



## Confronting water in an Israeli–Palestinian peace agreement

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### SUMMARY

Trans-boundary water agreements are usually conceived as allocation agreements. In other words, water is treated as if it were a pie to be divided among the riparian states. The treatment of water as if it were as immobile as land may be useful in the short term, but it is fundamentally flawed as a means to avoid conflict as well as to ensure efficient, equitable, and sustainable management of water over the long term. This article proposes to avoid quantitative allocations within international water agreements, whether they be presented as percentage or fixed allocations or whether or not accompanied by a periodic revision clause. It proposes instead an ongoing joint management structure that allows for continuous conflict resolution concerning water demands and uses in a manner that effectively de-nationalises water uses. As well, it builds on existing, functioning institutions that are already active over a variety of scalar levels. It disaggregates what is usually perceived as a national water demand into its component institutions and re-aggregates them within an international institutional context. Though this approach for building trans-boundary water agreements can prove useful in any geographical situation, this article uses the Israeli–Palestinian conflict as a model. It proposes to respect the existing differences in the institutional management of water between the two entities and to reach four general objectives: economic efficiency, social and political equity, ecological sustainability, and the ability to implement the agreement in practice. The institutional design and proposed mechanisms follow five key principles for shared management: water allocations that are not fixed but variable over time; equality in rights and responsibilities; priority for demand management over supply management; continuous monitoring of water quality and quantity; and mediation among competing uses of fresh water. This institutional structure balances water quantity and water quality issues and economic and environmental goals in a de-securitised fashion. Though specifically applied to water shared by Israelis and Palestinians, the objectives, principles and institutional structure are relevant to any place in the world where trans-boundary water divides rather than unites two or more peoples.

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“Treaties and institutional arrangements cannot remain static. Factors like water requirements, use patterns and efficiency of management change with time, as do water management paradigms, practices and processes [...]. It may not be an easy task to formulate dynamic treaties, but one that must be considered very seriously in the coming years’ (Varis et al., 2008, p. XI)”.

### Introduction

Of the five issues that were left for final status negotiations by the Oslo agreements, water seemed to many to be the simplest to solve. Ill informed and sensational reporting has sometimes presented water as the key problem, but borders, refugees, the status

of Jerusalem, and that of Israeli settlements in the Occupied Territories appear far more contentious to negotiators and researchers alike. Functionalist theories, which contend that co-operation between states on technical issues will spur collaboration in other domains, remain fashionable when it comes to water. Such theory assumes that water issues can be handled by hydrologists and engineers, who are expected to rise above political manoeuvring as they work for the greater good of ecological and economic sustainability. Indeed, it was specifically because physical scientists understand how the water development of one party is intricately linked to the other that “water resources” could be defined as a “technical” issue for multilateral discussions initiated by the Madrid process. Supporting this perspective, both Wolf and Gleick have demonstrated that, time and again, riparian states collaborate over trans-boundary water bodies rather than fight over them (Wolf, 1998; Gleick, 2000). The UNESCO’s Potential Conflict to Cooperation Potential (PCCP) programme has systematically promoted such analyses since 2001 (Cosgrove, 2003). Local examples lend credence to such a perspective, as exemplified by Jordan and

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Israel, which agreed on water sharing arrangements within Annex 2 of their 1994 Peace Treaty.

As opposed to what might be expected according to a functionalist theory, collaboration over water issues has not had significant spill-over effects in Israeli–Palestinian relations (World Bank, 2009). Little evidence suggests that their admitted co-operation over fresh water has promoted co-operation in other areas. Re-examination of the issue of water is therefore warranted. This article reviews some flaws in current approaches to water and explains how we have formulated an alternative proposal for water management between Israel and the future State of Palestine<sup>1</sup> within a Final Status Agreement (FSA). It contributes to the growing understanding that, in this region as elsewhere, water governance is less a technical issue than a political one (Feitelson, 2002; Blomquist and Ingram, 2003; Molle, 2009).

The work underlying this paper was originally prepared for consideration of the Geneva Initiative, an influential non-governmental effort to promote the Israeli–Palestinian Peace Process. The existing draft version of the FSA, generally called The Geneva Accord, allows for Article 12, “Water,” but only stipulates “still to be completed” (<http://www.informationclearinghouse.info/article5019.htm>; last accessed 16 April 2009). The material that we summarize below was prepared by the two authors under contract to Friends of the Earth Middle East, one of the few remaining Palestinian–Jordanian–Israeli organizations, which had been asked by the Geneva Initiative to undertake preparation of draft Articles on Water and on Environment, and which gave permission to release these summary results. Friends of the Earth Middle East was also asked to prepare a draft Article on Environment; which was undertaken by Alon Tal and Mohammad Said Al Hmaid, but which is not discussed further in this paper. The two bodies of work – on water and on environment – are part of what has grown to be called Track II efforts in the peace process. Whereas Track I negotiations are carried out directly by government representatives, Track II efforts are carried out by a variety of other actors, such as academics and NGOs. Though designed for the Israeli–Palestinian case, this draft agreement is quite general and could be used within other cases of shared water management around the world. The specifics of our proposal do presume prior definition of final borders between the State of Israel and a future State of Palestine, as well as resolution of the status of Israeli settlements and of Palestinian refugees.

In the first section, this article sketches the historical background of water management in Israel and the Occupied Territories. The second section briefly describes the hydro-geology of their water resources, and the following section details which of those water resources should be designated as ‘shared water’ within the context of this proposal. The fourth section identifies four

objectives that any agreement on shared water must satisfy, namely to be economically efficient, socially and politically equitable, ecologically sustainable and also (but often neglected) practically implementable. The fifth section examines five of the principles the proposal puts forward to achieve these objectives, and the sixth section describes the institutional structure proposed to implement an agreement on water. The article concludes with a few considerations on the difficult role of science in political choice. For convenience of writing, wherever the word “Agreement” appears with an upper case A, we are referring to this draft Article on fresh water in a Final Status Agreement; with a lower case a, it is a synonym for this or some other professional report.

### The historical construction of negotiations over water

Water in the land that is now designated as Israel and the West Bank and Gaza Strip did not become the object of international negotiations until the 20th century. When it did, the focus was always on water quantity, and always in terms of dividing an apparently fixed quantity of water. Colonial partitioning of the territory of the Ottoman Empire first divided the Jordan basin when it created the French mandate over Syria and Lebanon in the north and the British mandate over Palestine in the south. The British further partitioned the basin when they separated Transjordan (east of the Jordan River) from the rest of its mandate (west of the Jordan River). Once independent states emerged, they rapidly engaged in negotiations over the surface water resources of their basin. Eric Johnston, the special envoy of US President Eisenhower, literally went from capital to capital in the area during the 1950s, bargaining for quantities of surface water from the Jordan Basin to be attributed to each of Lebanon, Syria, Israel and Jordan, which included the West Bank at the time (Lonergan and Brooks, 1994). The result of his efforts, the Johnston Plan, was never ratified by the riparian states for overtly political reasons. However, the plan and the quantities it allocated each riparian state were respected by all the basin states until the war of 1967 (Lonergan and Brooks, 1994) (Hillel, 1994).

From the end of the 1967 war, Israel occupied the West Bank and Gaza Strip, and proceeded to issue military orders concerning water. Israel never annexed the West Bank or Gaza Strip, so it did not extend Israeli water law to these territories; in contrast, Israel did annex the Golan Heights, so it did apply Israeli water law there. Israel's military control of the territories led it to control water as if it were an Israeli public good. However, Israel never interfered with local forms of Palestinian water management that had developed to distribute the water of springs and wells, apart from attributing a quota to the wells that capped their extraction volume to that which was first measured after the beginning of the occupation (Trottier, 1999, 2007).

This quantitative approach to water in the area was pursued with the Oslo agreements in 1993–1995 and the Jordan–Israel peace treaty. The Oslo agreement detailed quantities of water from each of the West Bank aquifers that would be allocated to Israel and to the Palestinian Authority during the interim period until the FSA was reached. Schedule 10 referred to in Paragraph 20 of Article 40 of the Protocol Concerning Civil Affairs stipulates the quantities listed in Table 1.

**Table 1**  
Quantities of water attributed to each party by the 1995 agreement.

	Israel (MCM)	Palestinian authority (MCM)
Eastern aquifer	40	54 + 78 to be developed
North-eastern aquifer	103	42
Western aquifer	340	22

<sup>1</sup> The reader may be puzzled by the use of different terms: future State of Palestine, West Bank and Gaza Strip, and Occupied Territories to designate what laymen perceive as the same territory. These are three distinct terms that do not designate the same territory. The future state of Palestine has not emerged yet, and its borders are still being negotiated. This term refers to a state that includes a government, a territory that is not yet defined and a specific population. The West Bank and Gaza Strip are geographical terms that designate two precise territories. The West Bank designates the portion of the British Mandate over Palestine that was annexed by Transjordan when it became Jordan. This territory includes East Jerusalem. Israel occupied the West Bank, the Golan Heights, the Sinai and the Gaza Strip in 1967. Jordan relinquished all administrative ties with the West Bank in 1988. The Occupied Territories designate territories that are under Israeli Occupation. The Knesset (the Israeli Parliament) passed a law to annex East Jerusalem in 1967 and another law to annex the Golan Heights in 1981. However, it never passed a law to annex either the Gaza Strip or the West Bank apart from East Jerusalem, and it later withdrew from the Sinai. Consequently, Israel no longer considers East Jerusalem and the Golan Heights as occupied territories while the international community does.

The choice of each term, future State of Palestine, West Bank and Gaza Strip and Occupied Territories has therefore been carefully made each time it is used so that it designates a distinct reality that could be acceptable to both parties in each clause where it appears.

Similarly, the Jordan–Israel Peace Treaty detailed quantities of water to be released by Israel in summer from Tiberias Lake (also called the Sea of Galilee or, in Israel, Kinneret) into the King Abdullah Canal. In exchange, winter flood water from the Yarmuk was diverted into Tiberias Lake. Both the Oslo agreements and the Jordan–Israel peace treaty allocated quantities to a specific party, either a state or the Palestinian Authority, and held this party responsible for the regulation of water management within this allocation. The focus on quantities has led scientists to systematically resort to a “divide and allocate approach” when examining water in the Jordan Basin (Lautze et al., 2005; Lautze and Kirshen, 2009; Phillips et al., 2007a,b, 2009). This article proposes to break with such an approach.

This quantitative approach to sharing water has two serious defects: securitization of the resource and a rigidity that prevents the system from adjusting to natural changes or to socio-economic developments. When a quantity of water “must” be received according to a treaty, nature is being asked to oblige. It often resists. An issue becomes “securitized” when it becomes portrayed as an essential component of national security (Buzan, 1983). It then leaves the realm of what is negotiable, what can be the object of compromise. Discussing that quantity amounts to threatening the identity of the state (Lustick, 1993). Once such allocations have been fixed, changing them is perceived as a threat to national security.

In recent years, a window of opportunity was offered by the rapid increase in Israel’s desalination capacity. This new source of supply may allow it to reconsider the quantities allocated within the Oslo agreements, but Israel’s desalination policy not only raises environmental and economic issues, it also makes the country’s water supply vulnerable to unforeseen increases in energy prices. In other words the securitization of water would remain with desalination in a derived manner as the securitization of the energy sources, and the environmental cost would replace the direct securitization of the water mass itself. Moreover, desalination only produces drinking water, a small share of total water use. It is not contemplated as a source of irrigation water, which constitutes the bulk of the water used. Therefore, additional production of water through desalination can only lead to the negotiation of a slightly different quantitative allocation between the two parties. Even if all the domestic water used by Palestinians and Israelis were produced by desalination, water would remain securitized within the present institutional setting and the present approach to water negotiations. Exploring the relative environmental merits of maintaining current pumping rates or reducing them slightly thanks to a partial reliance on desalination is certainly worthwhile, but it falls outside the scope of this article. Our goal here is to devise an approach that would de-securitize water. Within such an approach, decisions might or might not be made to increase the contribution of desalination.

Quantification also leads to rigidity. First, climate change alters the overall quantities available to the parties. The present evolution of climate in the area suggests that renewable water resources will decrease overall, and that the effects on agriculture will be particularly severe (Freimuth et al., 2007; FAO, 2008). Fixed quantitative allocations that are possible today may very well be impossible in a few years simply by virtue of climate change. Second, demographic evolution and economic development will affect demand for water in unforeseeable ways. Fixed quantitative allocations that seem equitable now may be considered inequitable in a few years by one or the other party. A current proposal to switch from quantitative allocations to percentage allocations of whatever quantities are available could accommodate seasonal and climatic variability. But it could not accommodate different relative economic and demographic developments of the two parties. A percentage distribution deemed equitable today would likely be

considered inequitable a few years later by one of the parties. Third, water is a mobile natural resource, both on the surface and underground. Each water drop is used several times between the moment it falls as precipitation on the West Bank and the time it reaches the sea or some other sink, or evaporates or evapotranspires. As well, the quality of that water changes as it travels, typically becoming increasingly degraded.

Finally, as water moves, it comes to be used within different polities, each with its own structure of power determining the rules of management. It may be used a first time within a Palestinian farmer-operated irrigation system based on a communal property regime before it returns to the aquifer, laden with some pesticide. It may then reappear in a well operated by the Palestinian Authority to supply drinking water to an urban network. Then it may return to the aquifer laden with bacterial contaminants and reappear in an Israeli well operated by Mekorot to supply drinking water to either an Israeli or a Palestinian municipality. Every time, the set of actors determining what will be done to prevent that drop of water from evaporating or from being contaminated is organised differently. These polities are all related, and all of them need to be considered in the elaboration of a Final Status Agreement. This is exactly what both securitization and fixed quantitative allocations prevent. To the contrary, they constrain water as an object of centralised control by the state alone and consign any recognition of decentralised control as a threat to national security.

In summary, water can neither be described nor divided as if it were a pie, which makes it distinctly different from land or other fixed natural resources. It is a key part of our thesis that securitization of water and fixed quantitative allocations of water work against long-term solutions. The entire body of our work is designed to avoid these defects as much as possible in our draft Article on fresh water for the Final Status Agreement.

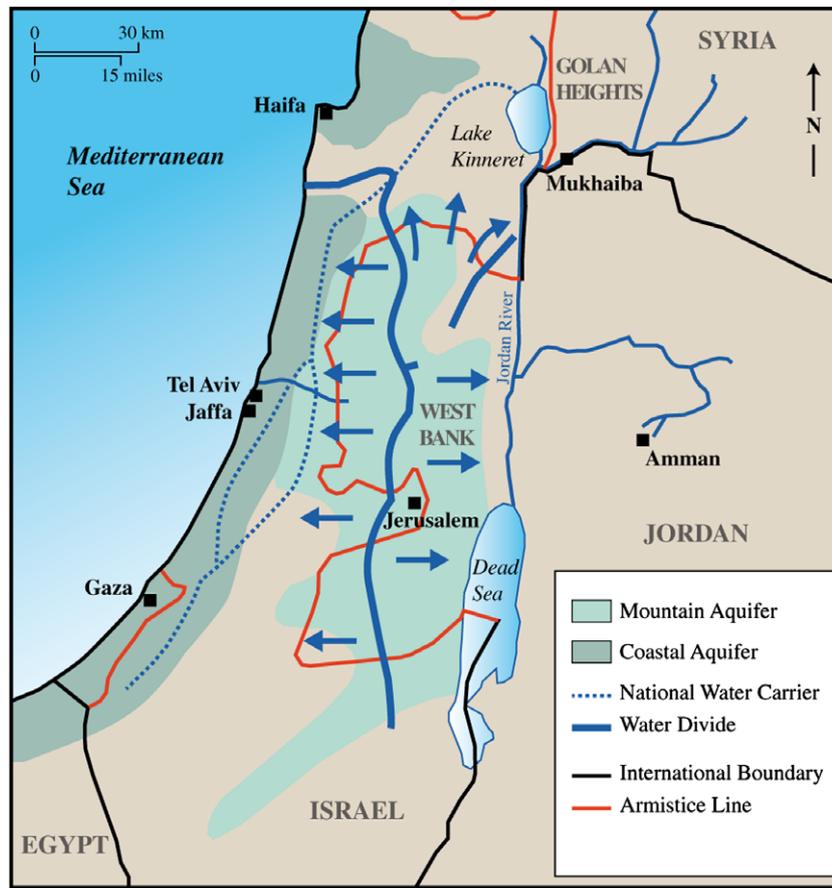
## Geography and hydro-geology

Fig. 1 shows the region occupied by Israel and the Palestinian Authority with the 1949 armistice line, commonly called the Green Line, and the larger surface water bodies and aquifers. Internationally recognized borders should replace armistice lines once a Final Status Agreement has been reached, but, for purposes of this article, we assume that they will be close to this armistice line. Climate ranges from semi-humid in the far north to semi-arid for most of the territory, and to arid in the south (the Negev in Israel and the Gaza Strip in Palestine). The ridge where many of the oldest cities are found separates drainage westward to the Mediterranean from drainage eastward to the rift valley. It also serves as a rain shadow with lower levels of precipitation on the eastern slope compared with those on the western slope.

The water bodies in contention between Palestine and Israel can be divided into three groups: aquifers, coastal rivers, and the Jordan River system. In addition, a large volume of waste water is reclaimed and used mainly for agricultural purposes, and an increasing proportion of Israeli drinking water is supplied by desalination plants. There are 527 springs and up to 326 irrigation wells operated by Palestinians though not all are still in use (Trottier, 1999). The hydro-geology of the region is described elsewhere (Hillel, 1994; Lonergan and Brooks, 1994; Wolf, 1995), but is briefly sketched here to provide context for the proposed Agreement discussed in the remainder of this article.

### Aquifers

Two main aquifer systems underlie Israeli and Palestinian land: the Mountain Aquifer and the Coastal Aquifer.



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Source : adapted from (Lonergan and Brooks, 1994)

Fig. 1. Water bodies and aquifers.

The Mountain Aquifer (also called Yarkon-Tannim Aquifer) underlies the mountainous ridge that separates drainage to the Dead Sea from that to the Mediterranean Sea. It is a karstic system that carries high-quality water with relatively rapid rates of flow from an intake area mainly located on the West Bank. The Mountain Aquifer is divided into three main blocks: an eastern block that lies almost entirely under the West Bank; a northeastern block that originates in the West Bank but with springs in northern Israel that drain to the Jordan Valley; and a western block, by far the largest, that originates in the West Bank with springs in Israel that drain to the Mediterranean. Because it underlies the highlands, much of the Mountain Aquifer can only be exploited by deep drilling.

The Coastal Aquifer is made up of a series of partially disconnected lenses in a sandstone series of rocks that dip gently from the coastal areas of Israel and the Gaza Strip toward the Mediterranean Sea. A relatively shallow aquifer, it has long been tapped to supply local communities and farms along the coastal belt. In recent years it has been subject to pollution from agricultural chemicals and to seawater infiltration as a result of over-pumping. For the most part, those portions of the Coastal Aquifer that underlie Israel are separate from those portions that underlie the Gaza Strip.

#### Coastal rivers

A number of rivers rise in the highlands, mainly in the West Bank, and flow through Israel to the Mediterranean Sea. The Khalil Besor river originates in the West Bank, flows through Israel and then reaches the Mediterranean in the Gaza Strip. Some of these rivers are ephemeral but most are permanent, and have been heavily exploited for local water needs and wastewater disposal. Many

had become little more than open sewers, but in the last few years their value for ecological services, for recreation, and for urban amenities has become more widely acknowledged. Reclamation efforts are underway with significant funding from the Israeli government, and, in general (Maruani and Amit-Cohen, 2008), water quality is improving and species that had been extirpated have begun to return.

#### Jordan river system

The Jordan River originates from three sources, the Dan Springs in Israel contributing about half the flow, the Hasbani in Lebanon, and the Banyas on the Golan Heights, each contributing about one quarter of the flow. The Upper Jordan flows from the conjunction of the three springs in Israel to Tiberias Lake (also called the Sea of Galilee in English and Kinneret in Hebrew) which lies entirely within Israel according to the 1949 armistice line. The Lower Jordan flows from Tiberias Lake to the Dead Sea. Its only major tributary is the Yarmuk River, which flows from highlands to the east and which, for part of its course, forms the border between Jordan and Syria. The Lower Jordan also forms the border between Israel and Jordan to the north of the Dead Sea. The rift valley continues southward to form the rest of the border. It separates the West Bank and Jordan although the 1994 Israeli–Jordanian peace treaty recognizes it as the border between Israel and Jordan. The Jordan is not a large river, but current flow is well below natural flow because so much of the water is withdrawn, mainly for agricultural purposes. Water quality was once good but has deteriorated because of sewage and runoff from agricultural fields.

### Other sources of water

Approximately 70% of Israel's municipal waste water is already captured, treated to secondary and in some cases tertiary levels, and reclaimed for large-scale agriculture. There are plans to expand the system until by 2020 some 20% of total water supply and 50% of total irrigation demand will come from treated waste water (Arlosoroff, 2007). The marginal cost (beyond collection and secondary treatment of urban sewage) is significant but well below the cost of additional fresh water (Brooks, 2007). It might get more expensive. Many scientists believe that waste water should receive even greater degrees of treatment, perhaps even desalination, to avoid long-term effects on water quality and soil structure (Wiel-Shafran, 2005). Very little of Palestine's waste water is reclaimed and treated for reuse, though some waste water originating in the West Bank is treated in Israeli plants.

Desalination plants located along the Mediterranean coast now supply about 200 Mcm of fresh water per year, with at least as much additional expected to become available in 5 years or so. The Ashkelon plant alone produces about 110 Mcm per year, and there are a number of other medium-sized plants. Contracts already let will increase capacity to between 400 and 500 Mcm per year ([www.water-technology.net/Israel/projects/](http://www.water-technology.net/Israel/projects/) accessed 08 December 2009). Using reverse osmosis, costs are generally reported to be between as low as US\$0.53 per cubic metre (at the plant). At present, the plants supply around 20% of the country's potable water needs. Though expensive from both energy and capital cost perspectives, the delivered cost of desalinated water compares favourably with that of other alternatives to provide additional drinking water.

At present, none of the "desal" plants supply Palestinian communities, but, in March 2009, information was released that indicated that Israel was willing to provide a piece of land in the Hadera area on which a desalination plant for the benefit of the Palestinian Authority could be built. Response from the Palestinian Authority has been negative. It is unwilling to purchase water at such a high cost from sources on the Mediterranean Coast until Palestinian water rights are formally established.

### What water is shared and what is not

Any agreement for joint management of shared water must be as clear as possible about exactly which bodies of water are shared and therefore subject to the agreement. This designation of water as "shared" is necessarily a political choice. It describes the water that would be the object of the institutional structure and mechanisms described in this article. Technically speaking, a small part of the water in the area, which is excluded from the category of shared water within this proposal, can actually be perceived as such from a hydrogeological point of view. This is the case, for example, of some of the portions of the coastal aquifer, which are excluded from the category of shared water for the purposes of this proposal.

The geography and the hydro-geology of the region shared by Israelis and Palestinians are such that it is easier to specify what water is not shared. The following provisions indicate what water is not shared and would be subject to the exclusive jurisdiction of either Israel or the future State of Palestine:

- Those portions of the Coastal Aquifer (which, as indicated above, consists of a series of partially disconnected lenses of water-bearing strata) that underlie Israel are Israeli and those portions that underlie the Gaza Strip are Palestinian.
- Water in and under the Negev is exclusively Israeli, except for those wadis that may flow through the Gaza Strip and those subject to joint agreements with Jordan.

- Water that is produced by desalination belongs to the state in which the desalination plant is situated, unless specific provisions are made for an alternative arrangement.
- In general, reclaimed water from a wastewater treatment plant belongs to the state in which the treatment plant is situated. However, if the treatment plant receives waste water from the other state, a separate agreement must be made to allocate the treated waste water as well as associated costs for treatment and delivery.
- Apart from any provision for storing winter flows in the Yarmuk for the benefit of Jordan (or, perhaps in the future, of Syria), all water in Tiberias Lake is Israeli.

This distinction between what constitutes shared water and what doesn't may appear incoherent with the stated objectives. Indeed, it does not allow for the fact that a final border between the states and accompanying arrangements concerning water is still to be finalized. The equity of classifying all water in Tiberias Lake as Israeli is therefore easy to challenge. Moreover, it is in effect treating water as if it were a pie, which is the very approach this article proposes to forgo. The reason for such a classification stems from a double choice:

- to construct a proposal that would capitalise on existing institutions – and institutions include existing agreements with other states – not to recommend to break them but rather to rely on the positive externalities they generate, no matter how imperfect we find them,
- to construct a proposal that could be accepted by both Israel and the future State of Palestine before the conclusion of new agreements with other states.

As this proposal only concerns Israel and the future State of Palestine, it could not include clauses that would involve Syria so it simply respected the present status quo concerning Tiberias Lake. But it is built in a manner that would allow other riparians to join in easily and only grants Israel a limited sovereignty over the water in Tiberias Lake because it specifies that the future State of Palestine is entitled half of the natural flow of the Jordan River. As this proposal can be accepted without a prior modification of the existing Israeli–Jordanian treaty, the treatment of water as a pie to be shared also appears when dealing with the Jordan River.

The preceding distinctions must be subject to a rule of reason. For example, it would be useful to say that an aquifer that is 90% under one side of the border shall be treated as non-shared water. Similarly, special arrangements will have to be made for desalination plants or water treatment plants that are located on or very close to the future border between Israel and Palestine. In addition, for purposes of ease of administration and monitoring, as well as minimization of conflict, it is reasonable to suggest the following two special cases:

- Though not entirely underlying land that is likely to be within Palestine after borders have been established in a Final Status Agreement, the Eastern block of the Mountain Aquifer will be considered Palestinian subject to provisions that certain Israeli communities, nature reserves, and the Dead Sea Works, which currently receive some water from the eastern block, will continue to be supplied.
- All water in and under the Gaza Strip will be treated, for the purposes of this agreement, as non-shared Palestinian water even though this designation may not be strictly true in hydrological terms. The special case made for the Gaza aquifer can be contested on the basis of the evidence of transmission of Eocene

salts between the coastal aquifer underlying Israel and that underlying Gaza. (Vengosh et al., 2005) At the time of writing the proposal requested by Friends of the Earth for the Geneva Initiative, the prevalent perception of the coastal aquifer as a series of disconnected lenses guided us. Extending the general regime proposed here for shared water to the coastal aquifer could therefore be warranted. It would make the proposal more coherent and would not require any more institutions than what is proposed here.

All other water that occurs in or under Israel and Palestine is shared water. In particular, the western and north-eastern blocks of the Mountain Aquifer, are shared water, as are all of the coastal rivers that rise in the highlands and that empty into the Mediterranean Sea.

Rules for sharing the Jordan River are more complicated because of the existing Peace Treaty between Israel and Jordan, which, in its Annex 2 not only divides the water in the river in ways that are inconsistent with the approach we propose in this article but that totally ignores the existence of a future State of Palestine. Our proposal for sharing the water of the Lower Jordan River begins from the acknowledged fact that Jordan is one of the most water-stressed states on earth (Scott et al., 2003; Alkhaddar et al., 2005). This leads us first to the assertion that water explicitly allocated to Israel under Annex 2 is implicitly allocated jointly to Israel and Palestine. Further, in recognition of the needs for Palestinian economic development in Palestine, we also assert that the allocations to Israel should be divided equally with the future State of Palestine.

Finally, the future State of Palestine should be treated as a riparian on the Dead Sea. Both states will have water rights and water responsibilities as described by international conventions. Those rights can most easily be recognized by including the future State of Palestine as a full member of any multilateral negotiations about future use, management or alteration of the Dead Sea.

### Searching for consensus on objectives for a water agreement

In drafting the proposed Article on fresh water for the Geneva Initiative, we put forward four objectives as the initial basis for shared management as it appeared that consensus between the two parties could be reached on those four, viz:

- economically efficient water management,
- socially and politically equitable water management,
- ecologically sustainable water management,
- management that would be implemented in practice.

The first three objectives are now commonly found in much international water law. The fourth is of particular interest to those who will be entrusted with implementation of a Final Status Agreement. None of the terms is fully self-explanatory, nor is any ranking implied by the order in which they are listed.

#### *Economically efficient water management*

Economic efficiency in water management is often presented as a matter of short-term savings, mainly operations and maintenance costs. It should be seen as long-term cost effectiveness, where costs are based on the cost (including capital) of obtaining the next increment of supply (Gleick et al., 2003). Increasingly, disposal costs for the waste water and quantifiable environmental impacts from both supply and disposal are also included as components of cost effectiveness. The appropriate cost will also vary with the end use, which in turn reflects the quality of the

water provided. For potable water, the marginal source of supply is probably desalination (plus pumping), and for irrigation water, additional treatment plants (plus pumping).

In the context of Israeli and Palestinian water use, such an understanding of economic efficiency is incomplete. For example, it does not account for the fact that much development of water infrastructure in both Israeli and Palestinian territory has been heavily subsidized from international sources. This skews costs as perceived by the respective authorities. Bouillon (2004) explored how a new class of actors has emerged, generating wealth from the “peace business,” i.e. the immense amounts of funds channelled to the Occupied Territories by the international community. Keating et al., 2005 and the World Bank (2009) have examined the impact of the channelling of more than \$6 billion to the Palestinians in the West Bank and Gaza Strip by western and other international donors after the signing of the Oslo Agreements in 1993. This phenomenon is not restricted to the Occupied Territories. Jewish organisations such as Keren Kayemet (Jewish National Fund) fund water infrastructure in Israel. This funding of water infrastructure via grants and gifts from external sources makes costs appear lower than they really are, and that leaves the infrastructure projects vulnerable to under-funding of replacement projects in the future.

A further problem with the standard definition of economic efficiency is its failure to take into account uses of the water that fall outside the monetarized economy. The West Bank is home to 527 springs, most of which have been used by local villagers over the centuries, partly for household water, but mostly for local irrigation networks. The construction and maintenance of these systems is labour intensive but does not rely on much capital. Such irrigation networks contribute to food security even when their overall production appears small according to an economic analysis. Their operation reinforces the social capital that produced them and provides an opportunity for use of otherwise unemployed labour.

Finally, current water prices and calculations of economic efficiency do not reflect the unsatisfied demand for irrigation water from Palestinian farmers in the West Bank. Most Palestinian farmers would pay the current price (or even more) for greater quantities of water than they can receive from Palestinian sources. Indeed, the present functioning of water institutions in the region allows Israel to control those sources, notably through the Joint Water Committee (Trottier, 2007).

These shortcomings of the usual definition of economic efficiency within water agreements are the reason why a broader approach to economic efficiency is adopted here.

It accepts that water is valued for many purposes and in many ways, not only as an input for production and for drinking.

#### *Socially and politically equitable water management*

Equitable use stands as a fundamental principle of the UN convention on international freshwater sources (Vinogradov et al., 2002). Equitable use must be distinguished from equal use. It does not mean equal quantities need to be allocated to each party. It does mean that allocations and measures should aim to have an equivalent impact on each party.

In the Israeli–Palestinian context, the principle of equitable use has several consequences. The Palestinian economy is far more dependent on agriculture than is the Israeli, whether measured as the share of gross domestic product originating from agriculture or from the perspective of local livelihoods. The marginal value product of additional water provided to Palestinian farms is therefore significantly greater than for Israeli farms. This difference may decline in the future but will probably remain important for the immediate and mid-term future. Our draft Agreement on water management therefore incorporated measures to reflect the pres-

ent situation as well as to allow for gradual modification to match evolution of the respective economies in the future.

The draft proposal is also innovative in taking into account concerns for political equity in water management. Israeli and Palestinian polities are very different from each other. Israel is a state that is recognized internationally. With passage of its basic water law in 1959, it nationalized all water in the name of the public and it went on to build both physical and institutional infrastructure to implement that form of governance for water. The Palestinian Authority does not yet constitute a state, and it still lacks true independence vis-à-vis Israel in its preparation of legislation. The Palestinians were given only a weak institutional structure as a result of the Oslo Agreements and, complicating things even more, the Palestinian Authority has had to compete with other sources of power in the exercise of social control (Trottier 1999, 2007; World Bank, 2009). It has come to resemble the state-in-society model described by Joel Migdal (2001), short of being a state, of course.

The second objective in the draft Agreement for water is to recognize the difference between the general states of economic development and of political structure in Israel and the future State of Palestine, and to put forward a resolution that respects both.

#### *Ecologically sustainable water management*

An anthropocentric definition of ecological sustainability would consider the capacity of the resource to continue to supply services to human beings and to ecosystems over time, in light of both periodic and secular changes in climate. An ecocentric definition of ecologically sustainable water management cannot exist as water management implies by definition an anthropogenic interference with the environment. However, it can be envisioned as the state of a water body at a stage before human intervention significantly altered the ecosystem.

Ecological sustainability is not a simple concept. More often than not, it is defined by the absence of obvious or measurable unsustainable characteristics, such as declining water tables or flow rates or increasing levels of contaminants. However defined, it is necessarily a social construct that emphasizes some aspects of an ecosystem rather than others. In recent years, the development of criteria of and standards for sustainability has passed from educated trial and error to use of scientific tools that provide indications of what is needed to maintain a water body in a state that satisfies one or another set of human values for ecological “goodness” (Postel and Richter, 2003; Millennium Ecosystem Assessment, 2005). Notably, it is now common for surface water bodies to be managed by a set of objectives that include not just a minimum flow rate but also seasonal changes in flow rate that reflect, as much as possible, natural conditions. It is more difficult to develop parallel criteria for aquifers but, at a minimum, falling water tables and increases in salinity or higher concentrations of trace elements are signs of impending trouble.

At present, Israel has a few physical determinations of ecological sustainability, as with the red lines for the level of Tiberias Lake and a sector for the ecology in its projections of future water demands. However, both are regularly ignored. Some Palestinian scientists recognize the importance of water in their ecology (Schoenfeld, 2005; de Châtel, 2007), but they have had neither the power nor the inclination to establish formal rules for implementation.

Most scientists accept that Israel has been withdrawing water from the West Bank aquifers at rates that are not sustainable (Alatout, 2000; Brooks, 2007; Zeitoun, 2008). But just what is sustainable? Alatout emphasizes “the political grounding of water estimates, an issue seldom considered in literature on water balances in the Middle East” (p. 59). He shows that, even those Israeli

hydrologists who were part of the peace movement maintained a discourse of abundance at a time when it suited the political interests of Zionism and later switched to a discourse of scarcity after independence. As he states (p. 76). “The technical language of water potential cannot but be embedded in political meaning.” This phenomenon is not a peculiarity of the Arab–Israeli conflict. Any production of scientific claims is necessarily embedded in a social and political context. Therefore, the transformation of a scientific claim into a scientific fact does not rely only on the intrinsic value of the scientific claim. It results from a complex process that includes economic and social mechanisms (Latour, 1987). Political mechanisms also play a crucial role (Trottier and Fernandez, 2010).

The importance of the environment has always been put forward within problem formulations that were shaped by competing actors with a political or a business stake in the development of infrastructure (Garb, 2004). There is no single formulation of what is an environmental problem, of its priority, or of its solution. The various stakes the actors had in the formulation of this problem systematically contributed to constructing the priorities and the solutions they articulated. The fact that water has been securitized within this conflict is influencing both Israeli and Palestinian scientists deeply. Their opinion of what is an ecologically sustainable water management is therefore necessarily politically laden.

#### *Practical and implementable water management arrangements*

An agreement concerning water management is both practical and implementable when both parties have the institutional, social and financial means to translate it into practice. Many of the water laws adopted by developing states over the last 20 years do not show these characteristics. They usually define water as public property when, in reality, it is managed according to other, typically communal, property regimes. The Oslo agreements and the ensuing Palestinian water law were no exceptions. They created the Palestinian Water Authority as a regulating body entrusted with implementing the provisions of the agreement concerning water (Trottier, 1999, 2007). However, at that time 70% of the water actually used by Palestinians was managed by local or farmer-based institutions. In effect, and with the support of some Palestinian officials, the Oslo Agreement imposed a carbon copy of Israeli water management institutions onto the Palestinians (World Bank, 2009). Few Palestinians even knew about this component of the Agreement or about the resulting Palestinian water law, and they continued to abide by the existing grassroots institutions they perceived as legitimate. As a consequence, water law promulgated by the Palestinian Water Authority (in English!) never came to match practice in the field (Trottier 1999, 2007).

The fourth objective of the draft Agreement for water takes great care to include mechanisms that are both practical and implementable. The institutional structure is designed to respond to the criteria for legitimacy as seen by Israelis and by Palestinians, even though their respective approaches to water management are almost diametrically opposite.

#### **Crucial principles for management of shared water**

In order to reach the objectives summarized in Section “Searching For Consensus On Objectives For A Water Agreement,” principles must be adopted to guide the design of the institutional structure for joint management of shared water. Many such principles, as with equitable and reasonable use, are common to all forms of trans-boundary water management (see, for example, Rahaman, 2009). We focus here on five supplemental principles that are critically relevant to our proposal for joint management of water shared by Israelis and Palestinians; viz:

- definition of water rights,
- equality in rights and responsibilities,
- priority to demand management,
- acceptance of the historic standing of local forms of management,
- continuous monitoring of quantity and quality in all shared water and mediation of conflicting uses, demands and practices.

#### *Definition of water rights*

In the Israeli–Palestinian context, water rights have been perceived until now as fixed and permanent quantities of water allocated to one side or the other. Such a definition of water rights may serve as a political slogan, but the variability of flows and the interconnection among sources make it problematic. A more appropriate definition of water rights relies on recognition of the mutual interdependence of both parties in sustaining the quality and quantity of all shared water. Water rights are therefore defined as a bundle of rights and responsibilities to manage water according to a set of mechanisms whereby each party has a right or duty to (a) access water, (b) use water, (c) treat water, and (d) release waste water, as well as to set the limits necessary for the access, use, treatment and release, in ways that will maintain the quantity and quality of flow in all shared water sources within limits set by (and perhaps changed by) natural conditions.

Parallel rights and obligations for the citizens and the institutions of the two parties imply that existing patterns and volumes of water use have some standing within the bundle. This principle does not extend so far as to give those patterns and volumes permanent status. However, they can be altered only after due consideration of impacts, and the changes must be implemented gradually to permit time for adjustment.

#### *Equality in rights and responsibilities*

Israelis and Palestinians must have equality in all rights and responsibilities related to the management, development and use of shared water. The Oslo Agreement created the Joint Water Committee (JWC), composed of equal numbers of Israelis and Palestinians, to function on the basis of consensus when making decisions about water. However, its role is truncated. The JWC only makes decisions concerning Palestinian water management and development in the Occupied Territories. It has no role with respect to water management or development carried out by Israel. Clearly, the current institutional design fails to satisfy the principle of equality in rights and responsibilities. In contrast, the set of institutions in our proposal have been designed from the start to accommodate this principle. Just as with the objective of equity, this does not mean that each party can expect to receive an equal volume of water. It does mean that each party will have equal standing within each of the institutions for joint management of shared water bodies.

#### *Priority to demand management*

There is enough water in the region shared by Israelis and Palestinians to satisfy all of their needs and to provide a high quality of life, but far less than enough to satisfy all their desires. Therefore, the main focus of water management must shift from supply to demand. Demand Management is a very broad concept with dimensions of both quantity and quality, as well as timing of use (Brooks 2006; Brooks et al., 2007). In management terms, it means that, when a request is expressed for more water, attention must be paid first to determining whether the proposed use of water can occur without increasing the supply of water. All requests for

funding of new supply must be considered against policy and program options that reduce the need for additional water, that reduce the quality of water required for the end use, or that shift the timing of use to off-peak periods. Moreover, though water use within a state, and pricing of water, are within the sovereign authority of that state, both parties must recognize that efforts to reduce the use of water through demand management are so fundamental to their respective futures that they are appropriate issues for negotiations between them.

The priority given to demand management is of course far different from the supply-management mentality that typically pervades government bodies across the entire region (Brooks and Wolfe, 2007). Whether the focus is drinking water for cities or irrigation water for farms, planners always look first to new supply, even when opportunities abound to reduce water use (Brooks et al., 2007). Nowhere in the entire Middle East is there a government agency tasked primarily with water demand management and given the bureaucratic status and the budget to make its role effective (Brooks and Wolfe, 2007).

#### *Acceptance of the historic standing of local forms of management*

Local forms of water management must receive formal standing. In effect, this principle conveys what are called “soft” or informal water rights. Local, communal forms of water management have been all but extinguished in Israel, but they remain common in Palestine. Despite the evidence that they can operate efficiently and effectively (Trottier, 1999), communal forms of water management are increasingly treated as vestiges of the past that have to give way to centralized institutions managed by the state. The Israeli pattern of top-down centralized management may appear convenient to officials in the Palestinian Water Authority as a replacement for the existing bottom-up pattern. However, evidence, both in the area and elsewhere in the world, shows that such a change usually impairs the goal of practical and implementable water arrangements (Buckles, 1999; Mabry, 1996).

Existing local and communal management institutions, whether formal or informal, should, at a minimum, be given a chance to prove themselves in a new State of Palestine. True, some minimal structure is needed to indicate which institutions do have standing, and which do not, something that can be contentious. Nevertheless, the process can be undertaken in a fairly rapid yet sensitive and transparent way, and it can stop far short of centralization.

#### *Continuous Monitoring of Quantity and Quality in All Shared Water and Mediation among Competing Uses, Demands and Practices*

Continuous monitoring and ongoing mediation processes must constitute the main management tools to ensure that the goals of equity, efficiency and sustainability are achieved. This principle is not just a technical detail; rather, it is the basis on which decisions will be reached concerning adjusting withdrawals from each well or reservoir, or modifying use of water from a spring. It has many implications, including the need for fair treatment of water users who find themselves requested to reduce their rates of extraction. For example, users of a well supplying household water might require immediate replacement with water from a different source. In contrast, users of a well supplying irrigation water might be asked to cut back at certain times of the year or to accept monetary compensation (along with technical advice) for shifting to rain-fed methods. Practices that are not directly linked to water, but affect water availability and quality, must also be considered. For example, urban developments that increase the area covered by impermeable surfaces or farming practices that allow polluted water to flow into aquifers must be challenged as undesirable land-use

changes that require coordination between water management and land management officials.

It is important to emphasize that this principle is not solely continuous monitoring but rather continuous monitoring and mediation. Mediation implies discussions with the groups involved and solutions devised at the lowest possible level according to the principle of subsidiarity. For example, a farmer-managed institution using well water for irrigation would be the most appropriate body to propose a new schedule of extraction in order to minimise the loss of crops while respecting new, lower extraction rates. Ongoing mediation could also allow a similar group to request a halt to neighbouring urban development in order to protect a spring recharge area. Most importantly, the ongoing mediation means that all actors involved can appeal to the proposed Water Mediation Board (see Section “Institutional structure”) whether they are scientists who perceive themselves as the spokespersons for the environment, or the members of the institutions that manage water, whether these institutions are state institutions, private institutions or communal institutions. The Water Mediation Board therefore provides a transparency to the interactions between the scientific claims and the social and political claims. This breaks with the usual approach that places water scientists (or other “experts”) in the role of an enlightened despot concerning water and the environment, effectively relying on the political and social values of the scientists alone in interacting with the scientific claims.

By virtue of the second principle of equality, continuous monitoring and mediation mechanisms will apply equally to both parties. It will also apply to withdrawals from any shared water, whether the system is private, communal, or public. However, mediation mechanisms will be more relevant to the existing Palestinian institutions than to Israeli ones because the latter are so centralized.

**Institutional structure**

The four objectives and five principles described above guided our work in designing an institutional structure for joint Israeli–Palestinian management of shared water. The resulting structure is illustrated in Fig. 2. It divides power over water along several axes:

- between the Israeli and Palestinian governments,
- among several joint Israeli–Palestinian institutions,
- between scientific and political dimensions of management, whether local or national,
- among institutions working over several scalar levels.

This division of power is systematically accompanied by mechanisms for mediation to seek resolution of competing claims. More specifically, it is designed to allow both parties to de-secure water and to treat water as a resource that is the object of competition among many different actors, acting over varying scalar levels, and involved in political, social and economic relations that are not determined solely by nationalist lines. In many ways, the success of the agreement on water will be measured less by the record of how many disputes are peacefully resolved than by the unrecorded number of disputes that are prevented and never come to mediation.

*Bilateral water commission*

The Bilateral Water Commission (BWC) will replace the existing Joint Water Committee, but will have responsibility for all shared water, not only Palestinian water (as is currently the case for the JWC). It will report directly to the Israeli and Palestinian governments with a mandate that is central and critical, but limited. Most importantly, it will have the mandate to:

- Establish limits for withdrawals, standards for treatment and targets for releases of water from aquifers on the basis of the recommendations set by the Senior Science Advisors (see below).
- Grant permits for new drilling projects on the basis of the recommendations set by the Senior Science Advisors.
- Develop extraction rates for contained aquifers, which are inherently non-renewable resources, so that their use is balanced over time against the ability of those using the water to develop alternative sources or to reduce demands for water.

The BWC can reject recommendations it receives from the Senior Scientific Advisors, but it cannot issue an alternative decision on its own. Rather, it must explain its reasons for rejection to the Senior Scientific Advisors and wait for new recommendations. If, after two exchanges, the BWC finds it impossible to reach agreement with the Senior Scientific Advisors, it can refer the matter to the Water Mediation Board (see below), but in no case can it issue its own decisions concerning the scientific soundness of these limits and standards.

Just as for its relationship with the Senior Scientific Advisors, the BWC will have final authority to accept or reject, but not to adjust or modify, decisions from the Water Mediation Board. When rejecting a decision from the Water Mediation Board, the BWC would be requested to explain the reason for its rejection. The

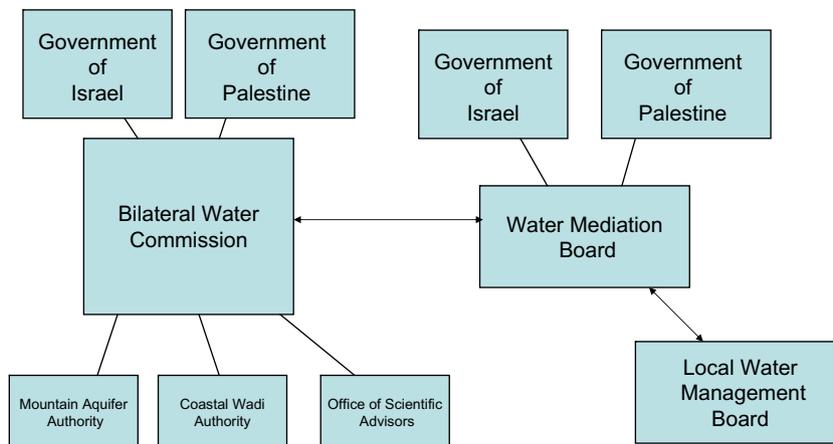


Fig. 2. Institutional structure.

Water Mediation Board would then re-examine its decision in light of this explanation and propose a new decision to the BWC. In short, the responsibility of the Bilateral Water Commission is solely to confirm the above-mentioned limits, permits and standards and to ensure that they are implemented.

Residual competence would generally lie elsewhere than with the BWC except that it would have final authority to accept or reject, but not to adjust or modify, decisions from the Water Mediation Board. Any responsibility that is not specifically detailed in the Agreement belongs to residual competences. An institution that retains residual competence retains all of its responsibilities except for those that are specifically attributed to another institution.

The BWC would be comprised of seven members, three selected by the governments of each Party, plus one member elected by the other six from any state other than the two parties. Decisions of the BWC would be made by majority rule provided that at least two members from the three selected by each Party must be in favour of any decision.

#### *Water Mediation Board*

The Water Mediation Board (WMB) will receive the complaints of any community or institution that argues that it is being negatively affected by either a planned water project, or an ongoing practice within another community or institution – including cases when these practices, such as urban planning, are not directly linked with water management. It will also receive complaints related to inequitable distribution of water or to inadequate water quality. For all of these situations, the main role of the Board will be to approach the parties involved in the complaint in order to hear their respective cases, and then to attempt conciliation.

In cases when either the conciliation process fails or the impact alleged by the entity bringing up the complaint is not proved to be attributable to the entity or entities incriminated, the Water Mediation Board will be responsible for investigating the complaint independently. Its investigations will include economic and other social science analyses to consider the incommensurable losses as well as the commensurable losses that any community or group claims to suffer. Open forums or public hearings may be held, and various dispute resolution options tried. Records shall be kept and published of all public hearings, and all recommendations to and from the Water Mediation Board shall be public.

The final decision of the Water Mediation Board will be implemented in a binding fashion. As necessary, BWC will confer with those ministries or authorities outside the water sector that have competence and authority in such areas as urban planning to determine how best to implement decisions on, for example, land-use or urban development.

The Water Mediation Board will be constituted by two Israeli members and two Palestinian members, each nominated by their respective ministries of justice, and one member elected by the members of the Local Water Management Board (see below).

#### *Office of Scientific Advisors*

The Office of the Scientific Advisors will consist of two “Senior Science Advisors,” one each seconded from appropriate agencies in their respective governments, plus supporting staff. Their office will have the responsibility for reporting to the BWC on relevant issues related to water quality and water quantity and of recommending appropriate abstraction licenses and drilling limitations to the BWC. In addition to the other roles, the two Senior Science Advisors will be expected to have access to and to provide the BWC with commentary on three broad sorts of information: Water quantity data (including mapping), water quality data, and ecological limits on water withdrawals and wastewater disposal. Their

role is not to maintain an independent database but to ensure accessibility of the databases maintained by the two Parties. As requested, they will make reports to the BWC and to other bodies created under this agreement.

The Senior Scientific Advisors will also have responsibility for establishing and then monitoring ecological “red lines” that define the minimum flow volumes and minimum quality standards that are required to maintain the ecological health of watersheds carrying shared water. After official review of red lines and of flow regimes, the BWC can adjust previous determinations for acceptable water withdrawals and release. Where existing quotas for withdrawal already exceed water availability in average rainfall years, or where water quality is impaired by existing quota levels, a schedule for gradual retirement or adjustment of quotas with appropriate compensation shall be negotiated with those holding such quotas. Quotas were introduced on Palestinian wells following the Israeli occupation of the territory. They determined the maximum yearly extraction each well could proceed with. The quota that was imposed on a well corresponded to the metered abstraction of that well over the previous year. It was not determined through modelling of the impact of that abstraction on the aquifer. The novelty of the proposal here is twofold. First, it consists of having quotas that are determined as a function of the uses made and as a function of the impact on the environment, and, second, it applies to both Israeli and Palestinian wells via a joint process. At present, Palestinians have no say in Israeli abstractions. In this proposal, domestic uses are rated as having highest priority and a minimum domestic allocation, corresponding to a ‘human right for water’ is to be guaranteed to every household, whether Israeli or Palestinian (see paragraph 14, especially 14b(ii)). All withdrawal limits and changes of appropriate flow regimes for shared water will be made public by the BWC.

Any community, local water institution, or non-governmental organization may protest excessive or inadequate limitations on water withdrawals or flow regimes to the Water Mediation Board.

#### *Mountain aquifer authority*

Because the Mountain Aquifer is both the most important and the most vulnerable of the shared water bodies, it requires special attention. It is therefore proposed that a Mountain Aquifer Authority be created to represent the BWC for the western and north-eastern blocks of the Mountain Aquifer and to provide advice for the eastern block, which, as indicated in Section “What water is shared and what is not”, is not shared water. The basic goals of the Authority will be to protect the aquifer from excessive withdrawals and from pollution – in effect serving in the role of the BWC for the same key functions, but with particular attention to the integrity of the aquifer. In addition, the Mountain Aquifer Authority will work cooperatively with national agencies in the two governments to limit flows of polluted surface water or of inadequately treated effluents into the aquifer. All of these priorities shall be accomplished prior to secondary priorities for promoting local and national economic development.

Possible designs and structures for a Mountain Aquifer Authority were studied by Israeli, Palestinian, and international scientists over a period of about 6 years with grants from Canada’s International Development Research Centre. Therefore, further discussion here is not needed. The results have been published in several formats (Feitelson and Haddad, 1998, 2000).

#### *Local Water Management Board*

A single Local Water Management Board will identify and register all bodies, families, communities or private entities that manage water resources locally and distribute the water to a

community. The criteria used for this identification will be the existence of “rules-in-use” locally. “Rules-in-use” are the rules according to which a resource is actually managed by a group in specific situations. They often differ from formal rules that have been recognized in writing. They can remain oral, yet be scrupulously obeyed within a community. In effect, the process of registering local water institutions is to give them standing in subsequent interaction with the bodies described just above.

Whenever a complaint is brought to the Water Mediation Board, the Local Water Management Board will, as requested, assist the experts of the Water Mediation Board to identify the institutions responsible for management of the water sources in question, and it will ensure that these institutions are fully consulted within any investigation under the auspices of the Water Mediation Board. It will further ensure that the conclusions and recommendations reached by the Water Mediation Board and BWC are communicated to appropriate local people or bodies. When these conclusions involve a change affecting these institutions, such as a reduction in extraction flow, the Local Water Management Board will negotiate with these institutions to develop a time schedule for implementing changes, and also some form of compensation. Such compensation needs not involve money but rather should preferably aim to develop mechanisms whereby the negative consequences of these changes will be mitigated as much as possible.

The Local Water Management Board will be comprised of four members. Initially, two members of the Board will be selected by the Palestinian Ministry of Local Governments, and two members by the Israeli Ministry of Social Affairs. Within 3 years of its creation, the registered local management bodies will each be given one vote, and their representatives will elect future members of the Local Water Management Board.

## Conclusion

In his response to the World Bank's Assessment of Restrictions on Palestinian Water Sector Development (2009), Dr. Nader Al Khateeb, Palestinian Co-director of Friends of the Earth Middle East, said (2009), “It is time to replace the failed mechanism of the Joint Water Committee, established under Oslo, with an institution where Palestinians and Israelis are true partners in both water supply and management responsibilities.” That is exactly what we have tried to do in this article. The institutional structure that we have proposed for ongoing management of water shared by Israelis and Palestinians is designed to accommodate the very different ways in which water is managed by the Israeli and Palestinian polities while, at the same time, treating them on an equal basis. It also considers every use of water, every release of waste water, every practice affecting water, within the context of their social and economic production and impact, without reducing any of those actions to a competition for water between Israel and the future State of Palestine.

Our approach breaks with the double delegation model that has been so common until now. Within such a model, citizens delegate decision making to elected representatives. When dealing with scientific issues, these elected representatives then delegate decision making to scientific experts (Callon, 2003). What we have done is to design a management structure for sharing water that both allows for a wider arena where non-state actors can interact and make their views known, and also permits the system to react to changes in the natural regime as well as in economic and social development. In contrast, if water were simply allocated as a set quantity to one party, the water scientist or water administrator from that party would consider it his or her responsibility to exercise “enlightened despotism” concerning management of that water.

The institutional structure that we have proposed does not quite match Latour's “new constitution” concerning the politics of nature, which relies on fundamentally liberal hypotheses concerning the positive nature of human beings and of the possibility to solve conflicts through dialogue (Latour, 2004). However, it does integrate many of his observations concerning the political construction of science and technology, as well as to the potential for cultural and structural violence (Galtung, 1969, 1990) that may follow from rigidly fixed and securitized positions. The proposed structure allows us to tackle the fact that hypotheses put forward within radical theories, according to which power structures rather than human nature cause conflicts, seem much more verifiable for water in the Israeli–Palestinian case than do the liberal hypotheses underlying Latour's “constitution”. The case study explored in this article has therefore allowed us to improve the theoretical framework we deployed when we examine and design trans-boundary water agreements. This is the role of a case study in social sciences within a qualitative research approach (Bryman, 1999).

Though our proposal breaks with the dominant approach for water in the Middle East, it will seem less daunting to politicians than to scientists. Politicians are accustomed to compromising power. Scientists, in contrast, tend to see themselves as working above politics, producing neutral, objective results (Trottier and Fernandez, 2010) (Molle, 2009). Even when they work with such concepts as environmental flows, scientists may not recognize that such concepts necessarily constitute compromises. In the absence of human intervention, all water is used by the ecosystem. Determining an environmental flow means adopting a series of values, prioritizing them, and accepting a certain pattern of use rates, timing, and qualities to protect what has been chosen as most important, which is a fundamentally political process.

In conclusion, the objectives, principles and institutions proposed here respond to several problems that have rarely been acknowledged.

First, this proposal leaves in place the contrasting manner by which Israeli and Palestinian societies have tackled water management. Though there is currently some effort to replace the existing decentralized system in Palestine with the centralized system in Israel, we do not expect that effort to be successful, at least not in a time frame relevant to the current peace process. This does not mean that one type of institution is better than the other; each has its advantages and its disadvantages. However, it does mean that the social capital produced by each society in dealing with water management must be reflected in and built upon within one agreement.

Second, this proposal accepts that scientists have a critical role to play in identifying alternative options for water management, but that their role (as scientists) stops short of determining what is best in water management. Political, social, economic and environmental values differ between and within societies, and those differences will lead to different preferences for water management.

Finally, this proposal recognizes the fact that many different and sometimes contradictory values exist, and it offers an institutionalised approach to the continuous negotiation and compromises that need to occur when managing water. It offers, as the quotation at the head of the article urges, a dynamic approach for international agreements on water.

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