates. Currently, arrangements are governed by a temporary agreement.

With regard to the Orontes river, it rises in Lebanon and enters the sea in Turkey, flowing through the Syrian Arab Republic. Its groundwater flow reaches 80 m³/second. Surface flow in the Al-Kabeer Al-Janoubi river shared by Lebanon and the Syrian Arab Republic is 8 m³/second. The water flow in the

¹ Syrian Arab Republic, Ministry of Irrigation, *Initial assessment study of water sector management in the Syrian Arab Republic*, 16 May 2004.

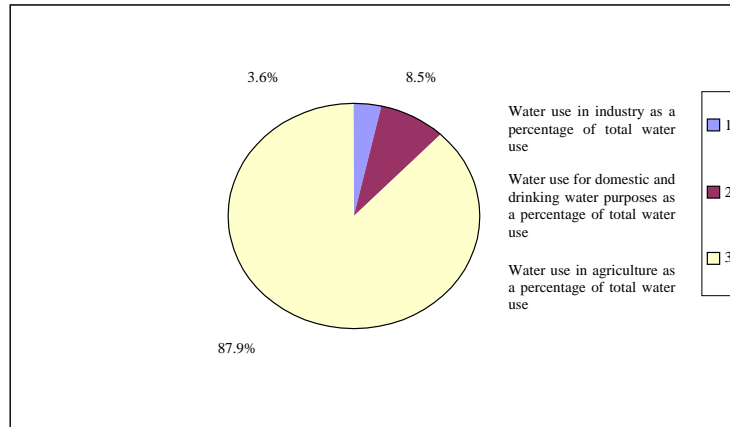
² ESCWA, *ESCWA Water development report 2005*, p. 37 (forthcoming).

³ Syrian Arab Republic, Ministry of Irrigation, *Initial assessment study of water sector management in the Syrian Arab Republic*, 16 May 2004, p. 4.

⁴ ESCWA, BGR & GTZ, *Enhancing negotiating skills on international water issues in the ESCWA region*, 2003, p. 3.

Yarmouk basin, shared by Jordan, Palestine and the Syrian Arab Republic, amounts to 15 m³/second.⁵ The agricultural sector in the Syrian Arab Republic consumes 87.9 per cent of the country's water, with the industrial sector and drinking water accounting for about 3.6 and 8.5 per cent respectively, as shown in figure III.

Figure III. Water use in the Syrian Arab Republic



In Lebanon, rivers are one of the most important surface water sources. There are 16 rivers in total, 13 of which are on the coast and three in the interior. Three of those rivers are shared with neighbouring countries: the Orontes and the Al-Kabeer Al-Janoubi with the Syrian Arab Republic and the Hasbani with Palestine. Annual rainfall is estimated at 8,600 million m³,⁶ playing a part in increasing water levels in springs and rivers. The annual total of groundwater and surface water is estimated at 2,600 million m³, of which only 2,000 million m³ is usable. The total quantity of groundwater available for use is about 1,000 million m³.⁷ Lebanon's limestone structure with its many fissures facilitates the flow of snow melt and rainwater to subsurface strata. Table 1 sets out the quantities of precipitation, evaporation, and water flow to neighbouring countries for Lebanon's rivers along with the quantities of groundwater present and in use in that country.

The quality of groundwater and surface water in Lebanon is in continuous decline, because of the direct release of untreated waste water and the use of unsustainable traditional irrigation methods resulting in the wastage of large quantities of water. The concentrated use of pesticides and fertilizers and the careless disposal of solid waste and liquid industrial waste have also contributed to pollution. In addition, large-scale groundwater abstraction has led to pollution, increased salinity and a fall in groundwater levels.⁸

The agricultural sector is the largest consumer of water, accounting for 58.1 per cent of consumption, regardless of the weakness of that sector in Lebanon compared to the other countries in the region. It is followed by the domestic sector with 32 and the industrial sector with 9.7 per cent of water consumption respectively, as indicated in figure IV.

⁵ Syrian Arab Republic, Ministry of Irrigation, *Initial assessment study of water sector management in the Syrian Arab Republic*, 16 May 2004, p. 1.

⁶ Lebanese Republic, Ministry of Environment, *State of the environment report*, 2001.

⁷ *Ibid.*, pp. 109 and 112.

⁸ *Ibid.*

TABLE 1. APPROXIMATE ANNUAL WATER BALANCE IN LEBANON⁹

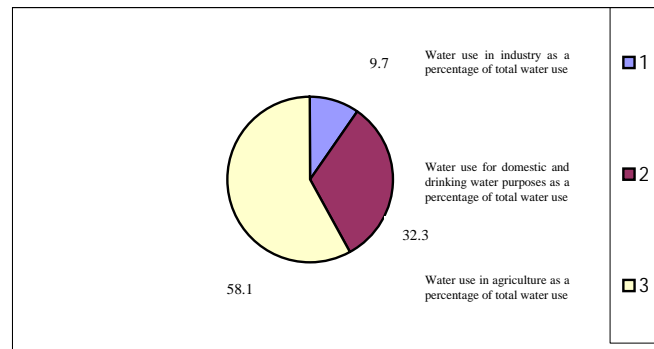
Description	Annual quantity (million cubic metres)
Precipitation	8 600
Evaporation	(4 300)
Water flow into neighbouring countries:	
Flow into the Syrian Arab Republic	
Orontes river	(415)
Al-Kabeer Al-Janoubi river	(95)
Flow into the Palestinian Occupied Territory	(160)
Hasbani river	(670)
Total flow to neighbouring countries	
Seepage to groundwater level	(1 030)
Net potential surface and groundwater available	2 600
Net usable surface and groundwater available	2 000

Source: Various, including Jaber, 1996; Al-Hajjar, 1997; ESCWA, 1997; Comair, 1998; El-Fadel and Zeinati, 2000.

Notes: Precipitation is estimated from isohyetal maps and flows to the Syrian Arab Republic from the National Authority of the Litani River.

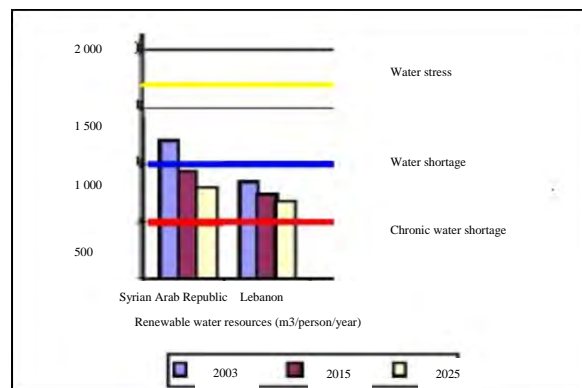
Figures in parentheses () are negative.

Figure IV. Water use in Lebanon



ESCWA studies indicate that Lebanon belongs to the category of countries facing water shortage, because renewable water resources amount to less than 1,000 m³ per person per annum. The Syrian Arab Republic belongs to the categories of countries facing a “water stress”; however, its position is likely to worsen, resulting in its entering the water shortage category in 2010 as a result of the projected increase in population (see figure V).

Figure V. Renewable water resources in Lebanon and the Syrian Arab Republic



⁹ Ibid., p. 110.

B. SURFACE WATER RESOURCES SHARED BY LEBANON AND THE SYRIAN ARAB REPUBLIC

Lebanon and the Syrian Arab Republic share two rivers, namely, the Orontes and the Al-Kabeer Al-Janoubi. The Orontes rises in Lebanon, north of Baalbek in the Bekaa Valley. Its total area is 37,900 km². It flows through the Syrian Arab Republic, passing through Homs and Hama, then flows west into the Ghab plain and on into Hatay province in Turkey before discharging into the Mediterranean. Its annual flow is 400 million m³ of which Lebanon's share is 80 million m³.

The Al-Kabeer Al-Janoubi river forms Lebanon's northern border with the Syrian Arab Republic. Its surface area is 1,300 km². Political, economic and social considerations led the two countries to decide at the highest political levels to enhance cooperation regarding the river through a joint agreement. The likely sustainability of that agreement, and its suitability for implementation, are discussed in the following paragraphs. There are also several other shared rivers in the region, namely, the Jordan river basin, with a total surface area of 42,800 km², shared by Israel, Jordan, Lebanon, Palestine and the Syrian Arab Republic; the Yarmouk basin, shared by Jordan, Palestine and the Syrian Arab Republic; and the Hasbani basin, together with its tributary the Wizani, shared by Israel, Jordan and Lebanon. In 1953 the Unified (Johnston) Plan investigated a possible comprehensive proposal for allotting shares in the Jordan river. The Arab and Israeli operational commissions both agreed to it, but the League of Arab States rejected it for political reasons. The riparian States subsequently engaged in unilateral development projects within their own borders without seeking the agreement of other States.

The Syrian Arab Republic also shares the Euphrates, which is 2,735 km in length and has a surface area of 450,000 km², with Iraq and Turkey. The river rises in Turkey and flows through the Syrian Arab Republic before entering Iraq on its way to the sea, where along with the Tigris, it forms the Shatt al-Arab. The Tigris is shared by Turkey, Iran and Iraq and forms the borders between the Syrian Arab Republic and Turkey and, for a short distance, between the Syrian Arab Republic and Iraq.

C. WATER POLICIES AND PLANS IN THE TWO COUNTRIES

In the Syrian Arab Republic, the Ministry of Irrigation is responsible for the management of water resources at the national level. It cooperates with other competent bodies and coordinates their work in accordance with applicable law. Its principal functions include the following:¹⁰

- (a) The study of water resources, measuring their quantity and quality, assessing the modalities for their development and protection from pollution, and determining how they are to be used;
- (b) The study and design of irrigation and land reclamation projects, and their direct or indirect implementation and supervision;
- (c) The proposal of economic, agricultural and social plans and policies for jointly-implemented irrigation and land reclamation projects;
- (d) The preparation and training of assistant engineers and technicians in the Ministry's field of specialization.

The organizational structure of the Ministry is currently being reformed in order to improve efficiency and better define responsibility for functions in the water sector. It is proposed to create an independent water resources agency which will take responsibility for qualitative and quantitative monitoring and evaluation of water resources. The Syrian Arab Republic is pursuing cooperation with European countries, notably Germany, in the fields of technical cooperation on institutional restructuring, financial cooperation for the modernization of hydrological infrastructure, support for planning, implementation and operation of

¹⁰ International Development and Research Center (IDRC), *Final Technical Report. Institutions for Transboundary Rivers: The Akkar Watershed in Syria and Lebanon*, August 2003, p. 67.

relevant projects, and initial assistance in developing an overall national plan for water resources based on the principles of integrated water resource management. A future project is also to be carried out regarding consultancy services to the Ministry of Irrigation for organizational development, the development of a general national water plan to involve the relevant institutions, and the establishment of an integrated hydrological database.¹¹

In Lebanon, responsibility for water management is currently divided between the Ministry of Energy and Water and the regional water authorities, in accordance with Law No. 221 (29 May 2000) concerning the reorganization of the water sector, as amended by Law No. 241 (7 August 2000). The institutional framework was established in accordance with the respective competencies of the Ministry of Energy and Water and the four regional water and wastewater authorities.

All matters relating to water resources in the north of Lebanon, including the Al-Kabeer Al-Janoubi river basin, come under the remit of the Water Authorities of North Lebanon, based in Tripoli. Its functions include the following:¹²

(a) Monitoring and control of water resources originating in the Al-Kabeer Al-Janoubi watercourse, evaluation of water needs in the surrounding region, and usage issues;

(b) Planning and implementation of such major water structures as dams on the Al-Kabeer Al-Janoubi river, and rectification of the watercourse if required, in accordance with the water distribution agreement between Lebanon and the Syrian Arab Republic;

(c) Taking necessary measures to settle acquired rights on the entire length of the river, and issuing permits for well-drilling and the use of public river property;

(d) Undertaking the hydrological and geological studies and research necessary to establish investment requirements.

Because of the expected water shortages in the coming years, the Ministry of Energy and Water, with the support and technical cooperation of the Japanese Government, has formulated a 10-year plan for basins and wastewater management for the period 2001-2011. The plan was approved by parliament in 2000 with a budget of \$850 million. It has six components, five of which relate to water issues. The most important of those is the procurement of additional water resources, which accounts for 66.7 per cent. Other components deal with potable water supply projects, irrigation and wastewater projects, the maintenance of rivers, and electrical infrastructure. The plan also identifies privatization as a strategy for increasing the efficient use of water resources.¹³

D. PROSPECTS FOR INTEGRATED WATER RESOURCE MANAGEMENT

Both Lebanon and the Syrian Arab Republic have taken a series of organizational, legislative and administrative measures to improve restructuring the water sector, with a view to optimizing water consumption with the aid of demand management policies and the renewal of economic and legal constraints. Such measures are still at the stage of detailed study and consultations with the competent agencies and ministries and with local non-governmental organizations in the region of the Al-Kabeer Al-Janoubi river basin. Effective participation by those parties is essential in order to ensure implementation of the projects: most countries in the region suffer from inadequate coordination between ministries and competent agencies in the execution of national strategies. However, notable progress has been made through partnership between the public and private sectors in the implementation of water projects in

¹¹ Syrian Arab Republic, Ministry of Irrigation, *Initial assessment study of water sector management in the Syrian Arab Republic*, 16 May 2004.

¹² International Development and Research Center (IDRC), *Final technical report. Institutions for transboundary rivers: the Akkar watershed in Syria and Lebanon*, August 2003, p. 63.

¹³ Lebanese Republic, Ministry of Environment, *State of the environment report*, 2001, p. 128.

Lebanon, and through effective management of basins by independent commissions in the Syrian Arab Republic. In relation to the arrangement and organization of the institutional management in order to increase efficiency in the management of water resources, the Syrian Arab Republic has introduced six independent directorates for catchment area irrigation, as well as a general authority for investment and development in the Euphrates basin. Those reforms represent a step towards increased decentralization and consolidation of the role of local authorities in the management of water issues at catchment basin level. Lebanon has given additional powers to the Ministry of Energy and Water regarding the development of national water policies and guidelines and the implementation of major projects. In addition, the 21 water boards have been merged into four regional water authorities and the National Authority of the Litani River.¹⁴

Economic instruments, particularly pollution charges and water pricing, have not as yet been the subject of serious study in the Syrian Arab Republic. In Lebanon, the currently predominant market system relies on the build-operate-transfer (BOT) mechanism and on a number of partnership models for service provision and wastewater treatment. In order to rationalize services and recover costs from the beneficiary, water meters are being introduced on a trial basis in Sidon and Tripoli in collaboration with a private company. In relation to conflict resolution, negotiations between Lebanon and the Syrian Arab Republic resulted in the conclusion in 1994 of the Accord Concerning the Distribution of the Orontes Waters Originating in the Lebanese Territory, the conclusion of the 2002 Agreement for Sharing the Water of Al-Kabeer Al-Janoubi River and for Building a Common Dam, and the implementation of the principles of integrated water resource management for the management of the waters of that river. Those are discussed in greater detail below.

II. THE AL-KABEER AL-JANOUBI RIVER BASIN

A. GEOGRAPHIC AND HYDROLOGICAL DATA

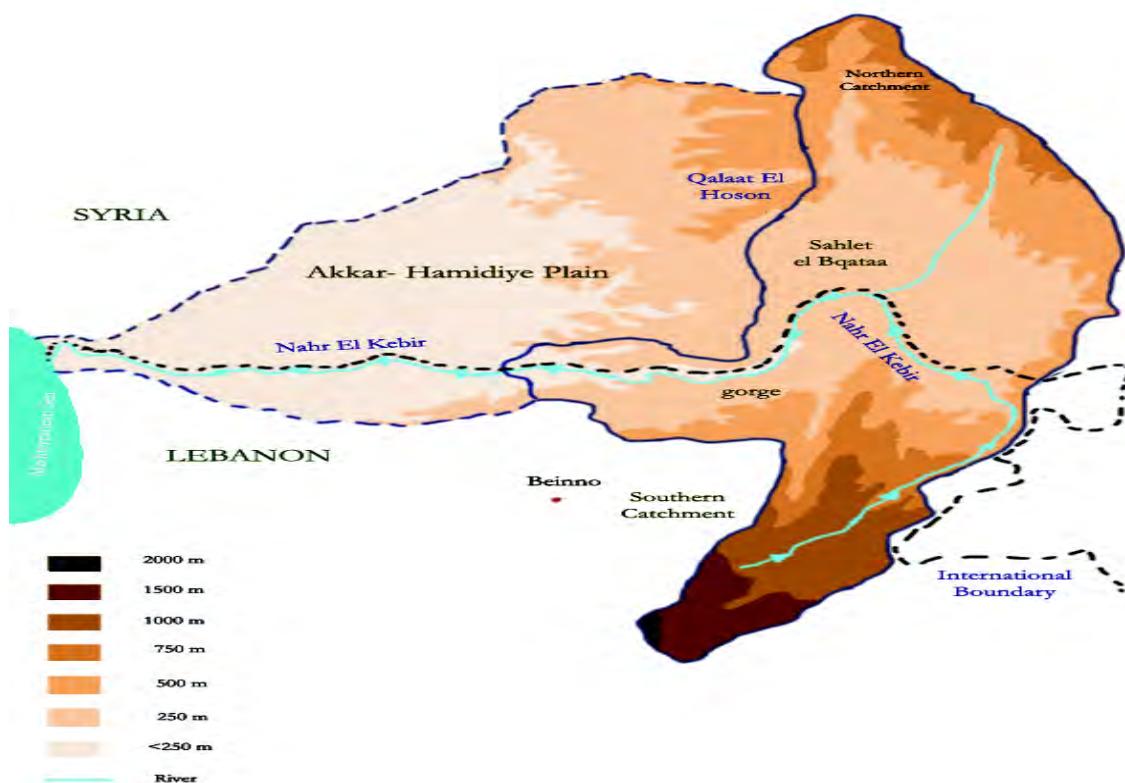
The Al-Kabeer Al-Janoubi river rises in Al-Areeda village and flows for 56 km along the border between Lebanon and the Syrian Arab Republic. Its total surface area is 991 km³, of which 295 km³ lies in Lebanon (see figure VI).¹⁵ The river has a low flow, although in some years exceptional levels of flow have caused damage and disasters; in 1979, the river destroyed the iron bridge in the Al-Areeda area. The average annual flow is 15 million m³. Annual precipitation rates into the Al-Kabeer Al-Janoubi river range between 600 mm and 1,000 mm, with levels of precipitation high in the winter and low in the summer. The river flows from east to west before entering Wadi Khalid and Wadi al-Itshan. Its basin comprises four different areas, listed from west to east:

- (a) The Akkar coastal plain, an agricultural region;
- (b) A narrow path where the river enters a plain lacking in good soil. The area has fruit trees and olive groves but is mostly used for pasture;
- (c) The Bekaa valley, where soil is of high quality for agriculture;
- (d) Wadi Khalid in Lebanon and Wadi al-Itshan in the Syrian Arab Republic.

¹⁴ ESCWA, *(Development of frameworks for the application of national strategies for the integrated management of water resources)*, 2005 (forthcoming), p. 37.

¹⁵ Mercier, J., Mémoire de Stage de Diplôme d'Etudes Approfondies de Sciences et Techniques de L'Environnement. "Usages politiques de la notion de gestion intégrée des ressources en eau aux niveaux libanais et syro-libanais: La réforme du secteur de l'eau au Liban et le partage des ressources en eaux du Nahr el-Kébir avec la Syrie". Université Paris XII - Val de Marne. Ecole Nationale du Génie Rural des Eaux et des Forêts, June 2005, p. 40.

Figure VI. The basin of the Al-Kabeer Al-Janoubi River in Lebanon and the Syrian Arab Republic



B. POPULATION AND ACTIVITIES

Approximately 400,000 persons live in the Al-Kabeer Al-Janoubi river basin,¹⁶ which, like other regions of Lebanon, has a diverse population. A small Bedouin population is also present in both the Lebanese and the Syrian areas of the basin. The Lebanese population of the basin has a high fertility rate compared to the national average. The populations on the Lebanese and Syrian sides are related, some residents on the Lebanese side having relatives on the Syrian side and vice-versa.¹⁷

Agriculture, although not highly profitable, is the principle source of income for the population. Local crops include citrus fruits and olives as well as other fruit, wheat and potatoes. Poultry-raising is also one of the main activities in the region. The agricultural sector is endangered in the Lebanese part of the basin for various reasons. The flooding of the Al-Kabeer Al-Janoubi river causes grave losses, notably the destruction of hundreds of hectares of sown land and of polytunnels, with the resulting loss of crops grown in them. Lebanon also lacks official agricultural policies to protect Lebanese agriculture from foreign competition. The agricultural infrastructure is poor, as is marketing of agricultural produce. Dams, which would reduce the danger of floods and ensure the supply of water for irrigation, are lacking.¹⁸ On the Syrian side, surveys are lacking, but it is clear that the agricultural sector uses a large amount of water and that there is considerable wastage, because of inadequate management methods. The industrial sector in the Al-Kabeer

¹⁶ IDRC, *Final technical report. Institutions for transboundary rivers: the Akkar watershed in Syria and Lebanon*, August 2003, p. 3.

¹⁷ Mercier, J., op. cit. (see footnote 15 above), p. 40.

¹⁸ Al-Ashqar, M. _____ (“Villages in the Akkar plain anxiously await the anger of the Al-Kabeer Al-Janoubi”), *An-Nahar*, 4 October 2004.

Al-Janoubi river basin is very weak, although there are a large number of car repair workshops and some other trades. The Akkar region, north of Tripoli, is not very far from Beirut, but is one of the poorest regions in Lebanon, despite being suitable for tourism activities. It lacks, however, the necessary infrastructure for development of that sector, including roads, services and hotels. A development plan is therefore required in order to rehabilitate the region and support the tourism sector. A hydrological project on the Al-Kabeer Al-Janoubi river involving the building of a dam and consequent formation of a lake could play a role in developing the touristic nature of the region.

C. ECONOMIC AND SOCIAL FACTORS

The region of the Al-Kabeer Al-Janoubi river basin relies on agriculture. The sector is not very profitable: 63.3 per cent of the population of the Akkar caza in Lebanon live below the poverty line, compared to a national average of 32.1 per cent. The illiteracy rate among residents over 10 years of age is 30.5 per cent, compared to a national average of 13.6 per cent. The army is the largest employer in the area, providing work for about 13.4 per cent of the workforce. That phenomenon dates back to the 1960s, when residents of the region were encouraged to join the army as a means of combating illiteracy and eliminating poverty.¹⁹

The difficulty of controlling the borders between the Lebanese and Syrian parts of the basin has led to the area becoming notorious for contraband trade, especially in Western goods and fuel oil. The smuggling of fuel oil has resulted in notable pollution, caused by leakage while it is transported across the river. Syrian residents form the workforce in the agricultural sector on the Lebanese side of the border, because of their low cost compared to Lebanese workers. That further aggravates the poverty of the Lebanese farming communities in the region.

III. THE AGREEMENT ON THE MANAGEMENT OF SHARED SURFACE WATER RESOURCES

A. BACKGROUND TO THE AGREEMENT

The significance of the Al-Kabeer Al-Janoubi river lies in its forming Lebanon's northern border with the Syrian Arab Republic, whereas other shared rivers are divided between an upstream and a downstream State. It thus became necessary to build a dam to share its waters between the two countries in the context of a joint agreement based on mutual cooperation. The river was adopted as the boundary between the two countries by the mandatory authorities during the French mandate of Lebanon and the Syrian Arab Republic which lasted from 1920 to 1943. At that time, the Maronite bishop called on the mandatory authorities to attach agricultural lands to Lebanon, because the Christians of Mount Lebanon were lacking in such resources, a lack which had been the principle cause of the famine under Ottoman rule during the First World War. In 1920 the French proclaimed the formation of the state of Greater Lebanon, including the Bekaa valley and part of the Akkar plain. Discussions between Lebanon and the Syrian Arab Republic on sharing the waters of the Al-Kabeer Al-Janoubi river began as discussions on sharing the waters of the Orontes were progressing. The latter started in 1994 and were particularly difficult. The draft agreement concerning the distribution of the Orontes waters originating in the Lebanese territory was signed in 1994. It includes an annex that was added in 1997 which sets out certain conditions relating to the agreement but was only ratified by the Syro-Lebanese Higher Council in 2001.²⁰ Finally, in 2002, regardless of the view of some that the project was unfair to the Lebanese side and that the quantity of water allocated to Lebanon was not sufficient for the expansion of agriculture in the Bekaa valley, the Syro-Lebanese Higher Council agreed upon a Lebanese project for a dam on the Orontes. That allowed a new agreement to be reached in December 2002 on the irrigation of 6,600 hectares of agricultural land in the Hermel and Bekaa regions in Lebanon. The Orontes dam currently operates with a capacity of 37 million m³.

¹⁹ Mercier, J. op. cit. (see footnote 15 above), p. 38.

²⁰ Comair, F. 2003. *Hydro diplomacy of Middle Eastern Countries along with the United Nations Convention on Non-Navigational Uses of International Watercourses: Case study: Orontus and Nahr El Kabir*. Preparatory Workshop on Enhancing Negotiation Skills on Shared Water issues for Palestine, 5-6 December 2003, Dead Sea, Jordan.

Unlike the negotiations regarding the Orontes, those regarding the Al-Kabeer Al-Janoubi, which commenced in 1998²¹ after the annex had been added to the agreement on the Orontes, were remarkably easy and distinguished by good will on both sides. They took place between a Syrian delegation appointed by the Ministry of Irrigation and a Lebanese delegation appointed by the Ministry of Energy and Water. Members of the Lebanese delegation noted the ease with which the negotiations over the agreement had been carried out, and the delegation made clear its satisfaction with the outcome. The negotiations took place without any need for a third party, because of the historic and political links that existed between the two countries at that time. The successful conclusion of the agreement, in the view of ESCWA, resulted not only from good preparation before the opening of negotiations, but also from the adoption of a “win-win” strategy aimed at realizing the potential benefits for both sides. It also resulted from the adoption of a number of confidence-building measures even before the negotiations began (see table 2).²²

TABLE 2. COMPARISON BETWEEN THE UNITED NATIONS CONVENTION ON THE LAW OF THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES AND THE AGREEMENTS BETWEEN LEBANON AND THE SYRIAN ARAB REPUBLIC

United Nations Convention	Agreement on the Al-Kabeer Al-Janoubi river	Agreement on the Orontes river
Articles 5 and 6: Equitable and reasonable utilization and participation and related factors	40 and 60 per cent of the total annual yield of the river are allocated to Lebanon and the Syrian Arab Republic respectively <i>Project:</i> A shared storage dam with a total capacity of approximately 70 million m ³ to irrigate 10,000 hectares of agricultural land	Of an annual yield within Lebanese territory of at least 400 million m ³ , Lebanon is allocated 80 million m ³ , or 20 per cent of the total if the water resources yield is >400 million m ³ <i>Project:</i> A conversion dam with a total capacity of 27 million m ³ A shared storage dam with a total capacity of 37 million m ³ to irrigate 6,000 hectares of agricultural land
Article 7: Obligation not to cause serious harm	Annex 2, article 1: Use of the waters of the basin must not impede water flow	The Orontes river project is considered to be to the mutual benefit of the two countries
Articles 8 and 9: General obligation to cooperate, regular exchange of data and information	Annex 2: A joint committee will maintain the dam and associated structures, record climatic data and quantities of water entering and leaving the reservoir	Article 5: A joint committee supervises the quantities of water released from the reservoir and the application of the distribution determined in the Agreement
Articles 20, 21 and 23: Protection of ecosystems and the marine environment, prevention of pollution	Article 5: Protection of the ecosystem	Article 6: Protection of the river from pollution and preservation of the ecosystem
Articles 24, 25 and 26: Management and regulation	Annex 1: Mechanism for the study and implementation of the dam. Annex 2: Mechanism for management of the basin, distribution of the waters and maintenance of the dam and associated structures	Articles 5 and 6: Management of quantities of water released from the reservoir and of the quantity determined in the Agreement; and management of the basin
Article 33: Settlement of disputes	Articles 7, 8 and 9: Joint technical water committee comprising representatives of the ministries and competent bodies in the two countries	Joint arbitration committee

²¹ Jaber, B., *The Lebanese-Syrian Agreement of Nahr el Kebir Al Janoubi*, 2002.

²² Comair, F. op. cit. (see footnote 20 above).

The agreement is derived from relevant provisions of international law and, in particular, the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses, 1997, which both Lebanon and the Syrian Arab Republic have ratified.²³ In addition to developing mutual relations and covering the outcome of the technical negotiations and the agreement on the principle of cooperation, the Agreement focussed on fair and optimal distribution of the waters of the Al-Kabeer Al-Janoubi river. The Agreement is composed of 15 articles,²⁴ and its relationship to the Convention can be seen in the following:

Article 5 of the Convention: Equitable and reasonable utilization and participation

The Al-Kabeer Al-Janoubi river agreement is in accordance with the provisions of this article in providing for the distribution of the water resources of the Al-Kabeer Al-Janoubi river between the two countries according to their respective requirements. It also provides for the construction of a dam shared between the two countries, which was essentially required to meet Lebanese needs, the Syrian Arab Republic having already benefited from the construction of two dams on the river in its territory. Lebanon and the Syrian Arab Republic undertook to share equally in the costs of constructing the dam.

Article 6: Factors relevant to equitable and reasonable utilization

The Al-Kabeer Al-Janoubi river agreement deals with the following:

- (a) Hydrographic, hydrological and other factors of a natural character;
- (b) Social and economic needs;
- (c) Population needs;
- (d) Ease of access to the water resource;
- (e) Means of protecting the water resource from pollution;
- (f) The availability of an alternative resource for various uses.

The majority of those factors were adopted and translated into shares in the distribution of the water, leading to agreement on the division of the waters of the Al-Kabeer Al-Janoubi river basin with 60 per cent of all the annual water flow of the river being assigned to the Syrian Arab Republic and 40 per cent to Lebanon, regardless of whether the rainfall in any given year was scarce, medium, or abundant. The Agreement also set out conditions for the development of surface water resources in the upper areas of the basin and the extent of their impact on each party's share of the water. Conditions were included regarding the annual use of river water and the methodology to be followed in managing the basin waters and in studying and implementing the joint dam. The stored water was to be distributed equally between the two countries for use in irrigating agricultural land (4,960 hectares in Lebanon alone) and in ensuring the supply of drinking water and water for industrial use in both countries.

Article 7: Obligation not to cause significant harm

The Syrian Arab Republic agreed to the construction of the dam, although it had little need for it because it had already built two dams on the upper stretches of the river, affecting its flow.

Article 8: General obligation to cooperate

The two sides agreed to establish a joint technical committee. They agreed to the construction of the dam, and to participation in the necessary studies, costs and construction work. Agreement was also reached on the arrangements for distribution of the waters.

²³ Jaber, B., 2002, op. cit. (see footnote 21 above).

²⁴ Al-Masri, A. 2002. "An Agreement between the Syrian Arab Republic and the Lebanese Republic for sharing the great southern river basin waters, and for building a joint dam upon them" in *From conflict to cooperation in international water resources management: challenges and opportunities*. UNESCO-IHE. Delft, the Netherlands 20-22 November 2002. Technical document in hydrology, No. 31, pp. 368-373.

Article 9: Regular exchange of data and information

There has been mutual exchange of data between the two sides since the beginning of the negotiations. Table 2 compares the United Nations Convention on the Law of the Non-navigational Use of International Waters and the Syrian-Lebanese agreements on the Orontes and Al-Kabeer Al-Janoubi rivers.

The final draft was drawn up in early 2002 and the agreement was signed by the Syrian Ministry of Irrigation and the Lebanese Ministry of Energy and Water on 20 April 2002. The Lebanese Parliament and the People's Assembly of the Syrian Arab Republic ratified it two months later, thus bringing to a quick and easy conclusion the negotiations that had been taking place between the two countries.

B. BENEFITS OF COOPERATION BETWEEN THE TWO COUNTRIES IN THE MANAGEMENT OF SHARED SURFACE WATER RESOURCES

The following four areas of mutual benefit arising from cooperation in the management of shared water resources can be identified:²⁵

(a) The preservation of the river's resources and the better management of the basin's ecosystem, water quality and biodiversity;

(b) Cooperation between the two countries improves the efficient management of the river, leading to greater benefit being derived from it, including increased agricultural production and energy generation; and facilitates improved flood and drought management;

(c) Reduced costs: costs are shared between the two parties and the cost of tension and conflict between the parties is reduced;

(d) Increased benefits in other areas, because cooperation in the management of water resources facilitates cooperation in the improvement of political and economic relations between the two countries.

The nature of those benefits varies between different basins, according to local political, geographic, economic and cultural conditions. The objective of the Lebanese State in building the dam on the Al-Kabeer Al-Janoubi river was to ensure the availability of a water reservoir for irrigation use, and to develop the Akkar region, one of the poorest in Lebanon.

C. PROJECTED ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF THE DAM

Construction of the shared dam will, as with any project of the sort, entail various economic, social and environmental impacts. The dam will result in development of the agricultural sector by allowing the irrigation of additional land, in conjunction with the use of advanced agricultural methods, with the assistance of the awareness-raising campaign carried out in conjunction with the project. That in turn will have a positive economic and social impact caused by increased crop production and consequent increases in income and employment opportunities in the agricultural sector.

In the environmental sphere, bad management of the project would leave the environment exposed to various negative impacts. The dam is an obstacle to water flow on the river, as it reduces the flow velocity. It may also lead to the increased deposit of suspended particulate matter in the reservoir water. While the velocity of the river leads to soil erosion, that erosion is itself the reason for the richness of the agricultural land of the Akkar area. It may also lead to accumulation of pollutants from solid waste, fuel oil and other forms of human waste in the reservoir, and their easy bonding with deposits may lead to a negative impact

²⁵ Sadoff C. & Grey D., "Co-operation on International Rivers: A continuum for Capturing Benefits" in *From conflict to Co-operation in International Water Resources Management: Challenges and Opportunities*. UNESCO-IHE. Delft. The Netherlands 20-22 November 2002. Technical Document in Hydrology, No. 31, p. 101.

on the sea and on the surrounding nature. It will be essential to ensure that the floor of the reservoir is continuously maintained and cleaned to prevent water pollution. Those negative impacts can be avoided if a high-quality integrated management regime is put in place. The project will reduce reliance on the over pumping of groundwater and thereby prevent increases in the level of salinity of groundwater resources.

D. IDENTIFYING THE GAPS AND CHALLENGES IN THE PROCESS OF IMPLEMENTING THE AGREEMENT

The Agreement is based on the principle of realizing mutual benefit for the two sides. The project must therefore bring about an increase in the area of irrigated land and the economic and touristic development of the region. Good relations between the two countries is the most important factor for success, as the durability of the Agreement depends largely on the durability of their relations. Political differences between the two countries could militate against the putting into practice of the Agreement.

Another basic element of the Agreement is the process of cooperation between the two sides through a joint committee to share information and results and bilateral cooperation to resolve problems. If either side fails to carry out its obligations or functions, conflict could arise which would impede the implementation of the Agreement. Along with the joint committee, a special fund should be established to distribute financial resources equitably between the two parties. Maintenance work on the reservoir and dam is essential in order to ensure the safety of the project, prevent the accumulation of pollutants on the floor of the reservoir and ensure that the structure of the dam remains sound. A breach in the dam could result in grave economic and social losses.

IV. CONSTRUCTION OF THE SHARED DAM

A. HISTORICAL BACKGROUND TO THE DAM AND THE CHOICE OF LOCATION

The two countries agreed to build the shared dam at Noura al-Tahta (Lebanon) - Idlin (Syrian Arab Republic) with a capacity of 70 million m³, allowing the irrigation of 10,000 hectares on both sides of the basin, including 4,959 in Lebanon. The water will also be used for the provision of drinking water and water for industrial use.²⁶ The preliminary study for the dam was carried out by the Food and Agriculture Organization of the United Nations in early 1970, but the project was then neglected because of the outbreak of the civil war in Lebanon.²⁷

After the end of the civil war, Lebanon produced a rehabilitation strategy for the water sector, and the Ministry of Energy and Water prepared a plan for the construction of a number of dams, including one on the Al-Kabeer Al-Janoubi river. The Lebanese Council for Development and Reconstruction drew up an estimate for the cost of constructing all the dams included in the project, on the basis of which the Ministry concluded that the completion of the project would take 30 years. It therefore considered it necessary to define the priorities within the project on the basis of the following four criteria:

- (a) The capacity of the proposed dam with regard to meeting domestic water needs;
- (b) The extent to which each proposal would result in land improvement;
- (c) The possibility of providing benefits in other sectors, including tourism, and of preventing floods, while avoiding negative environmental impacts;
- (d) The progress made in implementation, on the basis of a phasal evaluation.

²⁶ Comair, F., op. cit. (see footnote 20 above), p. 13.

²⁷ Mercier, J., op. cit. (see footnote 15 above), p. 41.

On the basis of those criteria, and because it forms the border between the two countries, the dam on the Al-Kabeer Al-Janoubi river was accorded high priority. Its cost was estimated at US\$ 49 million.²⁸

B. TECHNICAL AND ORGANIZATIONAL ASPECTS OF THE PROJECT

The construction of the proposed dam involves the study and determination of the technical and engineering conditions and their agreement by the two sides prior to the preparation of requests for tender. When tenders are received the best offers for all the required work can be selected. Given that the Al-Kabeer Al-Janoubi river is shared by Lebanon and the Syrian Arab Republic, the project necessitates cooperation between the two riparian countries, and that is referred to in Article 8 of the Agreement regarding the establishment of a joint technical committee for management of the dam. The joint committee undertook negotiations on the construction of the dam on the basis of equal participation in the costs of the project, in accordance with the United Nations Convention on the Law of the Non-navigational Use of International Waters, 1997 (as mentioned above). Pursuant to Article 9 of the Agreement, the remit of the committee included preparing all necessary documentation for the announcement within three months of the operational date of the Agreement of an international request for tenders to prepare a design study for the dam. A technical specifications document was to be prepared within two months and within a further two months a request for tenders was to be announced for a final design study for the dam, to be carried out by a specialist consultancy firm in accordance with a request for tenders. A period of three years has been identified for the completion of the dam and for it to be handed over to both sides, under the articles of the tender. That study was not to last more than two years, and would be followed by a six-month verification of the study and final design of the dam. The committee's other functions include the management of the dam after it becomes operational, maintenance work, the monitoring of groundwater, and conservation of the basin's ecosystem. It is also responsible for recording climatic data and the amounts of water held in and released from the dam.

C. THE CURRENT SITUATION AND PROGRESS MADE ON IMPLEMENTING THE PROJECT

Three years after the Agreement was signed and ratified by the two countries, a technical specifications document has been drawn up containing pre-implementation details of the project and the relevant requests for tender. The contract for study and design of the Al-Kabeer Al-Janoubi river dam has been awarded to a Swiss firm in cooperation with a Lebanese firm, in accordance with the tendering process, but the funds required to prepare the technical conditions booklet have not yet been made available. Administrative delays, coupled with the current political situation between the two countries, have so far prevented commencement of work on the dam. Residents of the villages along the Al-Kabeer Al-Janoubi river still fear flooding. The dangers include a possible repetition of the events of 16 February 2004, when the river flooded adjoining villages, destroying several houses, damaging crops and causing the loss of some livestock, as a result of which residents left their homes and migrated elsewhere.

V. WATER RESOURCE MANAGEMENT AND ENVIRONMENTAL PROTECTION IN THE REGION

A. ENVIRONMENTAL AWARENESS IN THE AKKAR REGION

In 2001 and 2003 the International Development and Research Centre, in cooperation with the two countries, funded a development project for the management of the Al-Kabeer Al-Janoubi river basin in the Akkar region, known as the Protocol for the Management of Ecosystems for Sustainable Development in the Akkar Basin in Lebanon and the Syrian Arab Republic.²⁹ Questionnaires seeking to assess environmental conditions and practices were distributed to a number of villages in the two countries. A workshop was held on awareness-raising about the project, allowing concerned bodies to exchange views and information. In order to promote a better understanding of the issue, a presentation was made giving in a simplified form some of the results regarding the Akkar basin. Emphasis was placed on the importance of mobilizing local

²⁸ Comair, F., op. cit. (see footnote 20 above), p. 11.

²⁹ Hallaq, M, "A Syrian-Lebanese-Canadian project to protect the Al-Kabeer Al-Janoubi river", *An-Nahar*, 24 December 2004.

participation to improve the situation of the basin and on making individual citizens the primary participants in the fight against pollution. That would require changing their everyday habits and their adoption of environmentally friendly behaviour in managing the basin's water resources. The programme also dealt with support for an environmental publicity campaign involving the distribution in the region of information and publications aimed at raising local awareness and emphasizing that the protection of the environment requires cooperation between citizens and Government agencies.

B. THE ENVIRONMENTAL SITUATION

The final report, including the comprehensive studies of the Al-Kabeer Al-Janoubi river basin, gave the causes for its pollution. The report was carried out as a scientific collaboration between the two Governments with the aid of Canadian Government funding for international development research. A number of social factors, of which the most important are poverty and illiteracy, has led to the decline of the environmental situation in the Akkar region through the disposal in the river of untreated solid waste and wastewater, resulting in a decline in water quality and environmental pollution. Intensive grazing on the riverbank has led to soil erosion and pollution of the watercourse. Prohibited fishing methods, including "poisoning"; the concentrated use of such prohibited agricultural chemicals as DDT; the intensive use of fertilizers and pesticides; and traditional irrigation methods are leading to water loss and pollution of the river through the deposit of transported matter, including fuel and food oils, and the use of groundwater for irrigation is leading to its salinization and pollution as well as incidences of observable diminution in the water level.

C. ENVIRONMENTAL CONSIDERATIONS IN THE MANAGEMENT OF SHARED WATER RESOURCES

Environmental sustainability must be taken into account in the management of shared water resources. In that regard, modern technology, including remote sensing and geographic information systems, may be of considerable use in determining the project's environmental impact in the countries concerned. Modern technology permits the measurement of climatic changes and their impact on river level and run-off, the probability of drought or floods, surface water movement and precipitation quantities and their impact on the basin's ecological systems and biodiversity. Articles 20, 21 and 23 of the United Nations Convention on the Law of the Non-navigational Use of International Waters, 1997, specify the need to protect the basin's ecosystems and prevent and reduce pollution. Because the Al-Kabeer Al-Janoubi river forms the border between Lebanon and the Syrian Arab Republic, integrated environmental management requires joint management of that important water source, enabling the countries to realize mutual benefits from it, prevent pollution and preserve the environment.

VI. SUMMARY AND RECOMMENDATIONS

The importance of the Al-Kabeer Al-Janoubi river lies in the fact that it forms the boundary between Lebanon and the Syrian Arab Republic. Cooperation between the two countries is therefore essential to manage that resource in an integrated manner. Because water resources in the region are declining and the population is growing, cooperation in constructing a dam has become necessary in order to increase the water available for development of the agricultural sector in the surrounding region and to realize the economic growth desired for the area. The negotiations were easy, given that the Agreement was based on the principles of the United Nations Convention on the Law of the Non-navigational Use of International Waters. The implementation of the Agreement, however, requires considerable efforts to be made, because construction of the dam remains suspended for administrative and financial reasons and because of the current state of relations between the two countries. The areas adjoining the river thus remain exposed to flooding and consequent financial losses. Work is required to move the project along to the implementation phase on the basis of the concept of integrated water resource management.

Despite the challenges facing application of the Agreement with regard to funding and implementation of the dam on the Al-Kabeer Al-Janoubi river, it provides a model for the application of international law with regard to shared water resources and proves that not only does water resource management require

international cooperation in itself, but it can also improve cooperation between two countries. However, the secret of success for any international agreement on shared water resources lies in continuous cooperation in the implementation of all its provisions, and pursuit of the implementation of long-term projects in order to ensure the integrated management of the shared resources.

The principle recommendations to the concerned countries arising from this report are set forth below:

(a) A joint steering committee should be established for coordination, cooperation and the exchange of information regarding the Agreement on the Al-Kabeer Al-Janoubi river, and putting in place of the necessary mechanisms to ensure implementation of the provisions of the Agreement;

(b) The parties should overcome the financial, administrative and political obstacles to enhancing water resources and bringing about sustainable development in the region through construction of the proposed dam on the Al-Kabeer Al-Janoubi river;

(c) The technical capacities of the institutions responsible for the implementation of projects related to the Agreement should be supported and, in order to enhance the benefit of the shared water resources in the region, management of the Al-Kabeer Al-Janoubi river basin should be included in the policies and plans of both countries.

PART TWO

**CASE STUDY OF THE BASALT AQUIFER SHARED BY JORDAN
AND THE SYRIAN ARAB REPUBLIC**

I. WATER RESOURCES IN JORDAN

This part describes the water resources that are available in Jordan. Those available in the Syrian Arab Republic have been described in Part one.

A. THE WATER SITUATION IN JORDAN

Jordan has a total area of 8,9210 km², extending east from the Jordan river. It is divided into 12 governorates, namely, Amman, Zarqa, Irbid, Mafraq, Balqa, Kerak, Tafileh, Maan, Jerash, Madaba, Aqaba and Ajlun. Average precipitation ranges from 50mm in the eastern and southern desert to 650 mm in the elevated northern districts. The annual rate of precipitation is 200 mm in some 90 per cent of the national territory. Water resources include surface and ground water, as well as wastewater which is treated for reuse in irrigation, particularly in the Jordan Valley. Renewable water resources are estimated at 939 million m³ per annum, comprising 275 million m³ of groundwater and 664 million m³ of surface water. A further 143 million m³ per annum is available from deep aquifers. Desalinated water is forecast to amount to 50 million m³ per annum and is mainly used for domestic purposes. As a result of the considerable challenges Jordan faces in the water sector, the individual annual water share does not exceed 150 m³.³⁰

B. CONVENTIONAL WATER RESOURCES

Jordan's surface water resources are divided into 15 basins. The Yarmouk river represents the country's principal source of surface water, providing 50 per cent of the available total surface water. The annual flow in all the rivers averages a total of almost 500 million m³. Most of that water flows into the Dead Sea or evaporates in the desert and in clay areas. Floodwater resulting from precipitation is estimated at about 334 million m³ annually, of which only 110 million m³ can be stored each year. There are some 800 wells which provide 210 million m³ annually. Their distribution largely reflects the distribution of the population.

Groundwater reserves are found in most of the governorates. They number 21 in total and are fed by 5-6 per cent of annual precipitation. Three principal aquifers contain about 80 per cent of the groundwater reserves, namely, the Amman/Wadi Sir aquifer, the basalt aquifer, and the Ram (or Wadi Ram) aquifer. The rate of groundwater pumping is estimated at 450 m³ per annum, which exceeds the level of safe reserves, estimated at approximately 270 m³ per annum.³¹

C. NON-CONVENTIONAL WATER RESOURCES

Non-conventional water resources represent an important additional resource in Jordan, which are used in irrigation to overcome the problems caused by the scarcity of available water. Treated wastewater used in agriculture is estimated at 70 million m³ per annum, representing 90 per cent of wastewater produced in the country. That amount is forecast to increase to 205 million m³ per annum by the year 2020.³² In addition to treated wastewater, technology for the desalinization of medium-salinity groundwater is being used in order to make available additional non-conventional water resources. The private sector is playing a considerable role in the operation and management of desalinization plants. However, while they provide, albeit at high cost, an extra source of water resources, such operations increase the pressure on groundwater resources.

D. WATER USE AND THE DEVELOPMENT OF WATER POLICY

Of total water use in Jordan, 32 per cent is for drinking water and domestic purposes and 5 per cent for industrial purposes. The agricultural sector dominates use with a 63 per cent share. The country is becoming increasingly less able to meet the demand for water, which is growing in line with rapid

³⁰ Bataineh, F. 2003. *Assessment of water demand management in Jordan*. Paper presented at the Second Regional Conference on Water Demand Management and Pollution Control. Sharm Al-Sheikh, Egypt, 14-17 December 2003, p. 4.

³¹ Ibid., p. 5.

³² Ibid.

population growth, while the quantities of water available are declining because of wastage and declining quality.

Jordan has prepared a water strategy and set out an associated operational programme for its implementation which devotes attention to the economic, social and environmental dimensions of water policy. An investment programme for the period 2002-2011 has also been drawn up. Furthermore, important steps have been taken with regard to water demand management at the administrative, financial and legal levels, and a special water demand management directorate has been established. The implementation of the new groundwater Control By-Law of 2002 resulted in a shortfall in the groundwater pumping rate estimated at between 100 and 150 m³ per annum.³³ Jordan continues to promote cooperation with neighbouring countries with a view to achieving the integrated management of shared water resources, particularly shared aquifers, preserving sustainable levels of available water in those aquifers and protecting their water quality.

II. CHARACTERISTICS OF THE BASALT AQUIFER

A. DESCRIPTION OF THE BASALT AQUIFER

The basalt aquifer lies in the basalt region in the north of Jordan and the southeast of the Syrian Arab Republic in Jabal al-Arab and the surrounding areas (see figure VII). Among its specific characteristics are the following:

(a) Most of the rainfall in the basalt region takes the form of torrential downpours, estimated at 3,500 million m³;

(b) The basalt aquifer is recharged from the Jabal al-Arab region and the surrounding valleys;

(c) The groundwater level in the aquifer varies from less than 50 m in such depressions as the Yarmouk basin and the Azraq oasis to over 400 m in the mountainous areas;

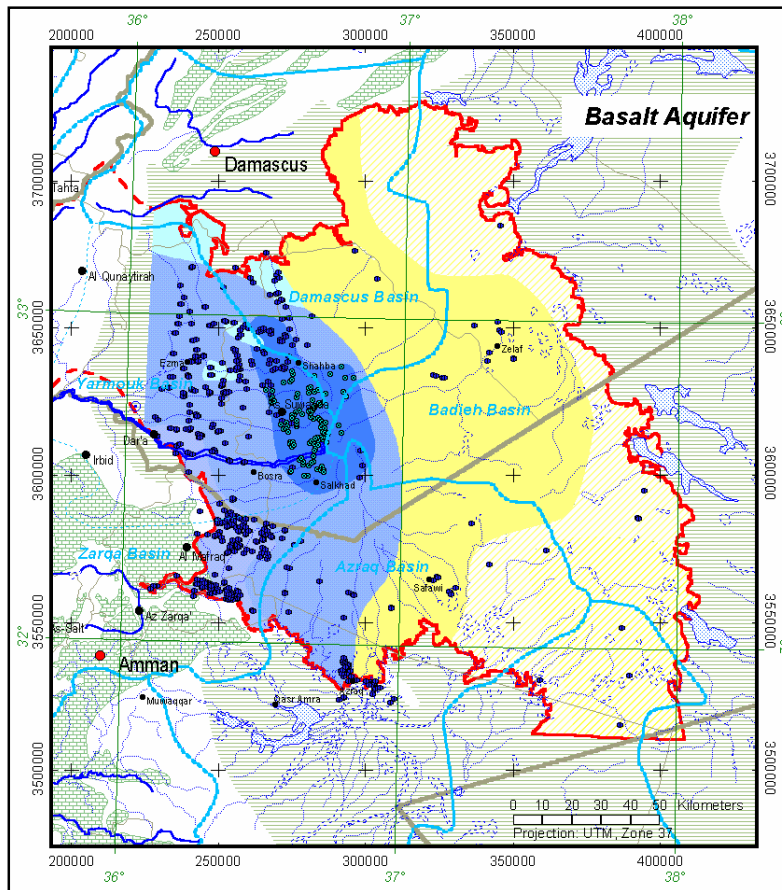
(d) Salinity is low (between 200 and 400 mg/l total dissolved solids) in the waters of the western part of the aquifer, and high (between 1,000 and 2,200 mg/l) in a number of areas, including eastern Mafraq and the Azraq plain, as a result of the diversion of irrigation water, infiltration of agricultural drainage water and overpumping. Data recorded from a number of wells in the Douhleil area over successive periods indicate that the concentration of chloride rose from 50 mg/l in 1970 to 600 mg/l at the beginning of the 1980s, because of an increase in the concentration of nitrates.³⁴

Overpumping of the aquifer has also led to a reduction in the water level and, in some cases, failure of springs, leading to a shortfall in surface water flows and a consequent negative environmental impact, as occurred in the Azraq oasis.

³³ Ibid., p. 8.

³⁴ ESCWA, *Report to the Commission on the investigation study of shared basalt aquifers in the Syrian Arab Republic and the Hashemite Kingdom of Jordan*, 1995 (E/ESCWA/ENR/1995/13).

Figure VII. The basalt aquifer



Source: ESCWA 1995.

B. ECONOMIC AND SOCIAL DIMENSIONS OF USE OF THE SHARED BASALT AQUIFER

Jordan is one of the most water-poor countries in the world. It relies on rainwater to recharge its surface watercourses and groundwater reserves, yet of that rainwater 92.2 per cent evaporates. Only 5.4 per cent of it recharges the aquifers and 2.4 per cent joins the surface water.³⁵

Furthermore, pumping from deep aquifers in the region increased between 1980 and 1990 as a result of the water policy then in force. That in turn led to a tenfold increase in soil salinity, creating grave problems in the agricultural sector. The Syrian Arab Republic suffered the worst drought conditions in four decades between 1999 and 2001, and peasant farmers compensated for the absence of surface water by excessive pumping from the aquifer, with negative economic and social consequences.

In the absence of the regional perspective represented by ESCWA, unsustainable management of the region's water resources in general, and of the resources of the basalt aquifer in particular, had a negative impact both economically and socially, given that those resources were highly important for meeting agricultural and domestic consumption needs in both Jordan and the Syrian Arab Republic. The social and economic impact of drought and water scarcity renders essential the adoption of sustainable and integrated ways of meeting water demand while preserving the quantity and quality of groundwater reserves,

³⁵ De Sherbinin, A. and Dompka, V. "Aquatic ecosystems: the challenge of conservation: Jordan". In *Water and population dynamics: case studies and policy implications*. American Association for the Advancement of Science, 1998, p. 3.

particularly those of the shared basalt aquifer, and sound management of water in order to achieve sustainable development in both countries.

Those considerations point to the importance of Jordan and the Syrian Arab Republic reaching a bilateral agreement for the optimal management of the aquifer. The lack of such an agreement, and of the cooperation and coordination which it would facilitate, represents one of the principal obstacles to good management of the shared aquifer. The two countries have many social and economic factors in common, and management of their water resources is an important element in achieving sustainable development in the region without the regional perspective represented by ESCWA. The basic aim of an agreement would be to produce a comprehensive multilateral cooperation plan to guarantee optimal use of the shared water resource. A joint consultative steering committee composed of representatives of the Governments and other competent authorities in the two countries would be a possible mechanism for achieving that.

Given the economic and social factors relating to the basalt aquifer, many issues need to be taken into account, including the following:

- (a) The means of accessing the waters of the basalt aquifer and the extent to which they must be made available to all levels of society;
- (b) An understanding of the cultural background of the local communities and the modalities of dealing with them;
- (c) The extent to which development plans and projects are compatible with local conditions, in order to ensure their acceptability to local communities and to citizens;
- (d) The economic effect of unfair groundwater pumping on countries sharing the water resources;
- (e) The impact of informal migratory movements;
- (f) The role and potential impact of wider participation in protecting groundwater;
- (g) The important role played by women, and in particular rural women, in aquifer management.

III. BACKGROUND TO THE STUDIES OF THE SHARED BASALT AQUIFER

The lack of information on shared groundwater resources is one of the principal obstacles to developing agreements thereto. Without such information it is difficult to determine the characteristics of the aquifers, including their depth, extent, and interaction with surface water resources. Furthermore, there is no comprehensive integrated legal framework or context for cooperation in groundwater management in the ESCWA region.

In that context, in 1994 ESCWA initiated a study on the shared basalt aquifer system. The study was carried out in cooperation with the water authorities in the Jordanian Ministry of Water and Irrigation and the irrigation and water resources department of the Syrian Ministry of Irrigation. The study formed part of the technical cooperation project between the ESCWA member countries and the Federal Institute for Geosciences and Natural Resources, Germany (BGR).³⁶

The main objectives of the study were the following:

- (a) The construction of a hydrogeological information database for the basalt aquifer region, that being a key requirement for sustainable management of groundwater resources;

³⁶ Expert Group Meeting on Development of Non-Conventional Water Resources and Appropriate Technologies for Groundwater Management in the ESCWA Member Countries, 27-30 October 1997, Manamah. Report by W. Wagner, *Regional groundwater studies in ESCWA countries*.

(b) The formulation of proposals for further studies and technical measures aimed at development and management of the water resources;

(c) The introduction of suitable tools, including remote sensing systems and radiographic equipment, for groundwater prospecting and management of the basalt aquifer region.

The long-term objective of the project was to bring about effective and sustainable management of the water resources available in the basalt aquifer region through the application and implementation of laws, defining responsibilities and taking measures to reduce pollution of the aquifer, which is a principal source of water for both Jordan and the Syrian Arab Republic in many sectors, notably agriculture and drinking water.

As part of that programme, the two countries were provided with information regarding hydrology, remote sensing systems and theoretical hydrology. Digital maps of the main points were drawn up, as was a complete assessment of the water resources in the basalt aquifer.

By virtue of its use of remote sensing and geographic information systems to determine the hydrological conditions, drainage, rainwater and infiltration in the basalt aquifer region, the study was able to determine the methods and techniques to be used in developing and managing the region's shared water resources in the two countries. A number of recommendations were made in that regard. Among the main measures proposed were the following:

(a) The preparation of a programme to explore groundwater and identify promising areas;

(b) The determination of the capacity of the basalt aquifer;

(c) The rehabilitation of water quality in defined areas of the basalt aquifer, and of the watercourses that gather surface water, recharge the groundwater and harvest rainwater.

The study pointed to the need for cooperation and coordination between the two countries in the development and management of the shared basalt aquifer on the basis of institutional agreements.

On the basis of the integrated hydrological, social and economic analysis of the region, the implementation of five basic options was recommended. The options comprised developing binding rules limiting the quantities of water that may be pumped from wells or distributed to irrigated agricultural areas, the use of treated wastewater instead of groundwater, and measures to improve the quality and efficient use of drinking water and water for industrial uses. A range of instruments and measures were indicated and scenarios were developed in order to represent the proposed strategies and operational programmes. The scenarios were designed with a view to aiding decision makers, well owners and the beneficiaries of water in gradually adopting a sustainable water pumping regime. A summary of the legal, institutional and environmental aspects was used in conveying an analysis and assessment of the economic and social factors relating to each option and scenario to the beneficiaries. The importance of applying the principle of participation is made clear by the example of the management of the groundwater of the Zarqa basin in Amman, which serves as a model for the management of other aquifers in the ESCWA region.

Remote sensing technologies and land information, in addition to information already available, was of assistance in developing a unified geological map of the basalt aquifer, which represents a basic source of information for the evaluation and development of its groundwater resources. In addition to surface geology, the map displays the linkages between the basic lithological units and the main geological structures, thereby directly clarifying the location and movement of the groundwater.

The study includes an evaluation and updating of the available information. Necessary information from the maps is given in a digital image and in graphs of the maps as working drafts, which have been discussed with the specialist staff of national institutions in Jordan and the Syrian Arab Republic. The main results of the study comprise 15 maps of the main points of interest, which are intended for use in planning for groundwater resources and providing regional information for the relevant national institutions.

IV. ACTIVITIES RELATED TO THE BASALT AQUIFER

The field visits carried out by ESCWA in 2002 led to the holding of a workshop in February 2002 on international cooperation in the management of the water resources shared by Jordan and the Syrian Arab Republic. The aims of the workshop were the following:

- (a) To formulate and apply an effective mechanism for cooperation on the exchange and updating of information;
- (b) To update the previous study on the basalt aquifer with additional data with the aim of using it in the groundwater model;
- (c) To select and adopt a groundwater model with a view to evaluating the reservoir and planning its integrated management;
- (d) To enhance as required the technical capacities of a working group to be appointed by the two countries.

The proceedings of the workshop addressed the following four principal themes:

1. Cooperation on gathering and exchanging information. The following measures and recommendations were proposed:

- (a) The verification of the extent to which information is available and covers the region being studied;
- (b) The development of a detailed work plan for the working group that will carry out the study;
- (c) The measurement and harmonization of the available information, with ESCWA to play an active facilitatory role;
- (d) The review of the available information and identification of information gaps with a view to the establishment of a joint information resource and database.

2. Updating the previous study of the basalt aquifer as the basis for a groundwater model, through the following:

- (a) The preparation of new maps of the aquifer, using remote sensing where required;
- (b) The preparation of geophysical studies where required, making use of alternative funding if necessary;
- (c) The dispatch of exploration missions where required, making use of alternative funding if necessary;
- (d) The analysis of the available information and data;
- (e) The preparation of such new maps and reports as might result from the preceding activities.

3. Selecting and applying a groundwater model, with a view to evaluating sustainable management plans, through the following steps:

- (a) The evaluation of the available hydrological models and selection of the most suitable;
- (b) The modification of the programme of the hydrological model selected in order to render it suitable for use in relation to the basalt aquifer;

- (c) The testing and evaluation of the groundwater model for the selected area;
 - (d) The definition, evaluation and testing of proposed programmes and strategies;
 - (e) The recommendation of practical choices for groundwater management.
4. Capacity-building training for the working group selected by the two sides to carry out the requisite activities. It was proposed that the training should include building technical capacities in the following:
- (a) Database development and administration;
 - (b) Operation of geographic information systems;
 - (c) Select groundwater modelling;
 - (d) Application of control techniques by remote sensing;
 - (e) Development of negotiating skills.

The principal results expected from cooperation between the two countries on the basalt aquifer include the following:

- (a) Conflict resolution and crisis management:
 - (i) Enhancement of cooperation between the Arab countries;
 - (ii) Avoiding conflict on common objectives;
 - (iii) Achievement of sustainable common objectives for water resources;
 - (iv) Coordination in the region of the shared basalt aquifer.
- (b) Economic benefits, including:
 - (i) Reduced cost of groundwater management;
 - (ii) Enhanced economic cooperation on a broader level.

V. CURRENT SITUATION REGARDING MUTUAL COOPERATION IN THE MANAGEMENT OF THE BASALT AQUIFER

As a result of the workshop held between the two ESCWA member countries, with the participation of the German side, a protocol and set of priorities for activities was established for the joint committee to be formed by Jordan and the Syrian Arab Republic. The committee was intended to manage the shared basalt aquifer under the supervision of ESCWA and with support from the German cooperation project. A memorandum of understanding was drafted, which continues to be studied. It was not possible to sign and conclude it definitively because new ministerial appointments were made in both countries after the workshop was held. In October 2005 a new phase of the German cooperation project began that will lead to the revival of the cooperation project and steps to establish a joint committee to manage the basalt aquifer. The programme involves a visit to the two countries and follow-up with the responsible officials, and the parties have been invited to a workshop with a view to forming a standing committee on the basalt aquifer and developing priorities for their requirements. The workshop will also build capacities to disseminate approaches to the exchange of information and expertise relating to the development and management of the shared basalt aquifer.

VI. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSIONS

Despite the growing number of agreements on shared water resources and the success a considerable number of them have had in achieving effective management of surface water, expertise in matters of

national and international law relating to the integrated management of aquifers is generally limited.³⁷ That is the case in the ESCWA region, where the issue of shared groundwater resources has not been accorded due importance. Among the international agreements on such resources are the Seoul Rules on International Groundwaters, 1986, which provide in Article 3, clause 3, that “basin States shall cooperate, at the request of any one of them, for the purpose of collecting and analysing additional needed information and data pertinent to the groundwaters or their aquifers”.

The fact that the legal and institutional systems responsible for the management of surface and groundwater in the riparian countries are not integrated, or, in other words, that there are multiple administrative authorities with competence in the water sector, constitutes a fundamental obstacle to reaching an agreement on their shared water resources. Information regarding the quantity and quality of shared water resources is one of the priorities in the planning, development and allocation of those important sources of water. The recorded quantities and quality of available groundwater are based on surveys, and those must be integrated into water resource strategies; the ESCWA region, in addition to the shared rivers, has some 37 aquifers. To that end, ESCWA has taken the initiative in encouraging the riparian countries in the region to reach understandings and come to agreements on cooperation in the management of shared water resources.

ESCWA also encourages its member countries to engage in negotiations: most of the agreements concluded on shared regional water resources rest on essential principles for integrated water resource management in the context of international water law. The pre-negotiation phase must not be neglected, it provides an opportunity for the parties to define the problem in its actual terms and relative to the positions of the concerned parties. It is also possible, in that preparatory phase, to establish the objectives and potential benefits of the negotiations, suggest models for studies that can later be agreed upon, raise sensitive issues and suggest a wide range of ideas about the various options for management of the shared water resources, particularly of shared groundwater resources. Such is the case with management of the basalt aquifer shared water by Jordan and the Syrian Arab Republic, rendering it possible to adopt constructive and reliable measures, leading to successful cooperation in the joint management of the aquifer shared by the two countries, with the participation of ESCWA.

B. RECOMMENDATIONS

The growing shortage of water and the increasing difficulty of access thereto is a fundamental obstacle to social and economic development in Jordan and the Syrian Arab Republic. Mutual cooperation and coordination in the development and management of the shared basalt aquifer therefore stands to benefit both countries. The basic goal with regard to the development of the aquifer is the preparation and implementation of a comprehensive multilateral plan to improve methods of managing the shared water resources, having regard to some of the social and economic factors which prevail in the two countries. In that context, the following principal recommendations are made to the countries concerned:

(a) The development of a plan for integrated management of shared groundwater resources, including a plan for exploration of groundwater, the preparation of water quality improvement programmes, the establishment of a groundwater information base, and institutional development;

(b) The establishment of a joint consultative steering committee comprising representatives from the two Governments and the relevant authorities, charged with coordination, follow-up and exchange of information on water issues;

(c) The formation of an expert group to collaborate on gathering and evaluating the basic information available on the characteristics of the water in the area being studied. Each Government should appoint a representative to the group who should be a member of the aforementioned steering committee;

³⁷ Puri, S. “Issues in developing co-operation for the sustainable management of transboundary aquifers” in *From conflict to co-operation in international water resources management: challenges and opportunities*. UNESCO-IHE. Delft. The Netherlands 20-22 November 2002. Technical Document in Hydrology, No. 31.

(d) Work on the development of joint programmes for collection of necessary data, statistics, publications and maps, evaluation of projects and research and of the mechanisms used therein, development of water basins, and the planning, implementation and management of suitable advisory studies of mutual benefit;

(e) The reporting and exchange of methodology and development of plans and programmes for information analysis for the protection of shared aquifers;

(f) The development of local plans and designs covering alternative methods of developing water resources and determining the quantities of water for various uses in a way that increases efficiency in the use of water resources;

(g) The development of a mechanism to enhance cooperation between Jordan and the Syrian Arab Republic on the shared basalt aquifer, starting with the organization of training sessions and regional workshops on the development of negotiation skills for the management of shared water resources;

(h) The inclusion of the management of shared aquifers, within the framework of integrated water resource management, in the two countries' water plans and policies.

Annex I

**AGREEMENT BETWEEN THE SYRIAN ARAB REPUBLIC AND LEBANON
FOR SHARING THE WATER OF THE AL-KABEER AL-JANOUBI RIVER
AND FOR BUILDING A JOINT DAM ON THE MAIN WATER COURSE**

The Government of the Syrian Arab Republic and the Government of the Republic of Lebanon,

Confirming their fraternal Arab ties, affirming their mutual relations, and working on the basis of their sincere cooperation in the field of the international water resources shared between them,

Having regard to the provisions of international law and, in particular, the provisions of the Convention on the Law of the Non-navigational Uses of International Watercourses, 1997, which has been ratified in principle by the two States and which provides the proper basis for the equitable and rational distribution of the waters of shared international rivers,

Noting the results of the negotiations undertaken by the delegations of the two countries, and bearing in mind the benefits to both States of an equitable and rational distribution of the waters of the Al-Kabeer Al-Janoubi River and the construction of a dam on its principal watercourse at Idlin – Noura al-Tahta,

Have decided to conclude this agreement, and to deputise:

Mr. Mohammed Radwan Martini, Minister of Irrigation, as representative of the Syrian Arab Republic, and Dr. Mohamad Abed Al Hamid Beydoun, Minister of Energy and Water, as representative of the Republic of Lebanon.

Article 1.

For the purposes of this Agreement, the following terms shall be construed as set out in this article:

- (a) **Syria:** the Syrian Arab Republic;
- (b) **Lebanon:** the Republic of Lebanon;
- (c) **State, Party, or country:** Syria or Lebanon, as appropriate;
- (d) **The competent Minister:** the Minister of Irrigation in Syria, and the Minister of Energy and Water in Lebanon;
- (e) **The Al-Kabeer Al-Janoubi River:** the river lying north of the Lebanese coastal plain and south of the Syrian coastal plain, and forming the international boundary between the two States;
- (f) **The Idlin – Noura al-Tahta dam and reservoir:** a dam for water storage to be erected on the Al-Kabeer Al-Janoubi River in both Syrian and Lebanese territory near Idlin and Noura al-Tahta;
- (g) **The Joint Committee:** The Syrian-Lebanese Joint Committee on Water;
- (h) **Mean annual water quantity:** Estimated as approximately 150 million cubic metres (m³).

Article 2.

The preamble to this Agreement and annexes 1 and 2 form an integral part of the Agreement, which shall be construed accordingly.

Article 3.

On the basis of the considerations cited in the preamble, and taking into consideration all relevant matters stipulated in Article 6 of the Convention on the Law of the Non-navigational Uses of International Watercourses as well as the natural rights of the parties:

The two States have decided that the waters of the South River shall be allocated to Syria in the amount of 60 (sixty) per cent of the total annual water quantity and to Lebanon in the amount of 40 (forty) per cent of the total annual water quantity.

Article 4.

The percentages established in Article 3 of this Agreement for the allocation of the waters of the river basin are valid in all circumstances, regardless of whether any given year is wet, dry or medium.

Article 5.

Each State is entitled to use the share of the waters allocated to it in Article 3 of this agreement within its territories at such times and places as it deems appropriate throughout the water year, and in so using its share shall comply with the standards for protection of the ecosystem established by the Joint Committee.

Article 6.

Having regard to the annual water quantities in the Al-Kabeer Al-Janoubi River basin and the water requirements of the two States for various uses, including drinking water, irrigation and industrial use, the two States have agreed to construct a shared dam at Idlin – Noura al-Tahta with a total storage capacity of approximately 70 million m³, in accordance with the economic and technical feasibility study.

Article 7.

The previously formed Joint Syrian-Lebanese Principal Committee on Water is charged with implementing the provisions of this Agreement. The Committee shall decide its own rules of procedure subject to the prior consent of the Syrian Minister of Irrigation and the Lebanese Minister of Energy and Water.

The Committee shall carry out all the functions assigned to it in accordance with the provisions of this Agreement, put into practice all applicable rights and obligations, and consider all issues that arise in the course of its application.

Article 8.

The Joint Syrian-Lebanese Principal Committee on Water will establish one or more bilateral subcommittees, according to requirements, to operate under its supervision. Where any disagreement arises between its members that the Committee is unable to resolve definitively, the Committee shall make an immediate report on the matter to the two Ministers, who shall resolve the matter by direct communication and the establishment of objective solutions which vindicate the rights of the two States in accordance with the provisions of this Agreement.

Article 9.

The Joint Committee referred to in Article 8 of this Agreement is charged with taking all necessary steps to study and implement the dam at Idlin – Noura al-Tahta in accordance with Annex 1 attached to this Agreement.

Article 10.

Syria and Lebanon will bear all the costs of the study and implementation of the shared dam, on the basis of each State paying an equal share of the cost, but both States may seek the necessary funding from external sources as well as their own resources.

Article 11.

The international borders currently applying between the two States shall remain unchanged and shall be considered to be a line on the surface of the water, regardless of the extent of the water surface in the reservoir resulting from the construction of the shared dam.

Article 12.

Where Syria or Lebanon wish to use waters upstream from the dam, during dry seasons or otherwise, they may do so within their allocation (60 and 40 per cent respectively) and in compliance with the provisions of Article 5 of this Agreement regarding the protection of the ecosystem. Any waters they so use shall be deducted from their share of the reservoir waters. Where by the end of the water year a State has not used its full allocation of the water stored in the reservoir in accordance with the water withdrawal programme set out in Annex 2 to this Agreement, it shall not be entitled to use any remainder of that allocation in the following year.

Article 13.

Members of the Joint Committee and the subcommittee and workers on the project shall enjoy all necessary facilities in pursuit of the study, implementation and development of the project in the territories of both States, including freedom of movement without any restrictions and without being liable to payment of any related fees or charges.

Article 14.

This Agreement shall be ratified in accordance with the constitutional procedures applying in each State and shall enter into force on the date of exchange of the instruments of ratification.

This Agreement may be amended by means of an addendum ratified in accordance with the procedures for ratification and exchange of instruments of ratification set out for this Agreement.

Article 15.

This Agreement was signed in Beirut on the twentieth day of April 2002 in the Arabic language, on two original texts, both of which are authentic and which have been deposited with the two States.

For the Republic of Lebanon
Minister of Energy and Water

Dr. Mohamad Abed Al Hamid Beydoun

For the Syrian Arab Republic
Minister of Irrigation

Mohammed Radwan Martini

Annex II

**MECHANISM FOR STUDY AND IMPLEMENTATION OF THE JOINT DAM ON
THE AL-KABEER AL-JANOUBI RIVER AT IDLIN – NOURA AL-TAHTA**

1. Call for tenders for the study and implementation of the dam:

The Joint Committee, in pursuit of Article 9 of the Agreement, shall undertake the following actions and functions:

(a) Preparation of all necessary documents for an international call for tenders for the study and design of the dam project within three months of the entry into force of this Agreement;

(b) Adoption by the parties of a technical specifications document for the study and design of the dam project in both Arabic and English within a timeframe of two months after the first call for tenders, and the announcement of a second call for tenders within another two months;

(c) The final study and design of the dam will be carried out by a consultancy firm selected in accordance with the tendering process within a maximum period of two years following the second call for tenders;

(d) Verification of the study and the final design, along with supervision of its implementation, will be carried out by a consultancy firm to be selected from offers made by a panel of experts agreed by the parties. The verification will be completed within a six month period after completion of the study and design of the project.

2. Those steps shall be taken in conjunction with the following step; both States will compensate their citizens for lands, real estate and installations compulsorily acquired in the region of the dam and the area of the reservoir in accordance with applicable law.

3. The Joint Committee is charged with announcing an international competition to build the dam within a period of three months after the completion of the previous phase, following the consent of the competent Ministers.

The dam is to be implemented and handed over to the two Parties, in accordance with the technical specifications document, and put into operation within a period of three years.

Beirut, 20 April 2002

For the Republic of Lebanon
Minister of Energy and Water

Dr. Mohamad Abed Al Hamid Beydoun

For the Syrian Arab Republic
Minister of Irrigation

Mohammed Radwan Martin

Annex III

**MECHANISM FOR MANAGEMENT OF THE BASIN AND DISTRIBUTION
OF THE WATERS OF THE AL-KABEER AL-JANOUBI RIVER**

1. Basis for development of the dam and the system for distributing the waters of the reservoir:

(a) **The States shall withdraw water from the reservoir in accordance with the Agreement and with articles 3, 5 and 12 thereof, and in accordance with the annual water use programme determined by the Joint Committee;**

(b) The basin management committee shall establish an annual programme for use of the waters of the said basin, which must be approved by the Joint Syrian-Lebanese Principal Committee on Water;

(c) The Joint Committee shall evaluate the use of the waters at the end of each water year; and the basin management shall prepare monthly reports on water quantities and withdrawals which shall be submitted to the Joint Committee;

(d) A special joint directorate for development and management of the waters of the basin shall be established by the parties, with an equal overall number of staff members (fulltime equivalent) from each party.

The remit of the said directorate shall be as follows:

(a) Implementation of the recommendations of the Principal Committee;

(b) Implementation of the tasks set out in the water use programme and protection of the ecosystem;

(c) Maintenance and repair of the dam and associated structures;

(d) Installation, operation and maintenance of water and climate measuring equipment;

(e) Recording climatic data and the quantity of waters entering and exiting the reservoir and withdrawn from it and the quantity of water used (stored or used for irrigation) above the reservoir in both States, and the use of telemetric systems linked to the central water directorate in both countries;

(f) Raising and lowering the sluice gates to regulate the outflow of water from the reservoir in accordance with the water use programme or in case of necessity, as in cases of flooding;

(g) Comprehensive monitoring of groundwater.

2. Standing instructions on the maintenance and repair of the dam and associated structures.

The States shall participate equally in maintenance work on the dam and reservoir and the repair of its structures. The Joint Committee shall, on the basis of decisions of the Ministers, issue directions and regulations and shall provide assistance in their practical application in the course of development of the project, including supervision, measurements and regular testing.

For the Republic of Lebanon
Minister of Energy and Water

Dr. Mohamad Abed Al Hamid Beydoun

For the Syrian Arab Republic
Minister of Irrigation

Mohammed Radwan Martini

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