

Shared Water Resources in the Jordan River Basin

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The purpose of this article is to chronicle the history of river basin development plans of the Jordan River basin riparians (Israel, Jordan, Lebanon, the Palestinian Authority, and Syria) and to analyze the agreements among the Jordan River basin riparians in light of international law principles. The relationship among the Jordan River basin riparians is complicated by the fact that many of the boundaries of these countries resemble a difficult jigsaw puzzle, which cuts across the sources of the water system.

The Jordan River basin is formed by two rivers -- the Jordan and the Yarmouk. The Jordan, which runs from north to south, has as its source three spring-fed streams: the Hasbani (in Hebrew, Nahal Senir) begins in Syria with a small part of its watershed in Lebanon, the Banyas (Nahal Hermon) begins in Syria, and the Dan (Nahal Liddani) begins in Israel. These three tributaries combine in Israel's Huleh Valley into the Jordan River, which then flows south into Lake Tiberias (known in Israel as Yam Kinneret and referred to in the Bible as the Sea of Galilee).

The Yarmouk River arises to the East of the Jordan River in Syria, and emerging from Syrian territory, forms the boundary between Jordan and Syria for eight miles and then forms the boundary between Jordan and Israel. The Yarmouk and Jordan Rivers converge below the Southern part of the Sea of Galilee and then flow through the Jordan Valley into the Dead Sea 70 miles downstream. The Jordan River forms the boundary between Jordan and Israel, and later between Jordan and the West Bank. The Yarmouk River is approximately 40% of the total flow.¹

Obtaining the agreements required for optimal development of the scarce water resources in this basin has proven elusive, although more pieces of the puzzle are in place than ever before. Peace agreements have been signed between Israel and Jordan² and between Israel and the Palestinian Authority³ that allocate water resources among those parties. Syria and Jordan had previously reached agreement on riparian rights to the Yarmouk waters,⁴ but this agreement will need to be updated in light of the increased use by Syria of Yarmouk waters.⁵ Under international law principles discussed in this Article, it will be necessary for the basin riparians to enter into consultations with each other, paying reasonable regard to the rights and legitimate interests of each riparian, in order to arrive at an equitable resolution.

Geography

Surface Water

Apart from the ancient political turmoil that has plagued the area for millennia, the Jordan River system itself does not present technical challenges. In the Jordan Valley, between Lake Tiberias and the Dead Sea, the Jordan River has carved a deep gorge called the Zor, which is flanked by the terraces of the Ghor on either side. Rain falls in the north of the Jordan River from October to May, with heaviest rainfall during the winter. In the winter, the side streams that feed the Jordan River become very full, while in the summer, they dry up. In order to use the waters in the system effectively, it is necessary to provide means to collect and store water during the winter, for use during the summer. Yarmouk and Jordan River waters that are not diverted or stored eventually flow into the Dead Sea and become commingled with its saline waters.

The Jordan watershed has a total surface area of 18,000 square kilometers.⁶ The flow of the three spring-fed streams, which form the headwaters of the Jordan River, is variable. The Dan is the least variable, ranging from 173 to 285 mcm/yr., and contributes about half of the normal flow of the Jordan. The Hasbani varies from 52 to 236 mcm/yr., averaging 138 mcm/yr. The Banyas varies from 63 to 190 mcm/yr., averaging 121 mcm/yr.⁷

After these three streams meet in Israel to form the Jordan River, an average of 660 MCM/yr. flows from the Jordan into Lake Tiberias, and 130 MCM/yr. is contributed by local run-off. Lake Tiberias has a volume of 4,000 mcm, which is 6.5 times the Jordan's average annual inflow and 8 times its average outflow. An average of 500 mcm/yr. passes further south from Israel into the Jordan.

The main source of the Lower Jordan is the Yarmouk river which rises in Syria and joins the Jordan River about 4 miles south of Lake Tiberias, with an average flow of 500 mcm/yr. After the confluence of the Yarmouk, the Jordan River also receives an average of about 523 MCM/yr. from the Zarqa River, wadis and local springs.

Water quality is variable in the river basin. The three tributaries of the upper Jordan (the Dan, Hasbani, and Banyas) have a low salinity of about 20 ppm.⁸ The salinity of the Yarmouk River is also satisfactory, at 100 ppm.⁹ The salinity of water in Lake Tiberias ranges from 240 ppm in the upper portion of the lake (marginal for irrigation water), to 350 ppm (too high for sensitive citrus fruits) where it discharges into the Jordan River.¹⁰ The salt comes from the saline subterranean springs. These springs pass through the beds of ancient seas and then flow into Lake Tiberias, as well as the groundwater sources that feed into the lower Jordan. The lower Jordan river becomes progressively more saline as it flows south, reaching twenty-five percent (250,000 ppm), when it ends in the Dead Sea which is about seven times saltier than the ocean.¹² The Dead Sea receives an average flow from the Jordan River of 1,850 mcm/yr.¹³

The natural salinity of the Jordan River has been exacerbated by the extensive exploitation of high quality water by Jordan and Israel. Israel extracts water from the northern edge of Lake Tiberias at Eshed Kinrot to feed into the National Water Carrier, a water system constructed in 1964 to convey water to coastal areas and to the Negev.

Jordan extracts water from the Yarmouk River to feed into the East Ghor Canal, which was completed by 1979 and runs parallel to the Jordan River.

Groundwaters

The most important source of water in the Jordan River basin is groundwater. The groundwater reservoir beneath the West Bank is the largest water resource in the region, supplying 600 mcm of water per year.¹⁴ Israel uses 495 mcm/yr. and the Palestinians use 105 mcm/yr.¹⁵ Prior to 1967, Israel had used 455 mcm of the groundwater. After 1967, the Israelis developed a new well system on the upper slopes of the West Bank, which makes it possible to retrieve more groundwater before it becomes saline. This aquifer is the source of 35% of Israel's total annual consumption.¹⁶ For the Palestinians in the West Bank, the aquifer provides 90% of their annual consumption: the rest of the water (15 mcm/yr.) comes from the National Water Carrier, local cisterns and surface waters.¹⁷

This aquifer can be divided into three major basins: (1) West: the Yarqon Tanninim basin which supplies 360 mcm/yr. of water.¹⁸ Israel uses 340 mcm/yr. of this water; the remaining 20 mcm/yr. is used by Palestinians in Qalqilya and Tulkarim, through springs and wells; (2) North: the Nablus-Gilboa basin, which supplies 140 mcm/yr. of water.¹⁹ Israel uses 115 mcm/yr. of this water, and 25mcm/yr. is used by Palestinians for irrigation through Wadi Farih, Bardela and other small springs. (3) East: this basin yields 100 mcm/yr. of water. Israel uses 40 mcm/yr. of this water; and the Palestinians use 60 mcm/yr. The East basin has an estimated reflow in excess of these amounts, and the Palestinians allocate these waters for future use under the Interim Agreement.²⁰

Past Plans

There have been a plethora of plans to develop the Jordan River Basin system.²¹ In 1953, Jordan, the U.N. Relief and Works Agency for Palestine Refugees and Syria agreed to the construction of a hydroelectric dam that would create a storage basin on the Yarmouk at Maqarin, and to the construction of a weir downstream at Adasiya, that would direct water into the East Ghor Canal for irrigation of the Jordan Valley. Later in the year, Israel announced its "All Israel Plan" to bring water to the coastal plain and Negev Desert through diverting the northern Jordan River and draining the Huleh Lake and surrounding swamps.²² Israel began to construct its National Water Carrier, the water transport system to carry water out of the Jordan river basin to arid regions in Israel, including the Negev dessert. When Israel drained the Huleh swamps and closed a dam south of Lake Tiberias,²³ this led to skirmishes with the Syrians in the demilitarized zone.²⁴

In 1953, to defuse the water conflicts that had arisen among the riparians of the Jordan River basin, President Eisenhower appointed Eric Johnston to obtain the agreement of the four riparian states to a regional plan for the development of the Jordan River basin's resources. The reasons for the mediation efforts of the U.S. were as follows:

"Finally, the United States believes that the international resources vital to the growth and development of more than one nation should be peacefully and equitably shared. It does not believe that such resources belong to the strongest or to those who happen to be in a position to pre-empt them. It believes that its own experience in sharing rivers which flow between the United States and its neighbors may be usefully brought to bear on the problem of sharing the waters of the Jordan."²⁵

The two-year mediation effort resulted in a technical agreement among Israel and the Arab States concerning water allocations and location of storage sites. The principal aspects of the plan were as follows:

Storage

Water would be impounded in a reservoir near Maqarin with construction of a dam 126 meters high on the Yarmouk River. In addition 150 million-kilowatt hours of electric energy would be generated. Yarmouk floodwaters averaging nearly 80 mcm/yr. would be stored in Lake Tiberias. A weir would be built at Adasiya to divert water into the East Ghor canal, and also to divert excess floodwaters for storage in Lake Tiberias. The water deposited in Lake Tiberias for Jordan's use would be recorded under supervision of a Watermaster. Studies would be carried out for a storage dam on the Hasbani to be used to irrigate land in Lebanon. Canal networks in Jordan would include: the East Ghor Canal running from Adasiya south to the vicinity of the Dead Sea, a West Ghor canal, and feeder canals from Adasiya to Lake Tiberias.

Distribution

The basic principle that was used was to assure to the Arab states enough water to meet the needs of all their lands that could feasibly be irrigated. The basic allocations were as follows:

- for Lebanon - 35 mcm from the Hasbani River
- for Syria - 20 mcm from the Banyas, 22 mcm from the Jordan for the Boteiha Farm area; and 90 mcm from the Yarmouk
- for Jordan - a total of 720 mcm, of which 377 mcm from the Yarmouk River, 100 mcm from the upper Jordan River, and 243 mcm from wadis and wells
- for Israel - The residual water from the Jordan River (this was computed as 361 mcm) and 25 mcm from the Yarmouk River for the Adasiya Triangle.

The Johnston Plan also provided for the creation of an impartial engineering board and a watermaster to supervise operation of the water system and to ensure compliance of the parties. There were three aspects of the Johnston Plan that were not finally agreed: the quantity of water for the Adasiya Triangle, the role of the watermaster, and the amount of saline water to be included in the 100 mcm for Jordan from the upper Jordan River. However, although almost all aspects of the plan were agreed at a technical level, the agreement was ultimately rejected by the Council of the Arab League for political

reasons,²⁶ but the allocations have been followed informally by Jordan and Israel for some time. Attached is a map detailing the Johnston Plan that will also assist in visualizing the geography involved.

Table 1: Plans for the Jordan River System

(mcm/yr.)²⁷

Plan/Source	Lebanon	Syria	Jordan	Israel	Total
C. Main Plan	-	45	774	394	1213
Arab Plan	35	132	698	182	1047
Cotton Plan ²⁸	450.7	30	575	1290	2345.7
Johnston Plan	35	132	720	400	1287

Many of the principles in the Johnston Plan have formed a basis for "equitable water sharing", and have been followed in the years since the negotiations resulted in a stalemate. Israel and Jordan continued to develop their water resources. Israel built the National Water Carrier, which pumped water from the northern part of Lake Tiberias via a pipeline and canal south to Tel Aviv and into the Negev for irrigation and agricultural development. Jordan developed the East Ghor Canal in the Jordan Valley for irrigation, using Yarmouk River water. The upper East Ghor Canal phase was completed in 1962; it is now 110 km. Long.²⁹ Jordan built the King Talal Dam on the Zarqa River to store water for irrigation use. The West Ghor Canal was never started because of the 1967 war and the subsequent occupation of the West Bank.

The United States has tried on three separate occasions, once in 1963, again in 1978, and the third time in 1988, to revive plans for the Maqarin Dam. The project was to include a 170 meter dam with a storage capacity of 486 mcm, a diversion weir at Adasiya, and diversion of the Wadi Raqqad in Syria into the Maqarin reservoir, extension of the East Ghor Main Canal, electric generating facilities of 20 mw at the dam, and 2 mw at the King Talal Dam. The first two attempts to implement the plan failed when agreement between Jordan and Syria on an amendment to the Treaty for the Utilization of the Waters of the Yarmouk River of June 4, 1953 could not be reached.

On September 3, 1987 a revised Treaty governing the riparian rights of Jordan and Syria on the Yarmouk River was concluded.³⁰ The principal features of the Treaty were:

1. The power plant was to be located on the Southern bank of the Yarmouk River within the dam.

2. Jordan would bear all costs, including reimbursement to Syria of costs for expropriating properties within Syria and cancellation of water rights of Syrians (Article 4); relocation of the Hejaz Railway (Article 8); and costs of silt and erosion control (Article 11).
3. Jordanian and Syrian workers would be used to construct the dam, as well as Jordanian and Syrian supervisors and technicians. Equal treatment would be given to Syrian public construction companies (Article 5).
4. The dam would have a height of 100 m, with design to provide for increasing the height of the dam upon agreement by both Syria and Jordan; current plans would result in gross storage capacity of about 230 cubic meters.
5. The percentages of electricity allocated to Jordan and Syria were 25% to Jordan and 75% to Syria (Article 7).
6. The Treaty provided for a Joint Commission to administer its provisions. Regulations governing the work of the Commission were to be approved by Jordan and Syria, and any dispute arising out of the work of the Commission was to be settled by negotiations between both governments.
7. The Treaty allocated to Syria all waters of all streams in Syria in the Yarmouk basin, with the exception of waters upstream of Maqarin below the 250 m contour (Article 7(a)). The Treaty also provided that Syria could hold water in small earth dams to capture flash flood water and for local irrigation and livestock watering. The locations of these dams and the amounts of water storage permitted were also specified. In addition, two dams that did not empty into the Yarmouk River were identified in an Annex to the Treaty.

The third attempt to get agreement among riparians for construction of the Maqarin dam in 1988 failed when U.S. mediation efforts between Jordan and Israel were unsuccessful. Without a dam for storage of Yarmouk River waters, Jordan is unable to capture the winter floodwaters. It is ironic that after ten years, with the water allocations agreed among Israel, Jordan and the Palestinian Authority, plans for a dam on the Yarmouk River are now in abeyance because of the need for agreement with Syria. The Jordan Israel Peace Treaty³¹ does not explicitly refer to the dam at Maqarin. However, the Treaty does provide that both parties "shall co-operate in developing plans for purposes of increasing water supplies and improving water use efficiency, within the context of bilateral, regional or international cooperation."³² The Israelis have recently selected a new dam site on the Yarmouk one mile upstream from Maqarin, but this is in disputed territory that Israel occupied after the 1967 war.³³

Allocations

Jordan and Israel

The Jordan Israel Peace Treaty aims at a "comprehensive and lasting settlement of all the water problems between them."³⁴ The allocations of both countries to the waters of the Jordan and Yarmouk river are set forth in Annex II of the Treaty, entitled "Water Related Matters."³⁵ Both countries "undertake to ensure that the management and development of their water resources do not, in any way, harm the water resources of the other Party."³⁶ In the water scarce Middle East, maintaining access to sufficient water is of vital importance. Both countries have attempted to maximize their water resources through cooperative arrangements that would have been considered impossible earlier.

A Joint Water Committee is established under the Treaty, comprised of three members from each country.³⁷ The Joint Water Committee is to manage mutual water resources, operate jointly established monitoring stations to monitor the quality of water along their boundary, and to develop plans to supply Jordan with an additional 50 mcm/yr. of drinking water.³⁸ Article 6 of the Jordan Israel Peace Treaty provides for mutual assistance in the alleviation of water shortages.³⁹

Yarmouk

Annex II of the Jordan Israel Peace Treaty sets out the allocations of water in the Jordan River basin to Israel and Jordan. During the summer, Israel is allocated 12 mcm of the Yarmouk River, and during the winter Israel is allocated 13 mcm. Jordan is allocated the rest of the flow of the Yarmouk River. The Johnston Plan allocated 25 mcm of Yarmouk River waters to Israel. Depending upon the flow of waters in the Yarmouk River in a given year, the amount of the water allocated to Jordan ranges from 305-355 mcm/yr., for an average of 330 mcm. Under the Johnston Plan, Jordan was to be allocated 377 mcm/yr., or 47 mcm/yr. more than under the Jordan-Israel Peace Treaty.

Another difference is that the Maqarin dam envisaged under the Johnston Plan, or some other facility to capture the winter floodwaters of the Yarmouk River, is not in place. To permit these waters to be utilized, Israel is also allocated an additional 20 mcm of Yarmouk water in winter in return for a transfer of 20 mcm of water to Jordan in the summer period.⁴⁰ Jordan is required to pay operation and maintenance cost of the transfer through existing transmission systems, and if a new transmission system is constructed, Jordan will bear the total cost.⁴¹

Jordan and Israel have agreed to the construction of a diversion dam at Adasiya, in order to improve the offtake of Yarmouk waters into the East Ghor Canal.⁴² The construction of this dam was contemplated in the Johnston Plan. Jordan and Israel are also entitled to excess floodwaters of the Yarmouk River downstream from the Adassiya diversion point so long as Jordan is not able to use them.⁴³

Jordan River

Under the Jordan Israel Peace Treaty, Jordan is entitled to a minimum average of 20 mcm of winter floodwaters from the Jordan River, in addition to the 20 mcm which Jordan receives from the Jordan River in exchange for Yarmouk waters. The water, which

Jordan receives from the Jordan River, is to be kept in a water storage system to be built on the Jordan River.⁴⁴ Under the Johnston Plan, Lake Tiberias was to be used for storage of Jordan's water as well as Israel's; but under the Jordan Israel Peace Treaty, Lake Tiberias is to be reserved entirely for Israel with no commingling of water for Jordan. Floodwaters in excess of this amount "can be utilised for the benefit of the two Parties."⁴⁵

Israel is entitled to maintain its current uses of Jordan River waters between the confluence of the Yarmouk and the green line,⁴⁶ and Jordan is entitled to an annual quantity equivalent to that of Israel, provided that Jordan's use does not harm the quantity or quality of Israel's use. The Joint Water Committee will make a base-line survey of existing uses to serve as a benchmark for monitoring whether "appreciable harm" results from Jordan's additional extractions.

Wells

The Jordan-Israel Peace Treaty also allows Israel to retain the use of any wells it was using prior to the Treaty that fell on Jordan's side of the new borders.⁴⁷ An additional 10 mcm/yr. was to be abstracted from these wells, provided that the Joint Water Committee determines this is hydrogeologically feasible and does not harm existing Jordanian uses.⁴⁸ The operation and maintenance of these wells, and their electricity supply, is Jordan's responsibility, but selection of the contractors is to be done by Israel, and payment of these costs is to be borne by Israel.⁴⁹

Salinity

The salinity of waters in the Jordan River basin is considerably higher than that in the Yarmouk, and the level of salinity increases progressively downstream. Israel has diverted about 20 mcm of saline springs into the Jordan River. Under the Jordan-Israel Peace Treaty, Israel is to desalinate these waters, and provide 10 mcm of the desalinated water to Jordan. Israel will explore the possibility of covering the operation and maintenance costs of desalination, but Jordan is to cover its pro-rata capital costs of constructing the facilities.⁵⁰ Until the desalination plants are operational, Israel is to supply Jordan on dates selected by Jordan that fall outside the summer months with 10 mcm of Jordan River water upstream from the Deganya gates, which are situated just south of Lake Tiberias.⁵¹

Jordan's use of Jordan River waters under the Jordan Israel Peace Treaty has been estimated to be between 150 to 200 mcm/yr.⁵² Under the Johnston Plan, Jordan was entitled to 100 mcm from the Jordan River, with 85 mcm to be from the upper Jordan River and another 243 mcm allocated to Jordan from wadis and wells from the eastern part of the Jordan River basin. The wadis now yield an average of 90 mcm/yr. Thus, there is an average of 78 mcm/yr. less water from the Jordan River allocated to Jordan under the Jordan-Israel Peace Treaty than was allocated under the Johnston Plan, and the waters are more saline than those that were to be allocated under the Johnston Plan. The allocations to Jordan under the Johnston Plan were made however when Jordan was in control of the West Bank. The Peace Treaty provides that Jordan and Israel will

"cooperate in finding sources for the supply to Jordan of an additional (50) MCM/year of water of drinkable standards."⁵³

Palestinian Authority and Israel

The Interim Agreement, signed a year after the Jordan-Israel Peace Treaty, specifies water allocations between the Israelis and Palestinians, and establishes a regulatory arrangement for licensing and approval of new wells, increased abstraction of water, and development of water projects. The Interim Agreement recognizes the water rights of Palestinians in the West Bank,⁵⁴ as well as the Israelis' and Palestinians' rights to maintain existing quantities of utilization,⁵⁵ and specifies that the future needs of the Palestinians in the West Bank are between 70 to 80 mcm/yr.⁵⁶

The current Palestinian average per capita consumption is less than one-third of the average per capita consumption in Israel.⁵⁷ Of 120 mcm/yr. consumed by Palestinians, 85 mcm/yr. is used to irrigate 9,500 hectares, 30 mcm/yr. is used for domestic consumption, and the rest is used for industrial purposes.⁵⁸ During the interim period, 28.6 mcm/yr. in additional supply of water is to be made available to the Palestinians.⁵⁹ The Palestinians are given the rights to develop projects for the supply of an additional 41.4-51.4 mcm/yr. from the Eastern Aquifer and other agreed sources in the West Bank for domestic and agricultural uses.⁶⁰ In the event that it becomes necessary for either side to purchase water, the principle of full cost recovery will govern pricing, including the cost of production at the source and the conveyance to the point of delivery.⁶¹

Both Israel and the Palestinians have agreed to take "all necessary measures to prevent any harm to water resources, including those utilized by the other side."⁶² A Joint Water Committee is established during the period governed by the Interim Agreement, with equal representation from Israel and the Palestinians. The Joint Water Committee is responsible for coordinating management of water resources, and overseeing Joint Supervision and Enforcement Teams that are established in the West Bank to monitor, supervise and enforce the agreements set forth in the Interim Agreement, including: (i) extraction of water resources according to licenses and permits; (ii) drilling of wells; (iii) development of new projects; (iv) environmental protection; and (v) collection of data and quality analyses.⁶³

The Joint Water Committee is also responsible for maintaining the existing utilization of the aquifers that is detailed in the Interim Agreement: (a) Eastern Aquifer, where 40 mcm is allocated to Israeli users and 54 mcm is allocated to Palestinian users. An additional 78 mcm in the Eastern Aquifer is estimated to be available for future development, and is designated as the primary source for the future needs of the Palestinians; (b) North-Eastern Aquifer, where 103 mcm is allocated to Israeli users and 42 is allocated to Palestinian users; and (c) Western Aquifer, where 340 mcm is allocated to Israeli users and 22 is allocated to Palestinian users.⁶⁴ These allocations have recognized the existing utilization patterns in the groundwater reservoir beneath the West Bank.⁶⁵

The three lower riparians in the Jordan River basin have allocated the water resources in the basin among themselves, also establishing a framework for future development of water resources within the basin. The agreements that have been reached represent a very significant achievement. However, in order to fully develop the resources of the Yarmouk River it will be indispensable to obtain the agreement of Syria. Lebanon is also an upper riparian because the Hasbani River is a tributary of the Jordan River. However, although continued access to the waters of the Hasbani is important to the lower riparians, Lebanon's potential use of the Hasbani would not necessarily affect the viability of projects located downstream in the Jordan River basin. Under international law principles described below, although Lebanon's cooperation would be highly desirable, Lebanon would not necessarily have to be consulted concerning further development of the Jordan River basin.

The Convention

In 1994 the International Law Commission of the United Nations concluded twenty-four years of work by adopting draft articles on the law of the non-navigational uses of international watercourses, together with a resolution on transboundary confined ground water, and recommended that a convention be prepared on the basis of its draft articles.⁶⁶

On May 21, 1997 the U.N. General Assembly adopted a Convention on the Law of Non-navigational Uses of International Watercourses.⁶⁷

The articles establish two principles for the use of international watercourses (other than navigation): "equitable and reasonable utilization"⁶⁸ and "the 'due diligence' obligation not to cause significant harm."⁶⁹ Equitable and reasonable utilization requires taking into account all relevant factors and circumstances, including:

- (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
- (b) The social and economic needs of the watercourse States concerned;
- (c) The population dependent on the watercourse in each watercourse State;
- (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
- (e) Existing and potential uses of the watercourse;
- (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
- (g) The availability of alternatives, of comparable value, to a particular planned or existing use.⁷⁰

The International Law Commission has defined the due diligence obligation not to cause significant harm as "not strict liability,"⁷¹ but "such care as governments ordinarily employ in their domestic concerns. The obligation of due diligence contained in article 7 sets the threshold for lawful State activity. It is not intended to guarantee that in utilizing an international watercourse significant harm would not occur. It is an obligation of conduct, not an obligation of result."⁷² Therefore, in order for a State to violate Article 7, this would require an element of negligence or an intentional act or omission.⁷³

The Convention is applicable to "a system of surface waters and groundwaters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus"⁷⁴ The Convention codifies the customary law of transboundary water resources, and also represents a progressive development of with respect to procedural guidelines for notification and consultation among riparians (Articles 12 through 18). Article 4 of the Convention recognizes the right of all riparians to participate in consultations on possible uses of a watercourse if a riparian's use may be affected.

Under the Convention, riparians, whose potential uses of a watercourse might affect the use of the watercourse by other riparians, are to be given timely notification.⁷⁵ Both downstream and upstream riparians have the right to receive notification. In the case of upstream riparians, their potential use of the watercourse might affect the viability of a project located downstream. In accordance with this provision, Syria would have the right to enter into consultations and negotiations concerning plans for the Jordan River basin, "on the basis that each State must in good faith pay reasonable regard to the rights and legitimate interests of the other State."⁷⁶

Groundwater

The Convention does not apply to "confined" groundwater systems, such as are present in the Jordan River basin. The Convention is applicable to groundwaters only if they flow into a common terminus. During initial drafting of the Convention, the definition of "watercourse system" did not exclude confined groundwater systems.⁷⁷ The Special Rapporteur, and some of the members of the International Law Commission believed that confined groundwaters that are intersected by a boundary should have been covered by the Convention.⁷⁸ Instead, the International Law Commission recommended that the principles of the Convention should be applied to transboundary confined groundwater by States.⁷⁹

Hydrologically, groundwater, whether "confined" or not, is part of the water cycle. Water percolates through layers of rock and soil until reaching a layer of impervious bedrock that forms a groundwater reservoir, called an aquifer. Groundwater rejoins the surface water system through springs, seeps or wells. Other international fora have recognized the need to regulate the relationships among States who share a groundwater resource. The European Economic Commission of the United Nations noted "that prevention and control of transboundary pollution in rivers and lakes...and in related groundwater aquifers, as well as prevention and control of floods are important and urgent tasks whose

effective accomplishment can only be ensured by enhanced cooperation among riparian countries."⁸⁰

A multidisciplinary group of specialists formulated in 1989 a draft international groundwater treaty. The treaty incorporates many articles similar to those found in the Jordan-Israel Peace Treaty and the Interim Arrangement including joint management, establishment of a joint commission, enforcement and oversight responsibilities, unified database.⁸¹ "Moreover, the availability of surface water or groundwater as well as the quality of each, varies significantly from place to place. This is because of considerations of suitability and yield, optimum utilization in a water-scarce area can often be achieved only by combining and managing the resource in its entirety, rather than as separate sources of supply."⁸²

In the Jordan River basin, where confined groundwater represents the largest water resource, the procedures and principles set forth in the Convention concerning water allocation, notification to riparians, and the obligation not to cause significant harm would have to be applied not only to the surface waters, but would have to apply to the confined groundwaters as well in order to arrive at an integrated water regime that takes all of the water resources in the basin into account. In essence, the agreements reached among the lower riparians of the Jordan River basin in the Jordan-Israel Peace Treaty and the Interim Agreement have done exactly that.

A number of writers have analyzed the characteristics of the Jordan River basin to determine what would be an equitable and reasonable utilization of the waters of that basin.⁸³ In the Jordan-Israel Peace Treaty and the Interim Agreement, the allocations agreed in technical discussions among the riparians during negotiation of the Johnston Plan over forty years ago have served as important precedent. Existing utilization patterns have also served as an important factor in determining the allocation of water.

The Joint Water Committees established under the Jordan-Israel Peace Treaty and the Interim Agreement have been given considerable responsibilities to administer the water sharing arrangements established among the riparians. Both of these agreements are forward-looking, in that they set important agenda for the further development of the Jordan River basin and place critical safeguards in place to ensure that these developments are sustainable and husband a scarce resource. It is to be hoped that these institutions will be successful in carrying out their mandates for administration of the scarce water resources in the Jordan River basin, and that ultimately Syria and Lebanon join their downstream riparians in order to maximize the use of all of the water resources in the Jordan River basin.

¹ Dante A. Caponera, *Legal Aspects of Transboundary River Basins in the Middle East: the Al Asi (Orontes), the Jordan and the Nile* 33 Nat. Resources J. 629, 638 (1993).

² Treaty of Peace, Annex II, "Water-Related Matters", July 25, 1994, Israel-Jordan, 34 I.L.M. 43 [hereinafter Jordan Israel Peace Treaty].

³ Interim Agreement on the West Bank and the Gaza Strip, Annex III, Art. 40 and Schedules 8, 10 and 11, September 28, 1995, Israel-Palestinian Interim Self-Government Authority, Ministry of Foreign Affairs of the State of Israel, Israel Information Center, (1995) [hereinafter Interim Agreement].

⁴ Treaty for the Utilization of the Waters of the Yarmouk River of June 4, 1953 (photocopy on file with author). A revised Treaty governing the riparian rights of Jordan and Syria on the Yarmouk River was concluded on September 3, 1987.

⁵ Syria has developed irrigation projects since the mid 70's along the Yarmouk which have increased Syria's use of Yarmouk waters from 153 mcm/yr. to 200 mcm/yr. Natasha Beschower, *Water & Instability in the Middle East* 3 Adelphi Paper 273 (Winter 1993).

⁶ or 6,953 square miles.

⁷ Joseph W. Dellapenna, *Water in the Jordan Valley: The Potential and Limits of Law*, *The Palestine Yearbook of Int'l L.* 15, 20 (1989).

⁸ John D. Keenan, *Technological Aspects of Water Resources Management: Euphrates and Jordan*, in *Country Experiences with Water Resources Management* 37-49, at 37 (World Bank Technical Paper No. 175, 1992) (Guy Le Moigne & Shakwi Barghouti eds.).

⁹ *Id.* at 39.

¹⁰ *Id.* at 39.

¹¹ Aaron Wolf & John Ross, *The Impact of Scarce Water Resources on the Arab-Israeli Conflict*, 32 *Nat. Resources J.* 919, 922 (1992).

¹² Keenan, *supra* note 8, at 39.

¹³ Dellapenna, *supra* note 7, at 21.

¹⁴ Y. Schwartz, *Water Resources in Judea, Samaria, and the Gaza Strip*, in *Judea, Samaria and Gaza: Views on the Present and Future* 81-100 (D. Elazar ed., 1982).

¹⁵ Eyal Benvenisti and Haim Gvirtzman, *Harnessing International Law to Determine Israeli-Palestinian Water Rights: The Mountain Aquifer*, 33 *Nat. Resources J.* 543, 559 (1993).

¹⁶ [Israeli] Central Bureau of Statistics, *The Israeli Annual Statistical Survey*, No. 42, at 389 (1991).

¹⁷ Benvenisti, *supra* note 15, at 561.

¹⁸ U. Baida, The Yarqon-Tanninim Basin and the Mountain Aquifer, Proceedings of the Israel Association of Hydrology Conference on Quantity and Quality Problems in the Present Israeli Water Balance 51-57 (Oct. 1986, in Hebrew), as quoted in Benvenisti, *supra* note 15, at 555 n 38.

¹⁹ G. Shaliv, *Beth-She'an and East Samaria basins: Updating of the Hydrogeological model*, TAHAL (Jan. 1980, in Hebrew), as quoted in Benvenisti, *supra* note 15, at 555 n.39.

²⁰ Interim Agreement, *supra* note 3, Annex III, Schedule 10.

²¹ American Friends of the Middle East, Inc., *The Jordan Water Problem, An Analysis and Summary of Available Documents*, Washington D.C. (1964) (photocopy on file with author) lists the following plans:

- Ionides Plan (1939) *Report on the Water Resources of Transjordan and their Development* by M. G. Ionides, Director of Development, Government of Transjordan, Incorporating a Report on Geology, Soils, Mineral and Hydro-Electric Correlations by G. S. Blake, London, March, 1939.
- Lowdermilk Plan (1944) in Walter Clay Lowdermilk, Palestine, Land of Promise, Chapter XI (New York and London, Harper & Bros., 1944).
- Hays Plan (1948) *T.V.A. on the Jordan, Proposals for Irrigation and Hydro-Electric Development in Palestine*, James B. Hays, Washington, D.C., Public Affairs Press. (A report prepared under the auspices of the Commission on Palestine Surveys).
- MacDonald Report (1951) *Report on the Proposed Extension of Irrigation in the Jordan Valley* by Sir M. MacDonald & Partners, London, March 1951.
- Bunger Plan (1952) *Feasibility: Yarmuk-Jordan Valley Project* (4 pages, not dated, Stencil No. 317/53).
- Charles T. Main Plan (1953) *The Unified Development of the Water Resources of the Jordan Valley Region*. Prepared at the request of the United Nations under the direction of the Tennessee Valley Authority by Charles T. Main, Inc., Boston, Massachusetts. This is the plan that Eric A. Johnston used as the basis for his negotiations with the Arabs and Israelis. Out of it grew the Unified Water Plan, sometimes referred to as the Johnston Plan
- Israel's Seven Year Plan (1953). Actually an implementation of the Lowdermilk-Hays Proposals. Formulated by the Israeli Ministry of Finance and published by the Ministry in *Data and Plans*, October, 1953. Sometimes called the National Water Plan or "All-Israel" Plan.
- Cotton Plan (1954). *The Cotton Plan for the Development and Utilization of the Water Resources of the Jordan and Litani River Basins*, Israel Office of Information, February, 1954. (Israeli counter-proposal to the Johnston Plan, based on the Main Plan. This included the Litani River in its scope, allocating 400 mcm of its waters to Israel and 300 mcm to Lebanon).

- Arab Plan (1954) *The Arabs' Plan for Development of Water Resources in the Jordan Valley*,² (Full English text in; "The Egyptian Economic and Political Review", October, 1955, pp. 42-46. (Arab counter-proposal to the Johnston Plan).
- Baker-Harza Plan (1955). *Yarmuk-Jordan Valley Project, Master Plan Report*,² Michael Baker, Jr., Inc. and Harza Engineering Co., Rochester, Pa., 1955, 8 volumes, 4 appendices. A summary appears in UNRWA, Bulletin of Economic Development, No. 14, *Special Reports on Jordan*, Beirut, Lebanon, July 1956, pp 100-118.

²² Wolf, *supra* note 11, at 931-32.

²³ *Id.* at 931.

²⁴ *Id.*

²⁵ The Johnston Plan, September 30, 1955 (photocopy on file with author) at 2.

²⁶ Jonathan M. Wenig, *Water and Peace: The Past, the Present, and the Future of the Jordan River Watercourse: An International Law Analysis*, 27 N.Y.U. J. Int'l L. & Pol., 331, 335 (1995).

²⁷ Thomas Naff & Ruth Matson, *Water in the Middle East: Conflict or Cooperation?* (1984).

²⁸ The Cotton Plan included the Litani River as part of the Jordan River basin.

²⁹ Keenan, *supra* note 8, at 40.

³⁰ Al Wehdah [Unity] Dam Agreement, dated November 23, 1987, Law No. 32 (Syria), Official Gazette of Dec. 9, 1987.

³¹ Jordan Israel Peace Treaty, *supra* note 2.

³² *Id.*, Art VII, sec. 3, Annex II.

³³ *A Poor Israeli Choice*, Wash. Post, Aug. 30-31, 1997, at 6.

³⁴ Jordan Israel Peace Treaty, *supra* note 2, art. 6.

³⁵ *Id.*

³⁶ *Id.*, art. 6, sec. 2.

³⁷ *Id.*, Annex II, art. VII, sec. 1.

³⁸ *Id.*, Annex II, art. III, sec. 2.

³⁹ Jordan Israel Peace Treaty, *supra* note 2, Art. 6.

⁴⁰ *Id.*, Annex II, art. I, sec. 2(a).

⁴¹ *Id.*, Annex II, art. I, sec. 2(a).

⁴² *Id.*, Annex II, art. II, sec. 1.

⁴³ *Id.*, Annex II, art. I, sec. 1(c).

⁴⁴ Jordan Israel Peace Treaty, *supra* note 2, Annex II, art. II, sec. 2.

⁴⁵ *Id.*, Annex II, art. I, sec. 2(b).

⁴⁶ *Id.*, Annex II, art. I, sec. 2(c).

⁴⁷ *Id.*, Annex II, art. IV, sec. 1.

⁴⁸ *Id.*, Annex II, art. IV, sec. 3.

⁴⁹ Jordan Israel Peace Treaty, *supra* note 2, Annex II, art. IV, sec. 3.

⁵⁰ *Id.*, Annex II, art. I, sec. 2(d).

⁵¹ *Id.*, Annex II, art. I, sec. 2(d).

⁵² Johnathan A. Wenig, *supra* note 26, at 340.

⁵³ Jordan Israel Peace Treaty, *supra* note 2, Annex II, art. I, sec. 3.

⁵⁴ Interim Agreement, *supra* note 3, Annex III, art. 40, sec. 1.

⁵⁵ *Id.*, Annex III, art 40, sec. 3(a).

⁵⁶ *Id.*, Annex III, art 40, sec. 6.

⁵⁷ The average per capita consumption in Israel is around 100 cubic meters per person per year. The estimated Palestinian per capita consumption is about 35 cubic meters per person per year. Benvenisti, *supra* note 15, at 561.

⁵⁸ H. Awartani, *A Projection of the Demand for Water in the Occupied Territories: Estimates for 1992-2005*, in *The First Israeli-Palestinian International Academic Conference on Water*, 7-8 (H. Shuval & J. Isaac eds., Elsevier Science Publishers), as quoted in Benvenisti, *supra* note 15, 561 n. 66. The 1995 GDP per capita was \$15,500 in Israel, \$4,700 in Jordan, and \$2,500 in the West Bank Central Intelligence Agency. World Factbook (1996).

⁵⁹ Interim Agreement, *supra* note 3, Annex III, art. 40, sec. 7. The Israelis have committed to finance projects for the supply of an additional 9.4 mcm/yr., and the Palestinians are responsible for projects to develop an additional 19.2 mcm/yr. These projects are agreed in principle between the two sides. *Id.* Annex III, Schedule 8, sec. 1(c).

⁶⁰ Interim Agreement, *supra* note 3, Annex III, art. 40, sec. 7(b)(6).

⁶¹ *Id.*, Annex III, art. 40, sec. 18.

⁶² *Id.*, Annex III, art. 40, sec. 3(e).

⁶³ *Id.*, Annex III, Schedule 9, sec. 4.

⁶⁴ *Id.*, Annex III, Schedule 10.

⁶⁵ *See supra*, notes 18-20 and accompanying text.

⁶⁶ Report of the International Law Commission to the General Assembly on the Work of its Forty-Sixth Session, in U.N. GAOR 49th Sess. Supp. (No. 10) at 196, U.N. Doc. A/49/10 (1994).

⁶⁷ [Hereinafter referred to as the "Convention"] 36 I.L.M. 700 (1997). By a vote of 103 in favor, to 3 against (Burundi, China, Turkey), with 27 abstentions (Andorra, Argentina, Azerbaijan, Belgium, Bolivia, Bulgaria, Colombia, Cuba, Ecuador, Egypt, Ethiopia, France, Ghana, Guatemala, India, Israel, Mali, Monaco, Mongolia, Pakistan, Panama, Paraguay, Peru, Rwanda, Spain, Tanzania and Uzbekistan). The Convention has been signed by Finland, Luxembourg, Portugal, South Africa, the Syrian Arab Republic, and Venezuela. [United Nations, *Multilateral Treaties Deposited with the Secretary General*, February 12, 1998. The Convention will enter into force 90 days after it has been ratified or accepted by thirty five signatories, (Article 36)].

⁶⁸ *Id.*, Article 5.

⁶⁹ *Id.*, Article 7.

⁷⁰ *Id.*, Article 6.

⁷¹ *Supra* note 66, at 237.

⁷² *Id.* *citing* The Geneva Arbitration (The Alabama case) reported in J.B. Moore, History and Digest of the International Arbitrations to which the United States has been a Party, Vol. I (1898), pp. 572-73, 612 respectively.

⁷³ *Id.*, *citing* The American Law Institute, Restatement of the Law, The Foreign Relations Law of the United States, Vol. 2 (1986), Section 601, comment (d), p. 105.

⁷⁴ Convention, *supra* note 67, Article 2(a).

⁷⁵ *Id.*, Article 12.

⁷⁶ *Id.*, Article 17(2).

⁷⁷ "A watercourse system is formed of hydrographic components such as rivers, lakes, canals, glaciers and ground water constituting by virtue of their physical relationship a unitary whole; thus, any use affecting waters in one part of the system may affect waters in another part." An "international watercourse system" is a watercourse system, components of which are situated in two or more States. Report of the International Law Commission to the General Assembly on the Work of its Fortieth Session, U.N. GAOR, 43rd Sess., Supp. No. 10, U.N. Doc. A/43/10 (1988), at 46.

⁷⁸ "The second report of the Special Rapporteur... contained express proposals for the deletion of the phrase 'flowing into a common terminus' in Article 2 of the draft articles." Report of the International Law Commission to the General Assembly on the Work of its Forty-sixth Session, *supra* note 66, at 196, 201.

⁷⁹ *Id.*, at 326. "Considering its view that the principles contained in its draft articles on the law of the non-navigational uses of international watercourses may be applied to transboundary confined groundwater,

1. Commends States to be guided by the principles contained in the draft articles on the law of the non-navigational uses of international watercourses, where appropriate, in regulating transboundary groundwater;
2. Recommends States to consider entering into agreements with the other State or States in which the confined transboundary groundwater is located;
3. Recommends also that, in the event of any dispute involving transboundary confined groundwater, the States concerned should consider resolving such dispute in accordance with the provisions contained in article 33 of the draft articles, or in such other manner as may be agreed upon."

⁸⁰ Resolution I (42) United Nations doc E/ECE/(42)/L.19, 30 April 87, at 13.

⁸¹ Robert Hayton and Albert Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 Nat. Resources J. 665 (1989).

⁸² *Id.* at 680.

⁸³ Niva Telerani, *Riparian Rights Under International Law: A Study of the Israeli Jordanian Peace Treaty*, 18 Loy. L.A. Int'l & Comp. L. J. (1995); Jonathan Wenig, *supra* note 26.

