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Harnessing International Law to Determine Israeli-Palestinian Water Rights: The Mountain Aquifer

Eyal Benvenisti

Haim Gvirtzman

EYAL BENVENISTI*
HAIM GVIRTZMAN**

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INTRODUCTION

A major issue that must be addressed in the future peace talks between Israel and the Palestinians is the conflict over the region's scarce water resources. Israel and the Palestinians share the greater part of their water resources. An underground aquifer called the Mountain Aquifer supplies about one-third of the water consumed in Israel annually, as well as most of the water consumed by Palestinians residing in "the Area."[1] Israel and the Palestinians also have major stakes in the water of the Jordan River system. In the semi-arid conditions of the Middle East, access to shared water resources may be, as it has been in the past, a source of friction and occasionally even armed conflict. Yet, this very interdependency may also prove to be a major incentive to peaceful cooperation. Thus, while any political agreement will have to include an arrangement concerning the utilization and conservation of this precious water, it may well be that the prospect of settling the water rights issue itself induces the parties to negotiate and conclude a peace agreement.

The importance of the water issue is reflected in the Israeli-Palestinian Declaration of Principles on Interim Self-Government Arrangements of Sept. 13, 1993. In Annex III the parties agree to es-

* Lecturer, the Hebrew University of Jerusalem, Faculty of Law. LL.B., the Hebrew University; LL.M., J.S.D., Yale Law School.

** Senior Lecturer, The Hebrew University of Jerusalem, Institute of Earth Sciences. B.Sc., The Hebrew University; Ph.D., The Weizmann Institute of Science.

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1. The basin of the Mountain Aquifer includes the area which was under Jordanian administration between 1948 and 1967, and since then has been under Israeli control (see Figure 1). Due to conflicting claims regarding the status of this area, different expressions have been used as titles of this region, such as "Judea and Samaria," "the West Bank," "the Administered Territories," and "the Occupied Territories." Even the present writers cannot agree on using one of these terms. In order to use a neutral term, this region shall be referred to as "the Area." The Area does not include the Gaza strip,

tablish a Continuing Committee whose first task is to discuss the cooperation in the field of water, including studies on the water rights of each party and the equitable utilization of joint water resources.

International law strives to delineate riparian states' rights to international water resources, whether those resources take the form of lakes, rivers, or underground aquifers. Initially, the attention of international lawyers focused mainly on the allocation and conservation of surface water. However, as the importance of groundwater became more apparent, efforts were made to elaborate on the law relevant to international groundwater.[2] In addition to the general clarification of international prescriptions, some neighboring states reached specific regional arrangements for the joint utilization and protection of international aquifers as, for example, in the Rhine region and in Lake Geneva in Europe, and in North America (between the United States and Mexico, and between the United States and Canada).[3] Both the international prescriptions and the experience of regional regimes offer the basis for discussing the principles of a future arrangement with respect to water in the Middle East.

This article draws upon this background, and applies the generally accepted principles of international law to the specific case of the Mountain Aquifer. The article outlines the legal aspects of a possible peaceful arrangement regarding the management of this crucial resource.[4] An examination of the various suggestions that have been articulated by the parties towards the solution of the Arab-Israeli conflict reveals that not all of the suggestions require an assessment of the water rights under regular principles of international water resources law. For example, an Israeli proposal, which consists of exclusive Israeli control over the Area, with personal autonomy to the Palestinians residing there is, like an Israeli annexation of the Area, an example of an option which would leave Israel as the sole authority with respect to management of the Mountain Aquifer. This article, therefore, examines the implications of the management of the Mountain Aquifer for only those options which would establish a separate legal entity for the Palestinians of the Area, be it an autonomous territory, an independent state, or a Jordanian-Palestinian confederation.

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which is situated in a different drainage basin.

2. For a general overview of the development of international groundwater law, *see* D. Caponera & D. Alheritiére, *Principles for International Groundwater Law*, 18 Nat. Res. J. 589 (1978); J. Barberis, *The Development of International Law of Transboundary Groundwater*, 31 Nat. Res. J. 167 (1991).

3. For an account of existing regional agreements concerning groundwater, *see* J. Barberis, *supra* note 2, at 184-85.

4. This article does not discuss the utilization of these waters under the current Israeli administration. On this issue, *see* E. Benvenisti, The International Law of Occupation, 128-129 (Princeton University Press, 1993).

Until now, the question of joint management of the water of the Mountain Aquifer has not been an issue for negotiations. Jordan occupied the Area in 1948. From that time until 1967, no challenges were made to Israeli utilization of the Aquifer. During that period, the Jordanian government was content with little investment in the Area, and Palestinian demand for water from this Aquifer remained relatively low through 1967.[5] The Israeli authorities who have administered the Area since 1967 have prevented Palestinian challenges to Israeli utilization by consolidating their control over all of the local water systems, and by severely limiting Palestinian access to additional water resources.[6] These circumstances prevented a fierce struggle over this Aquifer from taking place.

OUTLINE OF THE APPLICABLE INTERNATIONAL NORMS

An increasing demand for water has brought states that share water resources to conclude treaties regarding the joint utilization and management of water resources. Concurrently, a growing awareness of the necessity of community-wide principles has generated two parallel international efforts to explore and enhance legal guidelines regarding international water resources.[7] In 1966, the International Law Association (ILA) adopted the Helsinki Rules, which were supplemented in 1986 by the Seoul Rules concerning international groundwater resources.[8] In 1971, the International Law Commission (ILC) began drafting a treaty concerning the non-navigational uses of international watercourses. On July 19, 1991, the ILC adopted a text consisting of 32 draft articles which it sent to governments of member states for comments.[9] In addition, there have been regional efforts to clarify rules on this subject. Most noticeable is the activity of the United Nation's Economic Commission for Europe (ECE), which on April 21, 1989, adopted a Charter on Ground-Water Management.[10]

5. Y. Boneh & U. Baida, *Water Resources and its Utilization in Judea and Samaria*, in Bar Ilan University and the Ministry of Defense, Judea and Samaria 34-47 (1977).

6. *See* Benvenisti, *supra* note 4, at 128-129.

7. The Institute of International Law preceded both efforts with its Resolution on the Utilization of Non-Maritime International Waters (Except for Navigation), adopted at its session at Salzburg (September 3-12, 1961). *See* 49 (2) *Annuaire de l'Institut de Droit International*, 370 (1961); trans.: 56 AJIL 737 (1962).

8. The Helsinki Rules appear in the ILA's *Report of the Fifty-Second Conference*, at 484 (1967); the Seoul Rules appear in the ILA's *Report on the Sixty-Second Conference*, at 251 (1987).

9. For the text of the ILC Draft Articles, *see* 30 I.L.M. 1575 (1991); 21 Envtl. Pol'y and L. 191, 247-49.

10. ECE Annual Report (1989-90), ECOSOCOR 1989, Supp. No. 15. In addition, attention must be given to a private multi-disciplinary initiative by scientists and legal scholars to provide a blueprint for regional treaties for the regulation of shared aquifers. *See* R. Hayton & A. Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 Nat. Res. J. 663 (1989).

The underlying principle for the allocation of international water resources by riparian states that emerges from the developing norms of international law is the principle of equitable apportionment. This principle is recognized by the ILA[11] and the ILC,[12] as well as by several regional instruments,[13] and it applies to both surface and groundwater.[14] Basically, the principle of equitable apportionment calls for a balancing of the needs of the communities that share the common resource. The goal is to find a proper balance between the protection of existing uses and the initiation of new uses. Trying to define this general principle more minutely, both the Helsinki Rules and the ILC draft articles provide a partial list of factors that should be taken into consideration in determining the proper allocation of water in a specific basin.[15] The following analysis of the rights to the Mountain Aquifer will be based on this general principle of equitable apportionment, and will follow the list of factors indicated by the Helsinki Rules and the ILC draft articles.

Despite the wide acceptance of the principle of equitable allocation, it has been recently suggested that this doctrine should be replaced by the notion of "no appreciable harm," originally a principle employed in the context of the duty of one state to prevent appreciable environmental damage to a neighboring state.[16] The drafters of the ILC rules chose not to subject the rule of "no appreciable harm" to the

11. *See* the Helsinki Rules, *supra* note 8, Art. 4: "Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin."

12. *See* the ILC draft articles, *supra* note 9, Art. 5(1): "Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner."

13. *See*, e.g., Article 2.2(c) of the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, of the ECE countries (*reproduced in* 31 I.L.M. 1312 (1992)). For an impressive number of regional treaties that include the same principle either expressly or impliedly, *see* J. Barberis, *Bilan de recherches de la section de la langue Francais du Centre d'Etude et de Recherche de l'Academie, in* Hague Academy of International Law, Rights and Duties of Riparian States of International Rivers, 38-47 (1990). The same principle was applied in 1906 to the apportionment of the waters of the Rio Grande River between Mexico and the U.S. *See* N. Armstrong, *Anticipatory Transboundary Water Needs and Issues in the Mexico-U.S. Border Region in the Rio Grande Basin*, 22 Nat. Res. J. 877, 904 (1982).

14. The ILA Seoul Rules and the ILC draft articles both recognize that ground and surface water resources should be treated similarly. *See* ILA Seoul Rules, *supra* note 8, Art. 1; ILC draft articles, *supra* note 9, Art. 1 (definition of watercourse system). This is also the case in the ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, *supra* note 13, Art.1.1 (definition of transboundary waters).

15. *See* Helsinki Rules, *supra* note 8, Art. 6; ILC draft articles, *supra* note 9, Art. 6.

16. *See, e.g.*, A. Al-Khasawneh, *The International Law Commission and Middle East Waters*, Paper Submitted to the Water in the Middle East Conference, 3-5 (Nov. 1992).

rule of equitable allocation,[17] and thus opened the door to a new thesis, namely that the *quantities* of water should be allocated under the no-appreciable-harm principle.[18] Thus, a host of questions are raised: what are the rights that may not be appreciably harmed? Does the rule refer to *legal* rights or to actual uses (thus strengthening historic usage beyond what is warranted)?[19] Which harm is "appreciable" and which is not, and who determines it? These are some of the problems that this new thesis raises, problems that have the effect of blurring the "older" picture and jeopardizing what has been achieved so far with great effort. In any case, since this new thesis is yet to be elucidated and accepted as law, this article analyzes the allocation of the water of the Mountain Aquifer according to the principle of equitable allocation.

THE ALLOCATION OF THE WATER OF THE MOUNTAIN AQUIFER

1. Introduction: The Principle of Equitable Apportionment

This section examines the conditions of the Mountain Aquifer according to the principle of equitable apportionment. The examination follows the various factors suggested by the ILA and the ILC. These factors may be divided into three sets: the natural characteristics of the drainage basin; the existing and potential uses of the basin's water; and the alternatives to the water of the basin or to the water's existing uses. Since there are three distinct sets of factors, it is necessary, before applying these factors to the Mountain Aquifer, to discuss the relative weight of each of the sets. In particular, it is necessary to explore the relative weight of the natural factors vis-à-vis the conditions created by humans.

Although neither the Helsinki Rules nor the ILC draft articles give a clear priority to one set of factors or the other, two basic propositions may be culled from the abundant material that exists on this subject. The first proposition is that in order to determine the equitable apportionment of the water of a basin, human conditions, that is, the actual needs of the communities that depend on the water, take precedence over the analysis of the natural properties of the basin. The sec-

17. *See* ILC draft articles, *supra* note 9, Art. 7: "Watercourse States shall utilize an international watercourse in such a way as not to cause appreciable harm to other Watercourse States." Compare with Helsinki Rules, *supra* note 8, Art. 10 (concerning water pollution).

18. For a critical discussion of this thesis, *see* C. Bourne, *Protecting the Environment: Fresh Water Resources*, in From Coexistence to Cooperation, 128, 137-141 (E. McWhinney *et al.*, eds., 1991).

19. Al-Khasawneh, *supra* note 16, seems to approve of this outcome (*id.* 5).

ond proposition is that among the human conditions, priority is given to past and existing uses, at the expense of potential uses. The following paragraphs elaborate on these two propositions.

Stephen McCaffrey, the third Special Rapporteur to the ILC, concluded after reviewing all of the available evidence on the general practices of states, practice which states consider to be legally binding, that "no State whose territory is bordered or transversed by an international watercourse has an inherently superior claim to the use of the waters of that watercourse."[20] Therefore, in applying the principle of equitable apportionment, what counts are the needs of the neighboring communities: "In the most basic terms, the task of arriving at an equitable allocation involves striking a balance between the needs of the States concerned in such a way as to maximize the benefit, and minimize the detriment, to each."[21] This conclusion is based on ample evidence of states' practice, judicial decisions, and legal authorities.[22] This conclusion is also in line with the law of federal states.[23] In fact, there exists no evidence to support the contrary proposition, namely, that waters should be allocated, for example, according to the contribution of each state to the basin's water or the length of the river in each state's territory. It is interesting to note that the priority for human needs over natural parameters was recognized by Israel and its Arab neighbors in the 1950s, in the negotiations about allocation of the water of the River Jordan: the negotiating partners—Israel, Jordan, Lebanon, and Syria—viewed the agricultural needs of these states, rather than each state's natural contribution, as the primary consideration for allocation.[24]

Evidence for the general acceptance by states of the second proposition, namely that among the relevant human conditions, priority is

20. Second Report on the Law of the Non-Navigational Uses of International Watercourses, Doc. A/CN.4/399, ILC Yearbook 1986, Vol. II (Part 1), 87 at 131.

21. *Id.* at 132.

22. This conclusion has never been contested. *See* J. Lipper, "Equitable Utilization," in A. Garretson, et al. eds., The Law of International Drainage Basins, 41, 45 (1967); W. Griffin, *The Use of Waters of International Drainage Basins under Customary International Law*, 53 AJIL 50, 78-9 (1959); C. Bourne, *The Right to Utilize the Waters of International Rivers*, 3 Canadian Yearbook of Int'l Law 187, 199 (1965); P. Buirette, *Genese d'un droit fluvial international general*, 95 Recueil general de droit international public 5, 38 (1991); J. Barberis, *supra* note 13 at 40.

23. *See* McCaffrey, Second Report, *supra* note 20, at 129-130; Bourne, *supra* note 22, at 245-253. In the case of Arizona v. California, 373 U.S. 546 (1963), Justice Douglas mentioned in his dissent that, under the principle of equitable apportionment, the size of the basin within each of two states is a relevant factor (373 U.S. at 627)(J. Douglas, dissenting). A majority of U.S. Supreme Court has not adopted this factor. On this point, *see* G. Sherk, *Equitable Apportionment After Vermejo: The Demise of a Doctrine*, 29 Nat. Res. J. 565, 577 n.65 (1989).

24. The main factor used to calculate the allotments to the two principle users, Israel and Jordan, was their potential irrigable land. K. Doherty, *Jordan Waters Conflict, in International Conciliation*, No. 553, at 25-28 (1965).

given to past and existing uses, is equally abundant. As Article 8(1) of the Helsinki Rules states, "[a]n existing reasonable use may continue in operation unless the factors justifying its continuance are outweighed by other factors leading to the conclusion that it be modified or terminated so as to accommodate a competing incompatible use."[25] This principle is accepted also in the jurisprudence of the United States Supreme Court. The last ruling of the United States Supreme Court on the subject, in the case of *Colorado v. New Mexico*,[26] emphasized the predominance of existing uses and placed a heavy burden on the state challenging such uses to prove the desirability of the proposed change.[27]

Two considerations support the second proposition. The first takes note of prior uses of the water. The allocation of water is always historically contextualized. Communities settled in a certain basin because of the availability of water there. They have used the water and relied on its continued availability. Their reliance merits respect. This proposition is also justified from a prospective point of view. As the commentary to the Helsinki Rules explains, "failure to give any weight to existing uses can only serve to inhibit river development. A State is unlikely to invest large sums of money in the construction of a dam if it has no assurances of being afforded some legal protection for the use over an extended period of time."[28] While this proposition is well grounded in customary international law,[29] it seems to be challenged by the ILC draft, which does not accord special weight to any of the factors, including that of prior utilization.[30] Yet the insistence, in the ILC draft, on the "no appreciable harm" rule, also protects existing uses.

Based on this analysis, one may ask what the relevance is of an international basin's natural properties for the purpose of allocating its water among users. The answer seems to be that the main purpose of the natural factors is to set the background for the legal analysis. The natural factors define factual conditions of the shared drainage basin, such as the availability of water, as well as special problems such as drought conditions, potential building of dams and other structures, and delimitation of basin boundaries, which in turn determine the

25. Helsinki Rules, *supra* note 8 at Art. 8(1). In the same vein, *see* Resolution of the Institute of International Law, *supra* note 7, Articles 3 and 4.

26. 459 U.S. 176 (1982).

27. *Id.* at 187. "We recognize that the equities supporting the protection of existing economies will usually be compelling." *Id.* To justify the detriment to existing uses, a state would have to "demonstrate[] by clear and convincing evidence that the benefits of the [change] substantially outweigh the harm that might result." *Id. See also* R. Simms, *Equitable Apportionment-Priorities and New Uses*, 29 Nat. Res. J. 549 (1989); D. Tarlock, *The Law of Equitable Apportionment Revisited, Updated, and Restated*, 56 U. Colo. L. Rev. 381 (1985).

28. Commentary to the Helsinki Rules, *supra* note 8, at 493.

29. *See id.*

30. *See* Commentary to ILC draft article 7, ILC Yearbook-1987, Vol. II, Part 2, at 36 (1989).

states that are parties to the basin.[31] Accordingly, the present assessment of the Israelis' and the Palestinians' equitable shares begins with a description of the natural characteristics of the Mountain Aquifer.

2. Allocation of the Water of the Mountain Aquifer: Analysis of the Various Factors

a) Natural Characteristics

The natural characteristics include the geographic, hydrographic, hydrologic, climatic, and other natural features.[32] Each feature will be discussed individually.

Geography[33] The area above the Mountain Aquifer is longitudinally divided into three topographic units running from north to south: the coastal plain which rises up to 200 meters above sea level; the mountain ridge which rises up to 1000 meters in elevation; and the rift valley, which slopes down to 400 meters below sea level (see Figure 1). The Area is located mainly along the Judea and Samaria Mountains in the central part of the mountain ridge. These Mountains stretch between the Izre'el Valley in the north and the Be`er Sheva Valley in the south. The Area also includes a section of the rift valley, called the Jordan River Valley, between the Bet She'an Valley in the north and the Dead Sea in the south.

Climate[34] The western slopes of the Judea and Samaria Mountains, between 200-700 meters in elevation, have an annual rainfall of about 500 millimeters. The high mountain peaks of 800-1000 meters in elevation, within which are situated the major cities of Jerusalem, Hebron, Ramallah, and Nablus, get about 700 millimeters of precipitation annually. Along the eastern slopes of the Mountains the average annual rainfall drops sharply from 600 to 150 millimeters. These slopes are located in what is called "the shadow of the rain," and thus they are sometimes referred to as the Judea and Samaria Deserts. The Jordan Valley, which lies between 250 and 400 meters below sea level, receives about 100 millimeters of annual precipitation. The climate is Mediterranean, with rains usually occurring between November and

31. "Factors (a) to (c) mentioned in Article V of the Helsinki Rules merely re-emphasize the need for an accurate assessment of the nature and extent of the interdependence between utilization in the different basin states." *See* B. Godana, Africa's Shared Water Resources, 58 (1985).

32. *ILC draft articles, supra* note 9, Art. 7(1)(a); Helsinki Rules, *supra* note 8, Art. 5(2)(a)-(c). The latter sections mention in particular the extent of the drainage area in the territory of each basin state, and the contribution of water by each basin state. *See* Helsinki Rules, *supra* note 8, Art. 5(2)(a)-(c).

33. On the geography of Israel and the Area, *see* The Department of Surveys, *Atlas of Israel* 1-5 (1985).

34. On the climate in Israel and the Area *see Atlas of Israel, id.*, 12-14.

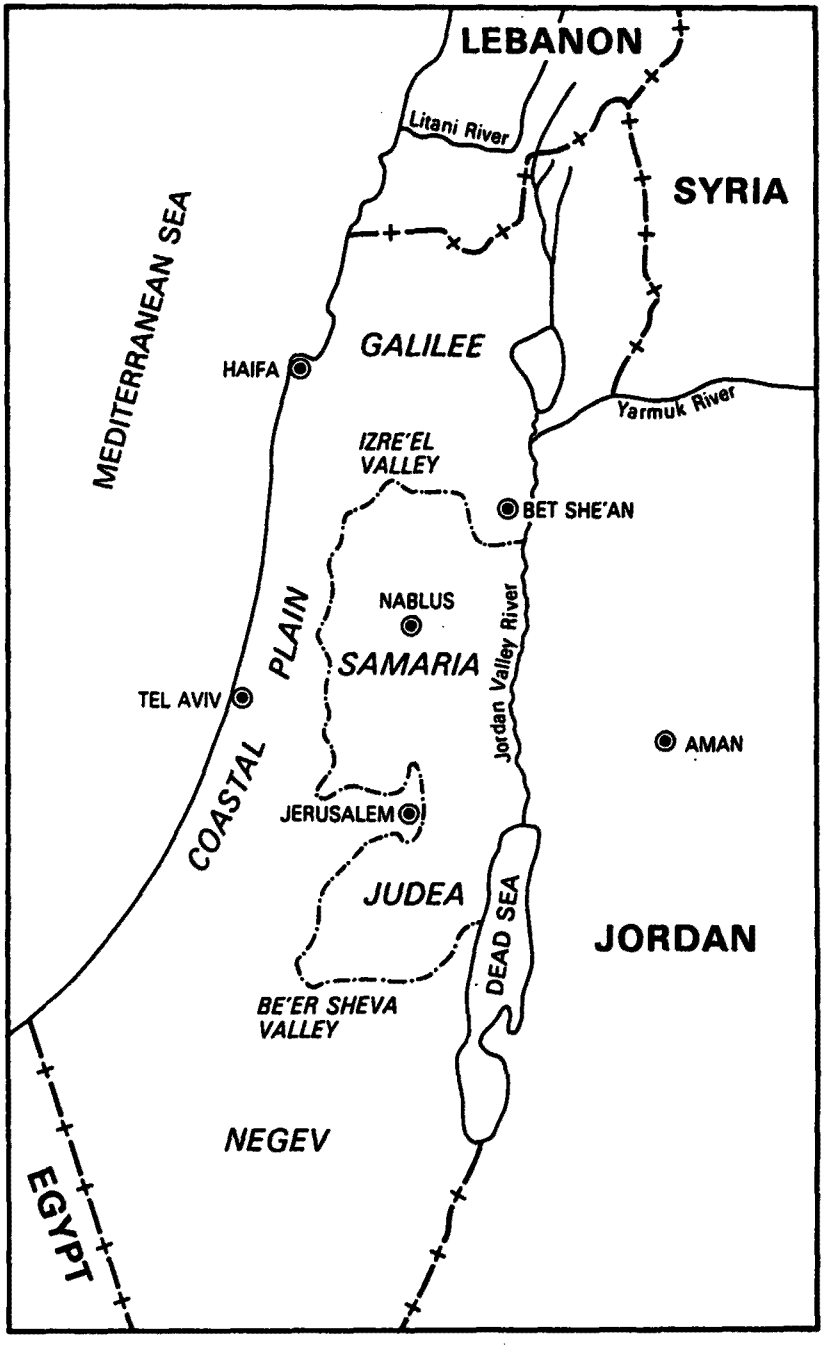

Figure 1: Geographic location map.

March. In this region of semi-arid climate conditions, the annual potential evaporation is 1900 to 2600 millimeters; most water evaporates. Only 25 to 30 percent of the rain enters groundwater systems, and about 5 percent runs on the land surface as floods.

Hydrology The rainwater that penetrates the surface moves downward through the soil and rocks and reaches a groundwater reservoir, a water-bearing rock formation called an aquifer. The groundwater reservoir beneath the Judea and Samaria Mountains constitutes the largest water resource in the region, supplying 600 million cubic meters per year (MCMY).[35] This is the source of the highest quality water in the region.

A schematic cross-section across the mountain ridge (see Figure 2) illustrates the water's flowpath. Rainwater that penetrates downward reaches the water table, flows laterally to the confined portion of the aquifer, and it is pumped from there through hundreds of wells. For the sake of simplification, consider as an example the western portion of the aquifer (see Figure 2, left side) as a huge "box" of porous material (130 kilometers length, 35 kilometers wide, and 0.6 kilometer thick) saturated with water. In reality, this "box" is composed of several sub-boxes of different rocks of complicated geological structure. Most of the water is included in a layer composed of limestone and dolomite rocks of the Cenomanian and Turonian age, called the "Judea Group" layer.[36] Some interconnected, smaller aquifers composed of other rocks exist in several sub-basins. All of these various aquifer basins and layers beneath the Judea and Samaria Mountains shall be referred to as the "Mountain Aquifer."

There are two hydrogeological terms, which for the sake of simplicity will be referred to here as the "feeding area" and the "storage area." The feeding area is the phreatic portion of the Aquifer. This is the surface area composed of permeable rock outcrops through which rainwater is able to penetrate and enter the underground reservoir. The feeding area is also the area through which pollutants can infiltrate and contaminate the Aquifer. This area, made of limestone and dolomite, spread along the entire length of the hilly backbone of the Mountains (see Figure 3).[37]

35. Slightly different numbers are mentioned in different publications. However, all numbers are in the range of 580 to 600 MCMY. These publications are by Israeli authors such as Y. Schwarz, *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), and Palestinian authors such as H. Zarour & J. Isaac, *The Water Crisis in the Occupied Territories* 9 (Paper Submitted to the VII World Congress on Water, May 1991).

36. *Atlas of Israel, supra* note 33, at 6.

37. *Id.*

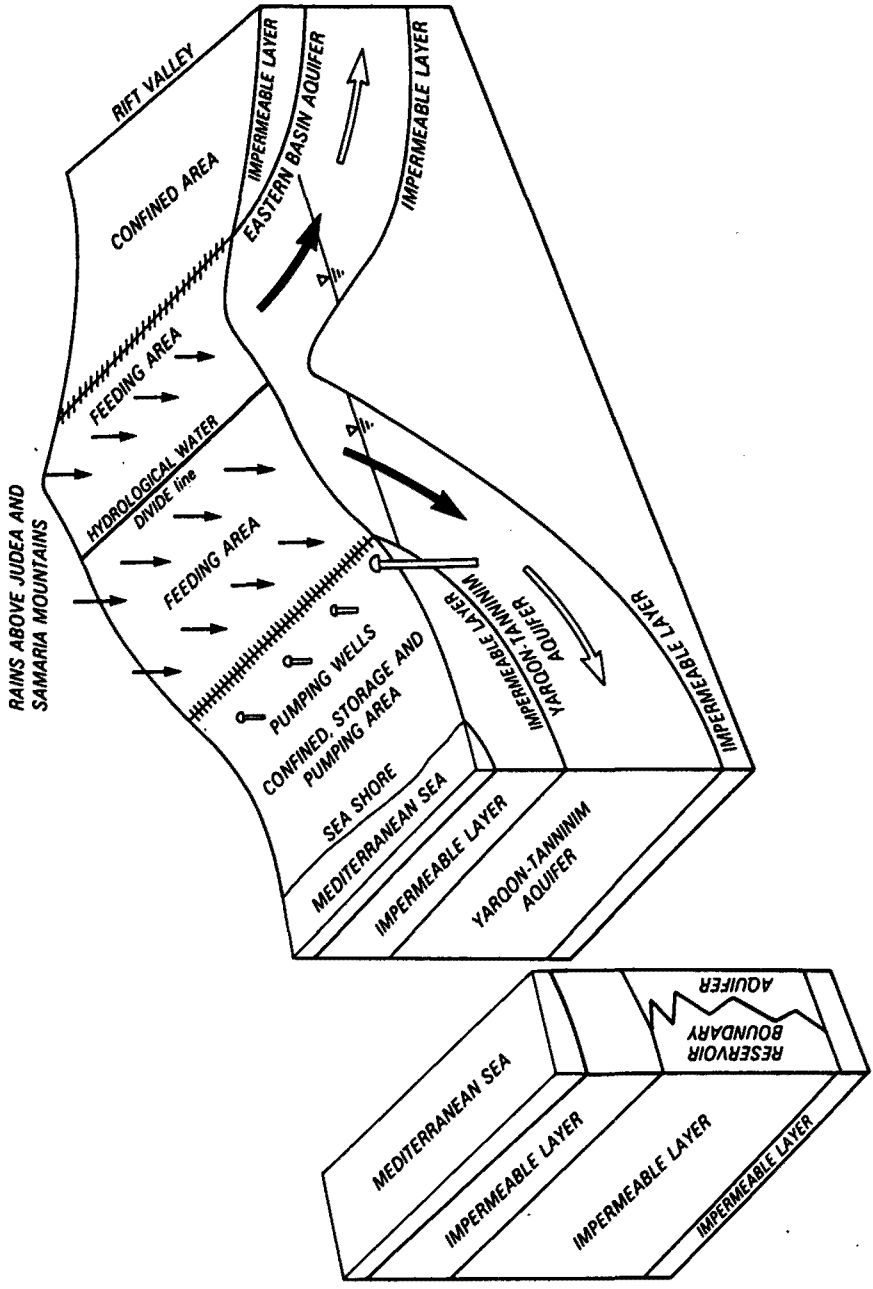

Figure 2: Block diagram of the Mountain Aquifer

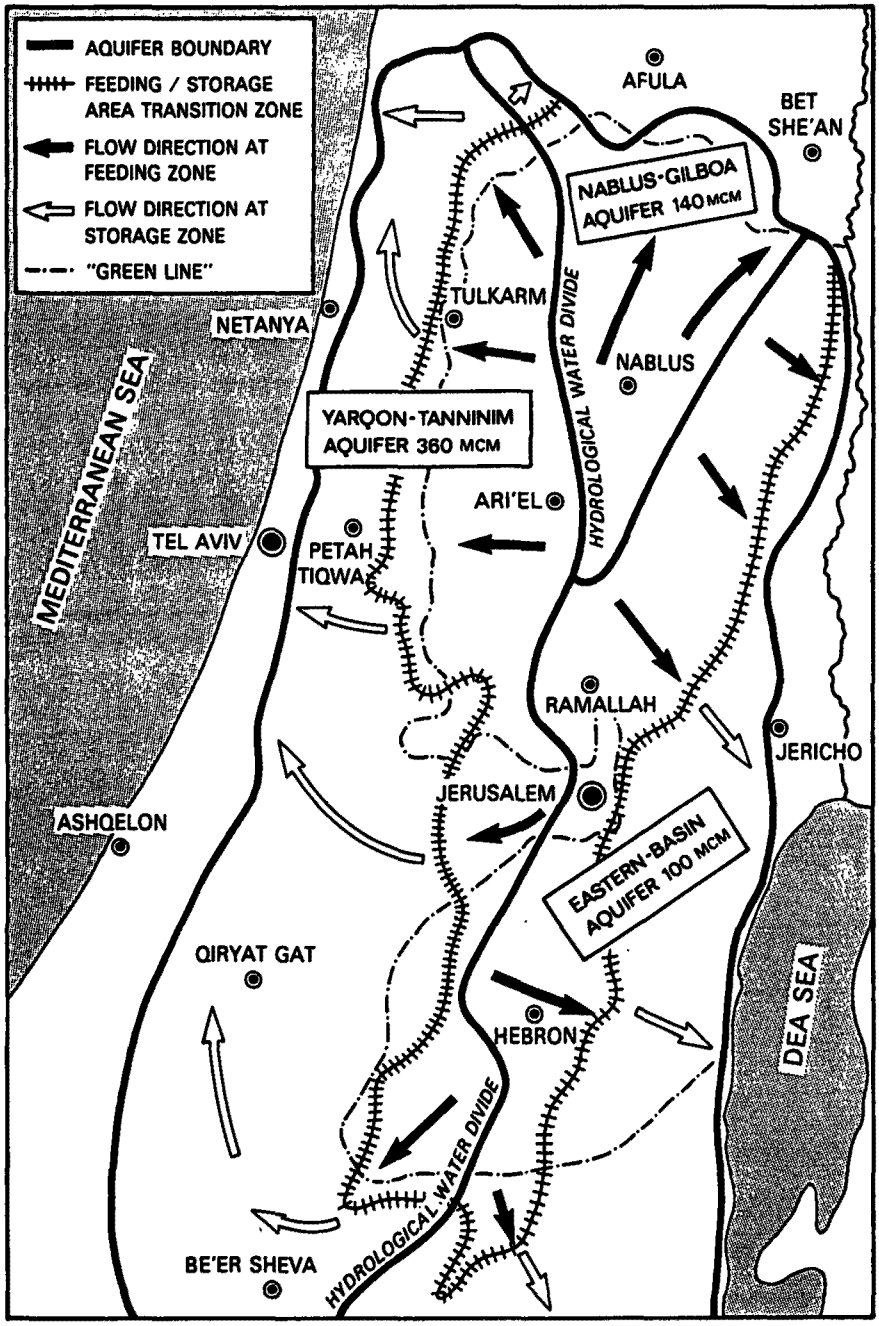

Figure 3: Hydrogeological Map of the Mountain Aquifer

The storage area is the confined portion of the Aquifer. This is the area where the surface rocks are impermeable and serve as a "roof" covering the groundwater reservoir. This storage area is located eastward and westward of the feeding area, beneath the margins of the Judea and Samaria Mountains and beneath the coastal plain. In this area the Aquifer is bounded on top, bottom, and one side with impermeable layers (see Figure 2). The vast majority of wells pumping water from the Mountain Aquifer are located at the storage area, where the pumping rate is stable and pumping is least expensive. The western boundary of the Aquifer (see Figure 3) is located along a line where the groundwater salinity exceeds 600 parts per million chloride, which makes the water unsuitable for use. This western boundary is located beneath the coastal plain, at depths of one-half to one kilometer. The eastern boundary of the Aquifer is located along the structural faults of the Jordan Valley (see Figure 3).

Groundwater Basins When water infiltrates the Aquifer at the feeding area, it flows in all directions following the hydrological gradient. The axes of the main structural anticlines determine the main watersheds dividing the groundwater flow to the west, to the east, and to the north. Accordingly, the aquifer systems related to the Judea and Samaria Mountains can be divided into three major basins.

(1) West. The "Yarqon Tanninim" basin includes the whole west side of the central anticline, west of the main hydrological water divide line (see Figure 3). The feeding area spreads over 1,800 square kilometers, of which 1,400 square kilometers lie to the east, and 400 square kilometers to the west, of the pre-1967 border known as the "green line" (i.e., were previously under Jordanian control). The storage area of the Aquifer spreads over 2,500 square kilometers, almost entirely to the west of the "green line" (i.e., was under pre-and post-1967 Israeli control). This basin supplies 360 MCMY of water.[38]

(2) North. The "Nablus-Gilboa" basin is located in the large syncline of the north-central part of the Samaria Mountains (see Figure 3). Groundwater here flows mainly northward. Both parts of this Aquifer, the feeding area and the storage area, spread over 700 square kilometers, of which 650 square kilometers are located to the south of the "green line." Only 50 square kilometers are located in the area north of the "green line" (i.e., were under Israeli control before the 1967 war). However, most water emerging from springs or wells is located north of the "green line." This basin's total yield is 140 MCMY of water.[39]

38. 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); *see also* Y. Gutman, *Simulation of the Flow and Salinity Regime in the Yarqon-Tanninim-Be'er-Sheva Aquifer Using a Two-Layered Model*, TAHAL (Jan. 1988 in Hebrew).

39. G. Shaliv, *Beth-She'an and East Samaria basins: Updating of the Hydrogeological model*, TAHAL (Jan. 1980, in Hebrew).

(3)East. This basin is composed of several separated groundwater cachement basins. The total feeding area spreads over 2,200 square kilometers. The storage area spreads over 2,000 square kilometers, mostly to the east of the "green line." This basin yields about 100 MCMY of water.[40] A small portion of the feeding area is located to the west of the "green line." This portion includes the city of Jerusalem and surrounding areas. Although Jerusalem is located right on the ridge of the topographical watershed which divides the eastern and western basins, the hydrological watershed is located about ten kilometers to the west of the "green line" (see Figure 3). Thus, water that infiltrates the ground in the area near Jerusalem ends up in the eastern aquifer. It is estimated that the contribution of the area of Jerusalem to the eastern aquifer, from both precipitation and leakages from the city's water network,[41] amounts to about ten MCMY.

As discussed above,[42] according to international law, the examination of an aquifer's natural conditions enables one to identify its international character and the countries that have rights to its water. As the description of the natural properties of the Mountain Aquifer shows, a territorial division along the pre-1967 "green line," being one option for solving the conflict, would render the entire Mountain Aquifer, with its three basins, an international aquifer, to which the law of international water resources would apply.

An aquifer's natural conditions do not have much bearing on the question of the quantities of water to be apportioned.[43] Nevertheless, a contrary view has been presented by some Palestinian writers who argue that apportionment of the water of this Aquifer should follow the Aquifer's natural attributes.[44] According to this view, Israel and the Palestinians should be entitled to the amount of rainwater that falls on the respective feeding areas in the territory of each party.[45] As was mentioned earlier,[46] this claim is not well founded in international

40. Schwarz, *supra* note 35, at 90; Zarour & Isaac, *supra* note 35, at 8.

41. The city of Jerusalem consumes about 50 MCMY, of which 12 percent leaks from the 810-kilometer-long pipelines (6 MCMY) in addition to the rain that falls in Jerusalem and its vicinity. Y. Dinur, *Water for Jerusalem-Yesterday and Today*, 41 Scopus (The Hebrew University Magazine) 18, 24 (1991).

42. *See supra* note 31 and accompanying text.

43. *See supra*, notes 20-30 and accompanying text.

44. They refer to the water of the Mountain Aquifer as belonging to the Palestinians. *See* Zarour & Isaac, *supra* note 35, at 8; J. Dillman, *Water Rights in the Occupied Territories*, J. of Palestine Studies 46, 57 (1989); J. Dellapenna, *Water in the Jordan Valley: The Potential and Limits of Law*, 5 Palestine Yb. of Int'l Law 15, 35 (1989).

45. *See* Zarour & Isaac, *supra* note 35, at 9. Yet the "natural attributes" thesis may be used to develop the opposite claim, namely, that the water should be allocated according to the locations from which the water naturally emerges. The vast majority of the natural springs of the Mountain Aquifer are situated on the Israeli side of the "green line." *See* Baida *supra*, note 38, at 51-57, and Shaliv, *supra* note 39, at 82.

46. *See supra* notes 20-30 and accompanying text.

law. However, for the sake of the argument, two other allocations based solely on natural properties could be suggested.

One such allocation could be based on the ratio between the feeding and storage areas of the Aquifer which would become under Israeli control, and the feeding and storage areas that would become under Palestinian control. Assuming that the "green line" were the border between the two areas, Israel would be entitled to a total of 255 MCMY of water, while the Palestinians would be entitled to 345 MCMY.[47] Alternatively, an allocation of water to Israelis and Palestinians could be based on the different volumes of water contained under each party's territory.[48] Due to the fact that most of the storage area of the larger Yarqon Tanninim basin is located under pre-1967 Israeli borders, Israel would be entitled to 310 MCMY under this calculation, and the Palestinians would be entitled to 290 MCMY.[49] If future borders deviated from the "green line," these methods of calculation would of course yield different results. However, as argued above, claims based on natural properties are neither persuasive as a matter of policy, nor in conformity with international law.[50]

(b) Past, Existing, and Potential Uses

Before pumping started, almost all groundwater of the Mountain Aquifer reached natural outlets, namely springs. The major springs are located at the foot of the hilly regions along the coastal plain, the northern Gilboa slopes, and the Jordan Valley. Above the upper slopes of the mountains, some smaller springs with an unstable flow rate exist as well. Today, the total groundwater potential is slightly greater than the total spring yield, since pumping makes it possible to retrieve water that used to flow to the sea.

The following analysis describes the past and existing uses of the three parts of the Mountain Aquifer. As noted earlier, this analysis is central for the determination of the entitlement to water.[51]

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47. In such a scenario, Israel would control 400 square kilometers of the feeding area and 2,500 square kilometers of the storage area, while the Palestinians would control 1,400 square kilometers of the feeding area (see Figure 3). Thus, from Yarqon Tanninim basin, Israel would be entitled to 68 percent of the water, and the Palestinians to 32 percent. The same calculation, applied to the Nablus-Gilboa basin, yields seven percent to Israel, and 93 percent to the Palestinians. In the Eastern basin, the area of Jerusalem and its vicinity represents about three percent of the Aquifer's entire area.

48. *See* Barberis, *supra* note 2, at 177-178 (in apparent agreement on such a method for allocating water).

49. The depth of the aquifer in the storage area is the full depth of the limestone layer, while its depth in the feeding area becomes shallower as it approaches the hydrological watershed on the mountain ridge (see Figure 2). *See* Gutman, *supra* note 38, *id.*.

50. *See supra* notes 20-30 and accompanying text.

51. *See supra* notes 25-30 and accompanying text. *See also* Helsinki Rules, *supra* note 8, Arts. 5(2) "Relevant factors which are to be considered include . . . (d) the past

(1) The Yarqon Tanninim basin was naturally drained through the Rosh-Ha`ayin springs (220 MCMY) and the Tanninim springs (100 MCMY).[52] Both are located above the storage area, in the coastal plain. Until the end of the last century, these springs were underutilized and the water that did not flow to the sea created swamps.[53] During the first decades of this century, the pioneering Zionist settlers succeeded in overcoming the undrained swamp problems and developed effective means to utilize these sources fully.[54]

When the natural spring flow was replaced by pumping, it became possible to achieve better regulation of water utilization between summer and winter seasons and from wet to dry years. Since the 1950s, the whole potential of this groundwater resource has been utilized.[55]In fact, during certain periods this resource was over used. In the early 1960s, for example, Israel used up to 30 MCMY more than the natural water potential; thus, water was mined and groundwater levels dropped. However, the introduction of a large-scale artificial recharge program, with water introduced through the National Water Carrier from the Sea of Galilee, enabled Israel to replenish the Aquifer.[56]

Before 1967, Israel used 340 of the 360 MCMY available in this basin. The other 20 MCMY were used by Palestinians in the towns of Qalqilya and Tulkarm, through springs and wells.[57] These figures have remained basically unchanged to this day.

The 340 MCMY pumped by Israel enter into the general Israeli "water bank." It is, therefore, both impossible and meaningless to compute exactly how much of this water goes to irrigation, industrial uses, or domestic consumption. It is worthwhile to note, however, that a recent report of the Israeli State Comptroller found that due to the high quality of this water, this basin, which is considered the principal long-term reservoir of the Israeli water system, provides the main source of drinking water for most of Israel's large towns, including the Tel-Aviv area and its suburbs, Jerusalem, and Be`er Sheva.[58] This basin also provides most of the water for the Jewish settlements situated in the Judea

utilization of the waters of the basin, including in particular existing utilization; (e) the economic and social needs of each basin State"; ILC draft articles, *supra* note 9, Art. 6 (1): "Utilization . . . in an equitable and reasonable manner . . . requires taking into account all relevant factors and circumstances, including: (b) the social and economic needs of the watercourse States concerned; . . . (d) existing and potential uses of the watercourse; . . ."

52. *See* Schwarz, *supra* note 35, at 89.

53. *Id.* at 91.

54. *Id.* at 92.

55. S. Mandel & Z. Shiftan, Groundwater Resources, Investigation and Development, 30-34 (1981).

56. *See* Schwarz, *supra* note 35, at 93.

57. Boneh & Baida, *supra* note 5, at 34-47.

58. The Israeli State Comptroller, *Report on the Management of The Water Economy in Israel* 20, 26-27 (1990).

and Samaria Mountains, as well as some of the domestic water needs of Arab towns and villages in the same areas.[59] The 20 MCMY that are drawn directly by the Palestinians in the Qalqilya and Tulkarm region are utilized mainly for irrigation (see Figure 4).[60]

(2) The Nablus-Gilboa basin was naturally drained through the Gilboa and Bet-She'an Valley springs (110 MCMY on average), and the Wadi Farih springs (18 MCMY). In the 1930s, the Zionist settlers in the region began to use the Gilboa and Bet-She'an springs, mainly for irrigation. Later, the springs were replaced by pumping wells.

Israel used about 115 MCMY from this basin before 1967. In the same period, the Wadi Farih springs, the Bardela springs, and some other small springs, which together yielded a total of 25 MCMY, were utilized by Palestinians mainly for irrigation. This allocation has remained unchanged since then.[61]

(3) The Eastern basin is composed of several sub-aquifers. They were naturally drained through the Auja spring (ten MCMY), Samiya spring (five MCMY), Feshkha springs (40 MCMY), Wadi Qilt springs (five MCMY), Jericho spring (13 MCMY), Ein Gedi spring (three MCMY), and numerous other smaller springs.[62] Many additional springs contain high salt concentrations which render them useless.

Before 1967, the fresh water springs, estimated to be about 58 MCMY, were diverted by Palestinian farmers, mainly for irrigation. After 1967, the Israeli authorities developed a new well system on the upper slopes of the Judea and Samaria Mountains to catch groundwater before it reaches the natural outlets and becomes saline. The new pumping system makes it possible to utilize larger amounts of the groundwater of this basin. Today, the basin yields about 100 MCMY. Of the additional amount that is thereby utilized, 35 MCMY is allocated for irrigation by Jewish settlements of about 7,200 hectares (see Figure 4),[63] and the rest is used for domestic consumption in both Jewish settlements and Arab towns and villages in the region.

To summarize the survey of existing uses: of the entire potential of the Mountain Aquifer, Israel (including Jewish settlements in the Area) uses about 495 MCMY, while the Palestinians use about 105 MCMY. For Israel, this Aquifer is the source of about 35 percent of its total annual consumption, which is about 1,400 MCMY of fresh water.[64]

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59. *See* Zarour & Isaac, *supra* note 35, *id.*

60. *See* Schwarz, *supra* note 35, at 94.

61. *Id.* at 89-90; Boneh & Baida, *supra* note 5, at 42-44.

62. Schwarz, *supra* note 35, at 90.

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

64. *Id.* Israel's other resources are mainly the Sea of Galilee and the Coastal Aquifer. *Id.*

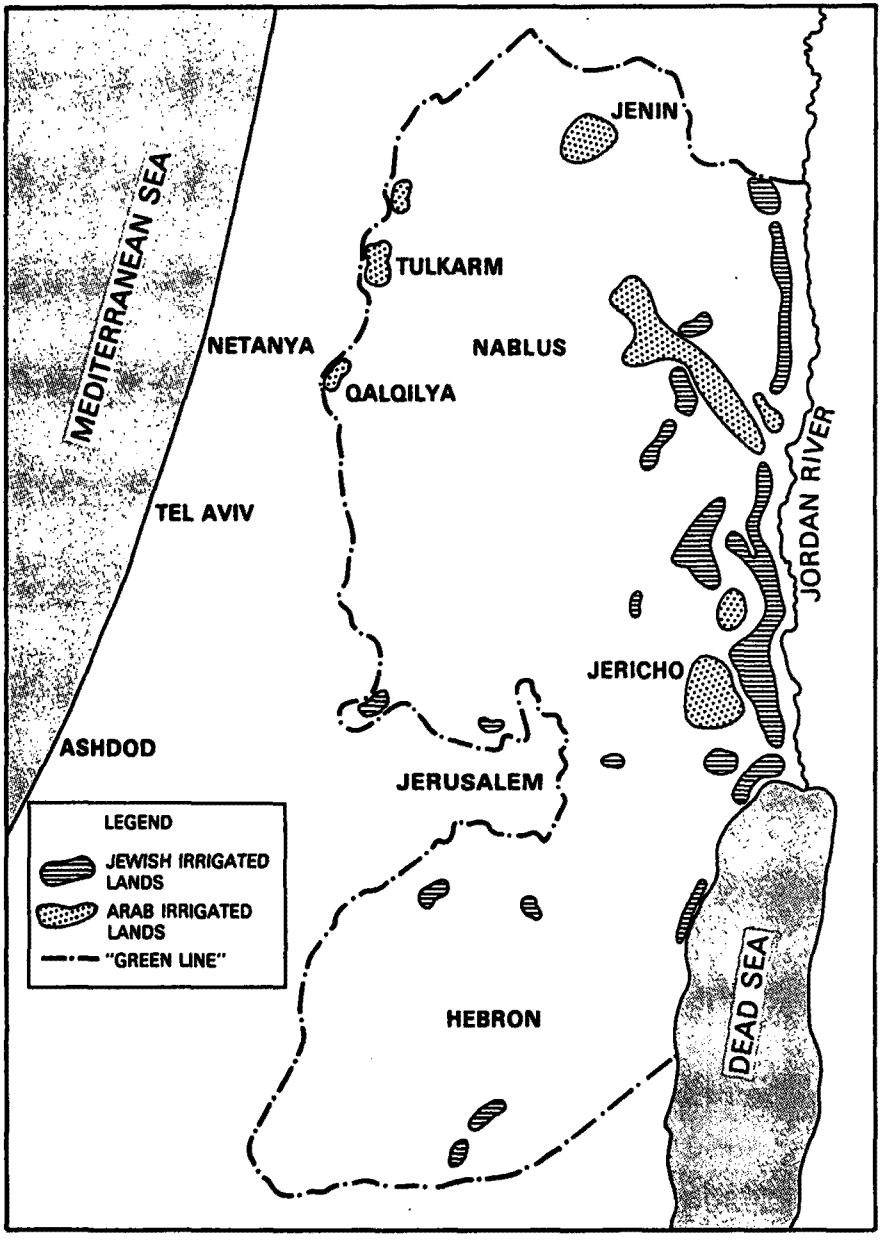

Figure 4: Irrigated Lands in the Area

For the Palestinians in the Area, the Aquifer provides about 90 percent of annual consumption. The rest of the water consumed by Palestinians, about 15 MCMY, comes from other sources.[65] Of the total 120 MCMY are consumed by the Palestinians, 85 MCMY are used to irrigate about 9,500 hectares, about 30 MCMY are used for domestic consumption, and the rest are used for industrial purposes.[66]

As discussed previously,[67] water allocations are usually made on the basis of existing uses. However, adjustments of existing allocations may be required due to changing circumstances and new demands. Ultimately, these new demands may conflict with prior uses, and thus the states sharing the basin must negotiate an agreement to accommodate their conflicting interests. The same is true in the case of the Mountain Aquifer: an analysis of the various factors may lead to allocations which differ from the existing allocations.

The peculiar historical circumstances, i.e., the Jordanian administration of the Area from 1948 to 1967, and since then the Israeli administration, complicate the regular analysis of the relationship between existing and potential uses. The Palestinians might claim that in this case, existing uses merit less deference than otherwise, due to the fact that since 1948, external forces prevented them from asserting their true needs for water. Israel would probably respond to this by noting that the allocations have not changed significantly since the 1950s, aside from the additional amounts used by the Jewish settlements in the Area.

When discussing potential uses, a distinction should be drawn between domestic uses on the one hand, and agricultural and industrial uses on the other. Domestic needs are, of course, the primary concern in water allocation.[68] Regarding domestic use, the basic distributive principle should be equal allocations of water to all users according to their needs. This principle would lead in the future to the allocation of additional quantities to the Palestinians for domestic purposes, since the current Palestinian average per capita consumption is less than one-third of average per capita consumption in Israel.[69]

65. These sources are the Israeli National Water Carrier, local cisterns, and surface water.

66. Based on the estimate for the year 1990 of H. Awartani *in, 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., forthcoming 1993, by Elsevier Science Publishers).

67. *See supra* notes 16-19 and accompanying text.

68. *See, e.g.,* Commentary to the Helsinki Rules, *supra* note 8, at 491-92 ("[I]f a domestic use is indispensable—since it is, in fact, the basis of life—it would not have any difficulty in prevailing on the merits against any other uses in the evaluation of the drainage basin").

69. The average per capita consumption in Israel is around 100 cubic meters per person per year(CMPY). TAHAL, *Master-Plan for the Water Economy-an Interim Report,* 55 (TELEM 47, 1988, in Hebrew). The estimated Palestinian per capita consumption is about 35 CMPY in towns, and 15 CMPY in villages. Zarour & Isaac, *supra* note 35, at 1.

Second to domestic uses are the agricultural and industrial needs. This is a more speculative area, since it is very hard to assess the competing potential agricultural needs. There are many factors, aside from the availability of water and land, that determine the economic viability of agriculture, and hence the potential demands it creates for water. Among these factors are growth of population in the region; use of agrotechnical techniques, including automated machinery, fertilizers, pesticides, and greenhouses; efficiency of possible methods of irrigation; availability of humanpower; and existence of potential markets.[70] For example, by using drip irrigation rather than flooding, it would be possible almost to double the number of irrigated fields in the Area.[71]

(c) Alternatives to Current Uses of the Water Resource

This third set of criteria calls for an assessment of the availability of other means to satisfy the demand for water. Thus it is necessary to look for other water resources in the region,[72] and methods to conserve and use existing resources more efficiently.[73]

The other major water resource in the region, to which both Israel and the Palestinians are riparians, is the Jordan River.[74] This River originates in the Huleh Valley in Israel (the Dan River); the Lebanon Valley in Lebanon (the Hasbani River); and the Golan Heights (the Banias River), which were under Syrian rule until Israel occupied them in 1967. The three tributaries of the Jordan River converge in the Huleh Valley, and from there the River flows in Israeli territory to the Sea of Galilee, also in Israel. The Jordan River, together with the Sea of Galilee, have an annual rechargeable volume of about 600 MCMY. From its southern outlet in the Sea of Galilee, the Jordan River flows in Israeli territory until the River meets its major tributary, the Yarmuk River, with

70. D. Kahan, *Agriculture and Water Resources in the West Bank and Gaza (1967-1987)*, 88 (1987) (listing a number of factors, besides the lack of water, that inhibited the growth of Palestinian irrigated agriculture since the beginning of the occupation period in 1967).

71. The efficiency of the drip irrigation technique is usually 90 percent, whereas flooding, a method widely used by Palestinians in the Area, wastes about 50 percent of the water through leaks or evaporation. Personal communication, Prof. Eli Ravitz, Soil and Water Department, the Hebrew University, Faculty of Agriculture (April 1992).

72. Helsinki Rules, *supra* note 8, Art. 5(h): "the availability of other resources"; ILC draft articles, *supra* note 9, Art. 6(f): the availability of alternatives, of corresponding value, to a particular planned or existing use.

73. Helsinki Rules, *supra* note 8, Art. 5(i): "the avoidance of unnecessary waste in the utilization of waters of the basin"; ILC draft articles, *supra* note 9, Art. 6(e):"conservation, protection, development, and economy of use of the water resources of the watercourse and the costs of measures taken to that effect."

74. On the Jordan River and the efforts to reach an agreement on the allocation of its waters *see, e.g.*, G. Stevens, *"The Jordan River Valley," International Conciliation*, No. 506 (1956); Doherty, *supra* note 24.

an average annual volume of about 400 MCMY. Until it reaches the Jordan River, the Yarmuk serves as a border between Jordan and Syria, and later between Israel and Jordan. From the point where the Jordan River meets the Yarmuk and southward, the Jordan River serves as a natural border between Israel and Jordan, and later between Jordan and the Area. Since the 1960s, Israel has diverted water from the Jordan River system through the National Water Carrier, and Jordan has diverted water from the Yarmuk River via the East Ghor Canal. As a result, the Jordan River south of the Sea of Galilee becomes almost dry at times.

It is significant that among the riparians to the Jordan River, the two countries in the north, Lebanon and Syria, enjoy a stable supply of water for all current and near-future uses.[75] For these two countries, the water of the Jordan River are not as crucial as they are to Israel, Jordan, and the Palestinians.[76] The Helsinki Rules and the ILC draft, which call for the assessment of other resources available to riparian states,[77] therefore suggest that the downstream riparians of the Jordan River should have a claim to the water of the Hasbani and Banias Rivers. This additional amount could then be allocated among the lower riparians according to their potential needs.

Allocation of the water of the Jordan River system has been the subject of major crises between the riparian states, and has even formed the background to limited armed conflicts between Israel and Syria. In an attempt to settle the dispute in 1953, President Eisenhower sent to the region a special envoy, Mr. Eric Johnston, to negotiate an agreement on this subject. After two years of negotiations, Mr. Johnston presented his plan. However, despite early agreements at the technical staffs' level, the Arab League found it impossible to sanction officially an agreement with Israel.[78]

Whether the Johnston plan became legally binding upon some or all of the riparians or not, the allocation of the water of the Jordan River should be re-examined during negotiations for a peaceful settle-

75. Lebanon has other resources, such as the Awali and the Litani Rivers. Syria's major sources of water are the Euphrates and the Orontes Rivers. The Euphrates River originates in Turkey, and thus Syria's supply depends on Turkey's respect for Syria's rights. On these countries' water economies, *see* United Nations Economic and Social Council, Economic and Social Commission for Western Asia, Energy and Natural Resources Division, *Water-Resources Management: Institutional and Legislative Aspects*, (1992) (E/ESCWA/ENR/1992/5); T. Naff & R. Matson, Water in the Middle East: Conflict or Cooperation? 65-80 (Lebanon), 83-100 (Syria) (1984).

76. *See* the description of the water economies of Lebanon and Syria, in Naff & Matson, *supra* note 75, *id.*. The sole motive for the pre-1967 joint Syrian-Lebanese attempts to divert the water of the Hasbani and Banias Rivers was to deny the water to Israel. *Id.* at 43-44.

77. *See supra* note 72.

78. Stevens, *supra* note 74, at 275; Doherty, *supra* note 24, at 29.

ment of the Arab-Israeli conflict in view of contemporary needs and legal guidelines. While it is not the purpose of this article to discuss what currently would be an equitable allocation of the Jordan River's water, it is important to emphasize that under established international rules, it seems that Lebanon and Syria should have to yield to the water needs of their drier neighbors downstream.[79] In view of Lebanon's and Syria's potential water reserves, relinquishment of access to the water of the Jordan River would hardly be of significance to either country.[80]

In view of the fact that Israel and the Palestinians have stakes in both the Mountain Aquifer and the Jordan River system, it would be necessary to link the negotiations over the allocation of the water of the Mountain Aquifer with the multi-party negotiations over the allocation of the water of the Jordan River. In addition, the Israeli-Palestinian negotiations could be affected by an agreement with Lebanon for the diversion of the largely unused water of the Litani River into the Jordan River system, in exchange for electricity produced by a hydroelectric plant which would use the height differences that exist between the Litani and the Hasbani Rivers.[81]

(d) The Dynamic Character of the Allocation Procedure

The discussion thus far has emphasized that existing uses should be the starting point for any discussion of the re-allocation of water. It has also been maintained that the existing allocation may change due to conflicting potential uses on the one hand, and alternative resources or new ways to use water more efficiently on the other. Hence, for example, if increased demand for water in one state can be satisfied by using other resources or more efficient irrigation techniques, the existing allocation could remain unchanged.

The final argument in this context relates to the procedural aspects of water allocation. The apportionment of an international water resource is an ongoing process. The relative demands of the riparian states may change over a period of time. The quantity of available water may also vary with the actual yearly precipitation. Drought, which is not an uncommon feature in this region, or massive pollution, could create the need to reapportion the available water on an *ad hoc* basis. Therefore, following the principle of equitable apportionment, there should be a constant exchange of relevant information and continued negotiations over the exact water allocation each year. Thus, in attempting to settle this allocation issue, the parties should not include

79. *See supra* note 72.

80. *See supra* note 75.

81. For a description of such a plan, *see* H. Ben-Shahar *et al.*, Economic Cooperation and Middle East Peace 104-107 (1989).

exact amounts of water to be apportioned. Rather, they should aim to establish a set of guidelines for apportionment, with a complementary mechanism for the re-evaluation of future supplies and demands. The establishment of mechanisms for the joint management of aquifers would provide an appropriate answer to such a challenge. As explained below, the joint management of an aquifer is crucial for other reasons as well.

JOINT MANAGEMENT OF THE MOUNTAIN AQUIFER

Appropriation of the water of a given aquifer is not the only issue that should be addressed by the riparian states. In underground systems, water flows at a relatively slow rate, as the water must permeate porous rocks. Thus, withdrawal effects may take many years to be transmitted from well to well; without monitoring, it is impossible to verify the amounts of water pumped by the co-riparians. Furthermore, underground reservoirs are sensitive to overpumping and contamination, which may cause irreversible damage. Sometimes it is difficult to determine whether an aquifer has been polluted, or to identify the source of the pollution.[82]

These concerns call for close cooperation between the co-riparians. Among the other issues that must be regulated jointly are the location of wells, monitoring of amounts actually pumped and of water quality, artificial recharge of the aquifer, conservation of the aquifer, and prevention of pollution. The optimal way to achieve such cooperation is through the joint management of aquifers. The establishment of institutions for the joint management of joint water resources is, therefore, essential.

The Mountain Aquifer requires special attention due to the special rock types of the mountains above it. The karstic properties of the limestone rocks that spread over the Judea and Samaria Mountains cause caves and underground canals to form and create shortcuts for pollutants seeping into the Aquifer. Natural impediments, like sorption or filtration, are absent under these conditions. Thus, effective mechanisms for the joint management of the Mountain Aquifer are essential.

Precedents exist in the area of joint management of international aquifers by interstate commissions. For example, since 1973, the United States-Mexican International Boundary and Water Commission (IBWC) has been dealing with issues concerning certain aquifers underlying the common border between the two States.[83] Similarly, since 1977, the

82. Many states have realized the danger of polluting aquifers and have promulgated laws to minimize the risk. *See* Economic Commission for Europe, *Ground-Water Legislation in the ECE Region*, ECE/Water/44 (1986).

83. Minute No. 242 of August 30, 1973, reprinted in 68 AJIL 376 (1974). On the powers of the IJC concerning the aquifers, *see* A. Utton, "International Groundwater Management:

U.S.-Canada International Joint Commission (IJC) has begun to look into issues relating to shared groundwater.[84] Additionally, management of the Lake Geneva Aquifer, which is shared by France and Switzerland, has been entrusted to a joint commission since 1978.[85]

The importance of regional institutions to the optimal utilization of international aquifers has been recognized recently in international instruments. The ILA's 1986 Seoul Rules on international groundwater, for instance, provide that, "[b]asin States should consider the integrated management, including conjunctive use with surface water, of their international groundwater at the request of any one of them."[86] Although there is no evidence yet of the crystallization of a customary norm to this effect, the ILA commentary foresees that more states will understand the importance of regional regimes and will, therefore, enter into joint management agreements.[87] The Charter on Groundwater Management, adopted in 1989 by the ECE, calls upon member states to establish joint commissions to cooperate in the management of joint groundwater resources.[88] A similar emphasis on the necessity of establishing joint commissions is found in the Bellagio Draft Treaty.[89] This draft treaty also specifies the typical assignments that such institutions may be called upon to perform, and suggests modalities for decision-making and a third-party dispute resolution mechanism.

The above analysis demonstrates that any political arrangement creating a separate Palestinian entity should include a procedure for the joint management of the Mountain Aquifer. In designing the suitable institutions, it would be advisable to study the outcome of similar arrangements in other international groundwater basins.

The Case of the U.S.-Mexican Frontier", *in* L. Teclaff & A. Utton eds., The Law of International Groundwaters 157, 159-60 (1981).

84. Caponera & Alheritiere, *supra* note 2, at 613.

85. The unpublished text of the French-Swiss agreement of June 9, 1978 appears in L. Teclaff & A. Utton, *supra* note 83, at 464-77.

86. Seoul Rules, *supra* note 8, Art. 4.

87. *Id.* at 272.

88. ECE Charter, *supra* note 10, Art. 25:

> "International cooperation. (1) Concerted endeavors to strengthen international cooperation for harmonious development, equitable use and joint conservation of ground-water resources, located beneath national boundaries, should be intensified. To this end, existing or new bilateral or multilateral agreements or other legally binding arrangements should be supplemented, if necessary, or concluded in order to place on a firmer basis cooperative efforts among countries for the protection of those ground-water resources which can be affected by neighboring countries through exploitation or pollution. In order to implement such cooperation, joint commissions or other intergovernmental bodies should be established. The work of other international organizations, particularly on data harmonization, should be taken into account."

89. *See* the Bellagio Draft Treaty, *supra* note 10, at 684 (Art. 3).

CONCLUSION

The scarcity of water in the Middle East region makes water allocation one of the central issues to be resolved in the Arab-Israeli conflict in general, and in the Israeli-Palestinian conflict in particular. Issues of control over and apportionment of water resources may fashion the parties' attitudes towards settlement. In fact, some circles in Israeli politics have already begun advocating against any territorial concessions, due to fear that a Palestinian state would control the flow and quality of water upon which Israel so heavily depends. Among the suggestions that have been made, this article examines the ramifications of those options which call for a separate legal entity for the Palestinians of the Area, be it an autonomous territory, an independent state, or a confederation with Jordan.

In analyzing the concept of "equitable apportionment" of shared water resources under international law, it becomes clear that the actual needs of communities that depend on the water should take precedence over the natural properties that exist in the basin. Among these needs, priority usually should be given to past and existing uses, at the expense of potential uses. This article applies these principles to the Mountain Aquifer through an analysis of various factors, and discusses the relevant considerations that may shape the potential uses of this water and possibly modify the existing uses.

There is little doubt that due to the natural characteristics of the most important aquifer in this region, the Mountain Aquifer, close cooperation will be required between Israel and a Palestinian entity, both on the issue of allocation of the available water, and on the issues of conservation and the prevention of pollution. It is equally clear that an effective arrangement can be made only as part of a more general agreement about the utilization of the other major water resource in which both Israel and the Palestinians have stakes—namely, the Jordan River.