
Impediments to the management of shared aquifers: A political economy perspective

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Abstract The reliance on aquifers which are shared by more than one country is increasing. Yet, shared aquifers are only rarely addressed in international treaties, despite the wide recognition of the desirability of comprehensive coordinated management. In order to identify the impediments to reaching agreements on the management of shared aquifers, and the factors that may assist in overcoming these impediments, the political economy of transboundary groundwater exploitation is outlined, and the Israeli-Palestinian case examined. It is argued that the main impediment to the conclusion of international agreements on groundwater is the array of domestic power structures, and particularly the power of small cohesive interest groups. The analysis of the Israeli-Palestinian 1995 interim agreement, and the negotiations leading to it, suggest that this impediment can be overcome, if the domestic interests are recognized in advance, and addressed in the agreement. It also shows that high level politics can play a positive role in forcing water negotiators to conclude an agreement.

Résumé La confiance dans les aquifères partagés par plusieurs pays s'améliore. Cependant, les aquifères partagés sont rarement repris dans les traités internationaux, malgré la reconnaissance du désir d'une gestion coordonnée et compréhensive. En identifiant les entraves aux accords sur la gestion des aquifères partagés, et les facteurs qui permettraient de surmonter ces entraves, les processus importants sont mis en lumière. À cette fin la politique économique de l'exploitation des eaux souterraines transfrontalières est dessinée, et le cas Israélo-Palestinien est examiné. La principale entrave aux accords internationaux sur les eaux souterraines, est l'organisation des structures de pouvoir domestique, et en particulier les petits groupes d'intérêts cohésifs. L'analyse de l'accord israélo-

palestinien intérimaire de 1995, et les négociations ayant conduit à celui-ci, suggèrent que les entraves peuvent être surmontées, si les intérêts domestiques sont reconnus par avance, et inscrits dans l'accord. Il est également montré que les politiques de haut niveau peuvent jouer un rôle positif en forçant les négociateurs de l'eau à conclure à un accord.

Resumen La dependencia en acuíferos que son compartidos por más de un país está incrementando. Sin embargo, los acuíferos compartidos rara vez son tomados en cuenta en tratados internacionales, a pesar de que es ampliamente reconocido el deseo de una gestión coordinada extensiva. Se destacan los procesos importantes al identificar los impedimentos para alcanzar acuerdos en la gestión de acuíferos compartidos y los factores que pueden ayudar en vencer esos impedimentos. Al respecto se delimita la economía política de la explotación de aguas subterráneas transfronterizas y se examina el caso Palestino-Israelí. Se discute que el principal obstáculo para alcanzar acuerdos internacionales en aguas subterráneas es el arreglo de estructuras de poder domésticas, y particularmente el poder de grupos de interés cohesivos pequeños. El análisis del acuerdo provisional Palestino-Israelí de 1995 y las negociaciones que condujeron al mismo sugieren que este obstáculo puede ser vencido si se reconocen por adelantado los intereses domésticos y si se tratan los mismos en el acuerdo. El análisis también muestra que la política de alto nivel puede jugar un rol positivo en forzar a los negociadores a alcanzar un acuerdo.

Key words Transboundary aquifers · Israeli-Palestinian Mountain aquifer · Political economy

Introduction

Numerous aquifers underlie international boundaries. While their exact number is yet unknown¹ it is clear that the reliance on such aquifers is increasing. As surface water is fully utilized in many parts of the world, and market-driven

¹ An indication of the extensiveness of such aquifers is a questionnaire-based UN Economic Commission for Europe (UNECE) inventory of twenty five countries, mostly in Europe, which identified 89 transboundary aquifers (Almassy and Buzas 1999).

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demand for water increases, the extensiveness of aquifer exploitation rises (Shah 2000; Llamas and Martinez-Santos 2005). Consequently, the importance of establishing transboundary regimes to manage such shared (or transboundary) groundwater is growing (Feitelson 2000).

The management of aquifers raises a host of difficult issues, particularly when the aquifers are intensively used, as the exploitation of such aquifers is imbued with multiple externalities (Llamas and Custodio 2003; Puri and El Naser 2003). While the extent of externalities may be limited at the outset of utilization, it tends to increase with population growth and urbanization. Consequently, judicious management implies increasingly more comprehensive management over a wider spatial extent (Howard and Gelo 2003). The difficulties faced in the establishment of comprehensive management regimes are compounded when boundaries transact the overlying area, as measures cannot be implemented over the whole aquifer without a voluntary agreement among the overlying entities. The immediate implication of these observations is that judicious management of shared aquifers requires cooperation between the different parties that overlie them.

The desirability of cooperative management is widely recognized for shared surface water resources, as seen in the large number of transboundary water agreements in the Transboundary Freshwater Dispute Database compiled by Wolf (1999). In the case of groundwater this recognition has been slower to arrive, not least because of the relative invisibility of groundwater and the externalities of exploitation, and the recentness of extensive groundwater exploitation. Indeed, international law regarding shared aquifers has developed only lately, and is seen by experts as still being in an infancy stage (Dellapenna 2001). Essentially, it has developed as an extension of the international law of surface water. Thus, the (yet unratified) 1997 UN International Water Convention (UN ILC 1997) includes only groundwater that has hydraulic connections to surface water, thereby omitting from its purview many confined and fossil aquifers. The convention, as well as previous codes, focuses on allocation principles, and has not advanced cooperation (Benvenisti 1996). Still, the desirability of cooperation in the management of shared aquifers has been recognized by international experts for some time now. Over fifteen years ago a group of leading experts drafted a blueprint for comprehensive management of transboundary aquifers, based on the U.S.-Mexico case—the Bellagio draft treaty (Hayton and Utton 1989). However, in a survey of 62 agreements that mention groundwater in some way (including a well or a spring) Matsumoto (2002) found only nine that touched upon management, of which only four had groundwater as a central focus.

The question this paper asks is: what are the impediments to reaching agreements on the management of shared aquifers, and how can these be overcome? It is tempting to suggest that the impediments are merely lack of awareness (perhaps due to the relative local scale of many externalities), and the complexity of the technical issues that have to be addressed. If this is indeed the case, then we can expect that with increasing recognition of the need for comprehen-

sive transboundary management and with increasing technical ingenuity the impediments to negotiating and signing agreements for joint management of shared aquifers will increasingly be overcome. This paper, however, argues that there are structural impediments that deter governments from negotiating, signing and ratifying agreements on transboundary aquifers, which are grounded in the political economy of groundwater exploitation. It then goes on to examine how these impediments were overcome, at least partially, in the seemingly unlikely Israeli-Palestinian case.

The paper begins by outlining the political economy of aquifer exploitation. Then the implications for transboundary agreements are identified, and the factors that may overcome the impediments that were identified are suggested. These suggestions are then examined in the Israeli-Palestinian context. This context may be particularly illustrative as the competition over the mountain aquifers shared by the two parties is keen, given the extreme water stress and high population growth rate in the region. Yet, despite the highly contentious relations between the parties, a cooperative structure for managing the aquifers has been established and maintained throughout the recent hostilities.

The Political Economy of Transboundary Groundwater Exploitation

Aquifers are classical commons, where many pumpers abstract water from a common depletable source. These pumpers have an incentive to extract all they can as long as the marginal value product of the water is greater or equal to the marginal pumping costs. If the marginal pumping costs do not include the social costs (the externalities imposed by the abstractions) abstractions will increase when the shadow value (the value of water in alternative use) of water rises, regardless of the rate of natural recharge. In semi-arid areas where water is scarce and the shadow value is high, an open-access regime, whereby landowners have unfettered access to groundwater, will lead to falling water tables, and subsequently higher abstraction costs, desiccation of groundwater-dependent ecosystem and greater threats of salinization.² To avoid this very common scenario, it is necessary to regulate abstractions.

When an aquifer underlies a single jurisdiction that jurisdiction may impose regulations³ that will lead to a new equilibrium (Blomquist et al. 2004). However, when an aquifer underlies a boundary it is usually necessary to impose restrictions on both sides of the boundary in order to stabilize the water table at a level that will preclude severe external costs. In such a situation neither party has an incentive to impose restrictions unilaterally, as it is not likely to enjoy the full benefits of these restrictions, while the costs of the restrictions (usually in the form of lost revenue

² See Sophocleous (2003) and Koussis et al. (2003) for examples and specifications of such processes.

³ The term “regulations” includes all forms of government intervention, including levies, taxes, quotas (both tradable and non-tradable) and pumping or drilling restrictions.

from the water use) will be borne fully by it. This is a classic prisoners' dilemma case, whereby both parties will be better off if they cooperate, but have an incentive to defect, and hence if compliance cannot be assured the two parties may well end up in a lose-lose situation. As water authorities are often unable to monitor and control water within their jurisdiction, it is clear that the ability of one country to monitor all extractions from an aquifer in another country is very limited. Hence, it is much more difficult to assure compliance in the case of transboundary groundwater than of surface water, where monitoring flows is relatively straightforward. Therefore, a 'race to the bottom' is more likely in the case of aquifers than for surface water.

Still, as Benvenisti (2002) rightfully notes, many small communities have succeeded in avoiding this prisoners' dilemma by imposing quite sophisticated measures endogenously. Ostrom (1990) who studied extensively the situations under which endogenous resource management regimes evolve found that they tend to work when the number of actors is limited and stable, and when there are multiple repetitive interactions between the parties. As the number of countries sharing a basin is usually limited and stable, it can be expected that countries will also be able to reach an agreement on the sharing of the aquifers.

However, in contrast to the situation at the local level, countries are not unitary players. Putnam (1988) has already argued that international negotiations take place concurrently on two 'tables'. The first table is where the negotiators representing the various countries meet. The second table is the domestic table. Essentially, negotiators have to make sure that the outcome of the international negotiations will be acceptable in the domestic arena. Otherwise the agreement they reach may not be ratified. Thus, the domestic arena determines the 'win sets' available to negotiators – the parameters within which they may negotiate and the constraints on concessions they may make. Therefore, in order to assess the likelihood of an agreement being reached on the management of a shared aquifer, and the readiness of a party to impose and enforce the internal restrictions needed to meet its obligations under the agreement, it is necessary to understand the domestic political economy of aquifer exploitation.

The establishment of a system that constrains and regulates abstraction is largely a function of the ability of professional or government agencies, acting as 'policy entrepreneurs', to exploit 'policy windows' to push through such proposals.⁴ These efforts, however, will be opposed by those that stand to lose from such restrictions, mainly the current pumpers. The number of pumpers is a function of the attributes of the aquifer and available technology (as these determine the cost and ease of abstraction). However, also when the number of pumpers is small, their power to obstruct the implementation of constraints on abstractions may be considerable, as they will act as an interest group. Moreover, even if constraints are established they

⁴ On the importance of such entrepreneurship and of 'policy windows' in setting agendas and implementing policies, as well as for definitions of these terms, see Kingdon (1984).

may be breached, thereby annulling the effectiveness and viability of the agreement. The reason this may happen is that as demand continues to rise, the value of abstractions grows, thereby generating pressures from abstractors to increase the volume and number of abstractions. The ensuing efforts are termed in the economic literature as 'rent seeking', and are considered wasteful from a societal perspective (Mitchell and Munger 1991; Rausser and Zusman 1991). They take place largely in the political arena, where pumpers often prevail.

To understand the particular outcomes of the political game it is necessary to analyze the different parties from a power perspective. The pumpers will apply pressures for additional pumpage. The power of such pumpers, acting as an interest group stems from their limited size and cohesiveness. The smaller and more cohesive an interest group is the lower its internal monitoring costs, thereby reducing free rider problems, and hence the stronger it is, and the greater the likelihood that the outcome will be in its favor.⁵ As the extent of abstraction is of little importance to most of the electorate, organized pumpers who focus on this issue and can monitor decisions regarding it are likely to be highly effective.⁶

The institutions established to assign and monitor groundwater-use rights are likely to be under continuous and escalating pressures to assign additional rights to various existing or potential pumpers. This will be especially acute during drought periods, when the shadow value of water rises, particularly if irrigation is a major use. Thus, the pressures for additional abstractions will rise precisely at the moment when, from a sustainable management perspective, the authorities should limit the pumpage.

Actually, the only group that is likely to oppose the pumpers are water managers, as they seek to minimize the probability of overabstraction, for which they may be criticized or held accountable. The political game that ensues, therefore, is one in which users strain to increase abstractions, mainly by using political leverages, while water managers strive to constrain such abstraction, by using administrative authority and legal means, to the extent to which they are available to them.⁷ The conflict between pumpers and managers is likely to come to a head in drought situations, when both the shadow value of water and the threats to the aquifers rise.

From a decision makers' perspective any cut in allocations is likely to be seen as a certain loss, as pumpers will blame the decision makers for the restrictions imposed on abstractions. Following Kahneman and Tversky's (1979) prospect theory, Bromely (1991) suggests that decision

⁵ For expositions on the reasons that policy outcomes tend to favor interest groups, and particularly small cohesive ones, see Grossman and Helpman (1996), Coate and Morris (1995) or Lohmann (1998).

⁶ See Lohmann (1998) for the theoretical substantiation of this statement.

⁷ The form this struggle will take is a function of the local institutional structure. Yet, the incidence of such struggles is widespread, and may explain perhaps the difficulties that various water management institutions face in managing aquifers in many parts of the world (Shah 2005)

makers prefer a probabilistic loss to a certain loss even when the mean value of the probabilistic loss is greater than the certain loss. Therefore, they prefer to over-pump the aquifer, rather than to cut allocations to well-organized users, in contrast to the advice of water managers. In other words, the extensive abstraction from aquifers above the rate of recharge, especially in drought situations, is politically rational, and therefore should not be seen as an aberration or misconception by decision makers (Feitelson 2005).

The implication of this argumentation in a transboundary context is that any attempt to impose limitations on domestic water abstractions is likely to face a stiff opposition from well entrenched interest groups, mainly composed of existing pumpers.

The position of domestic water managers regarding transboundary aquifers is less clear. On one hand, if additional restrictions on abstractions are imposed, the pressures on them are likely to mount and the degrees of freedom they enjoy in managing the water system constrained. Hence, they may join pumpers in opposing such restrictions, thereby further constraining the possible 'win sets' available to negotiators. On the other hand, externally imposed restrictions may assist water managers in preventing over-abstractions of the aquifer. In other circumstances (perhaps most notably in the Mediterranean) professionals acting within the context of an epistemic community have collaborated transnationally in advancing international agreements, thereby forcing their own governments to accept measures they may not have been willing to implement otherwise (Haas 1990). Noting this form of behavior, Benvenisti (2002) has argued that many international transboundary resource issues should be analyzed in a transnational context, whereby different interest groups and epistemic communities, acting as interest groups, create coalitions across borders in order to advance their domestic agendas. It is thus possible that water managers from different parties will work together to reach an international agreement that will assist them in advancing their domestic agenda, to protect the resource (the aquifer). The position water managers actually take is thus dependent on whether they view the potential outcome of the negotiations as a constraint that will limit their freedom of action, viewing water allocations as a 'zero sum game', or as an asset that will assist them in the domestic power struggle over abstractions.

Once these power and interest relations are understood it seems that the more pertinent question is why and how are such agreements reached and signed, despite the inevitable opposition by existing well-organized pumpers. To address this question we turn to the seemingly unlikely Israeli-Palestinian case.

The Israeli-Palestinian Case: Background

The most important groundwater resource shared by Israelis and Palestinians is the Mountain aquifer. It underlies the central mountain ridge stretching along a north-south axis for about 150 km through Israel and the West Bank. The

groundwater of the Mountain aquifer is contained in the water-bearing calcareous rocks from the Turonian Cenomanian (upper and lower) and Eocene ages. This karstic aquifer is considered highly permeable, non-homogeneous and non-isotropic (Harpaz et al. 2001). The axis of the main anticlines determines the main watersheds, dividing underground flows to the west toward the coastal plain, to the east toward the Jordan valley, and to the north-east toward the Yezre'el and Bethshean valleys. The Mountain aquifer system can be divided thus into three sub-aquifers (Fig. 1). In each sub-basin phreatic conditions exist along the central ridge and immediately below it, while confined conditions develop further downstream (Harpaz et al. 2001).

The Mountain aquifer constitutes a major water resource for both Israel and the Palestinians in the West Bank, both of which suffer from severe water scarcity. Palestinians withdraw approximately 110 million m³, which is about 80% of their annual consumption in the West Bank, while Israel extracts approximately 500 million m³ annually, out of the 1600 million m³ of freshwater it consumes annually, on average. As a result the heavy reliance of both parties on the Mountain aquifer's water, it has been one of the focal points of contention between Israel and the Palestinians throughout the peace process in the 1990s.

In the early 1950s Israel commenced on a widespread drilling program along the foothills of the western basin, subsequently desiccating the natural outlet, the springs at Rosh Ha'ayin. Concurrently it started to develop a national conveyance system to the northern Negev. With the completion of the national water carrier (NWC) in 1964 the western aquifer was integrated within a national water system. Since the occupation of the West Bank in 1967 Israel began conveying water to the West Bank (see Fig. 1), thereby further integrating the north-eastern and western basins into the Israeli water supply system.

The Israeli water system is composed of three main reservoirs, Lake Kinneret (Tiberias), the coastal aquifer and the (western and north-eastern) Mountain aquifer, connected by the NWC. Under the 1959 Water Law all water in Israel has been nationalized and placed under the jurisdiction of a Water Commissioner, who has the sole authority to determine abstractions from all reservoirs, as well as to allocate water to all users.⁸ The Water Commissioner was placed under the Minister of Agriculture, who invariably hailed from the agricultural sector. This extraordinarily centralized system was established under particular political circumstances, when the Mapai party, which adhered to a statist-socialist ideology, was at the zenith of its power (Feitelson 2005).

Despite the extensive introduction of water conservation measures in irrigation, most notably drip irrigation, the demand for water in agriculture continued to rise, albeit slowly (Fig. 2). As domestic consumption rose concurrently, the pressures on the water commissioners mounted, leading them to adopt a de-facto brinkmanship strategy, whereby abstractions exceeded recharge in average years, thereby threatening the aquifer with salinization

⁸ For a description of the Israeli water system see Arlosoroff (2001).

Fig. 1 The Shared Israeli-Arab Water Resources

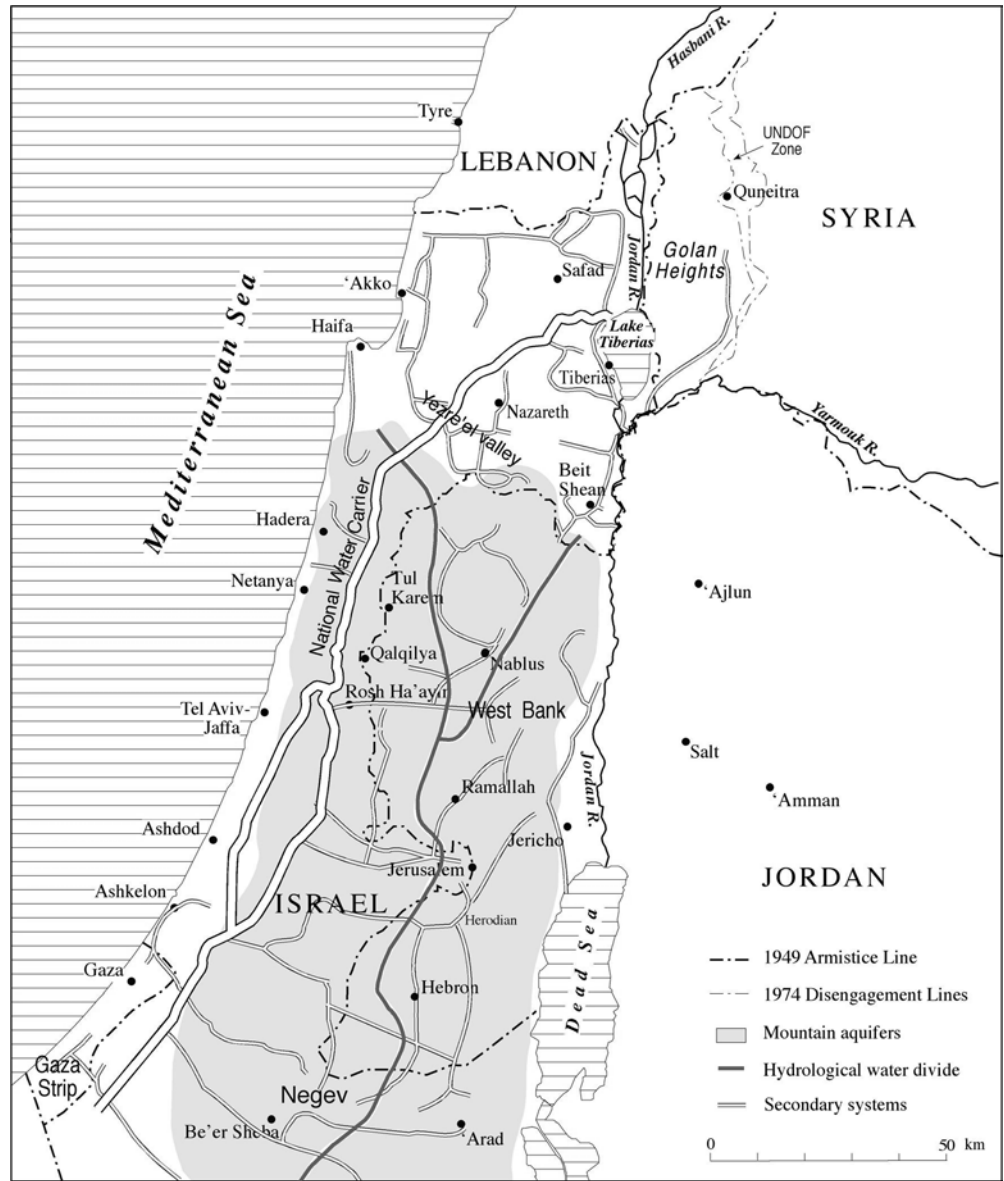
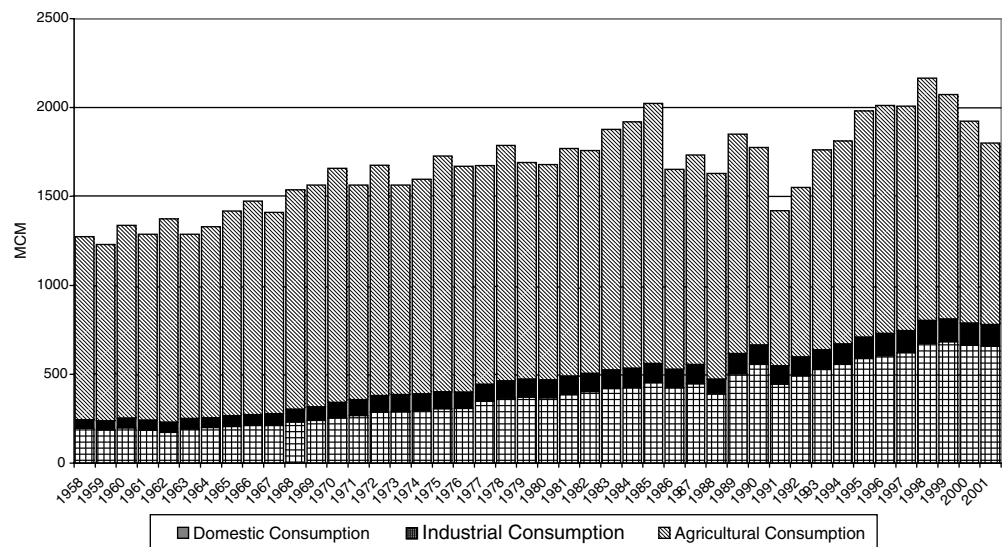


Fig. 2 Fresh Water Use (million m³, or MCM) in Israel 1958–2001



(Gvirtzman 2002). This was rationalized by the argument that overdrafts will be redressed in the occasional years with very high rainfall. This brinkmanship strategy came under severe criticism by the State Comptroller in 1990, when as a result of a drought, water levels dropped and reached the lower 'red lines' designated at the time in both Lake Kinneret and the Mountain Aquifer. Consequently, the Water Commissioner was relieved and a new commissioner appointed, an academic who, for the first time, was not part of the Agricultural establishment.

However, following a record rainfall in 1991–1992 and the replacement of the Water Commissioner after a new government was formed in 1992, previous policies were resumed. This is manifest in the piecemeal increase in freshwater consumption in agriculture in the mid and late 1990s, seen in Fig. 2. In addition, following the massive immigration wave in the early 1990s domestic consumption rose steadily, resulting in an increase in total freshwater consumption during the early 1990s.

Groundwater was only sparsely developed during the Jordanian era in the West Bank (1948–1967). Hence, by 1967 Israel already utilized 340 million m³ from the western basin and 115 million m³ from the northeastern basin, while Palestinians utilized only 20 million m³ from the western basin and 25 million m³ from the northeastern basin. Following the occupation Israel extended its pumpage regulations to the West Bank, by military orders, thereby constraining further drilling by Palestinians. Thus, while Palestinian use grew slightly since 1967 (partially through augmentation from Israel), a wide disparity in per capita availability remained. As Palestinians point out while most of the water of the Mountain aquifer originate in the West Bank, it largely benefits Israel (Isaac and Selby 1996, for example). Thus, from the outset of negotiations Palestinians demanded that they should obtain their water rights (Elmusa 1996; Isaac 2002), while Israel argued that its historic use of the aquifer should not be compromised and that additional water for the Palestinians should be provided from new sources, primarily desalination (Benvenisti and Gvirtzman 1993). This seemingly zero-sum setting was the backdrop to the interim agreement negotiations in 1995. However, before this agreement can be analyzed it is worthwhile understanding the Israeli political economy of its water sector, as the onus of concessions and change from existing practices in these negotiations was primarily on Israel, due to the fact that it was the party in exclusive control over the resource.

The Political Economy of Groundwater Exploitation in Israel

Since the mid-1980s two policies were advanced by professionals in Israel, who were throughout well aware of the rising demand for water, and the strains on the natural reservoirs, particularly the aquifers. The first, advanced by economists from academia and the treasury, called for full cost pricing (Mosenson 1986; Kislev 1991). As a result of their efforts a block rate pricing structure was adopted when a 'policy window' opened following the crises in the late

1980s and 1990. Still, while the new rate structure had a significant impact on demand (Kislev and Vaksin 1997), it did not amount to full cost pricing. The main impediment to implementing full cost pricing was the need to approve pricing in a Knesset sub-committee, the Water Committee, which was dominated by the agricultural lobby, thereby effectively blocking rates increases. An amendment of the law in 1992 that shifted the authority to the Finance Committee of the Knesset did not produce a change, as the agricultural lobby is well represented in the Finance Committee too.

A second policy that was proposed to address the apparent shortage is an increase in supply. There are two major options for such an increase. The first is additional and higher level wastewater treatment and re-use. The second, and more substantial, is seawater desalination. Yet, as these options require significant capital outlays the treasury was able to postpone them. Thus, a policy impasse arose, whereby the treasury prevented the capital outlays necessary for supply enhancement until full cost pricing is implemented, while the agricultural lobby prevented the increase in water rates, as such an increase requires the approval of Knesset committees, where the agricultural interests are disproportionately represented (Feitelson 2005).

As a result of the policy impasse, which lasted throughout the 1980s and 1990s,⁹ the water commissioners were faced with increasing pressures by rent-seeking farmers to allocate more freshwater for agriculture in rainy years, the results of which are seen in Fig. 2 in the increase in freshwater use in agriculture. In the subsequent drought years, with water levels nearing the 'red lines', water commissioners did not have a recourse other than cutting quotas or over pumping. In the 1990 drought the then-acting Water Commissioner tried to avert the certain political loss associated with allocation cut-backs, and opted to take the risk of over-pumping the aquifers, against the advice of water professionals (Dery and Salomon 1997). This disregard of expert advice was one of the major criticisms levied against this Water Commissioner by the State Comptroller in 1990, leading to his dismissal. Still, a similar line was followed in the 1998–2000 drought. However, in this period the dominant discourse shifted, creating a much stronger pro-desalination discourse coalition (Feitelson 2002). The main shift occurred among farmers. While previously they were concerned that desalination will lead to higher water rates, in 1999 when faced with increasing pressures to cut allocations they joined the water managers in calling for desalination, which was approved by government in 2000 (Feitelson 2005).

The Israeli-Palestinian Interim Agreement

The first Israeli-Palestinian agreement in which water issues were explicitly included is the interim agreement (the so-called Oslo B agreement), signed in Taba on September

⁹ This impasse was overcome for wastewater recycling in 1993 when planners and environmentalists were able to incorporate wastewater treatment as a pre-condition for residential development in the national plan for immigration absorption and development, thereby forcing housing interests to finance wastewater recycling.

Table 1 Water Allocations of the Mountain Aquifer According to the Oslo B Agreement (annual averages in million cubic meters (MCM))

| Sub-basin | Replenishment | Water Use prior to Oslo B | | Water Allocations in Oslo B | |
|---------------|---------------|---------------------------|-------------|-----------------------------|-------------|
| | | Israeli | Palestinian | Israeli | Palestinian |
| Western | 350–360 | 320–360 | 20–25 | 340 | 22 |
| North-eastern | 140–150 | 115–120 | 20–45 | 103 | 42 |
| Eastern | 150–180 | 29–40 | 50–60 | 40 | 54+78* |

* 78 million m³ were to be developed from the eastern aquifer

28th 1995. Article 40 of Annex III of this agreement (the article dedicated to water) includes several significant components. The first, appearing in the first clause, is Israel's recognition of Palestinian water rights, though the specification of these rights is left for the permanent status negotiations. The second significant component is Israel's agreement to increase Palestinian consumption by 28.6 million cubic meters (MCM), thereby acknowledging Palestinian immediate needs, as a first installment toward meeting the needs which were defined as 70–80 MCM. Table 1 summarizes water use by the two parties prior to the agreement and the water allocations in the agreement.¹⁰ The third component, which is the most interesting one for the purpose of this paper, is the establishment of a Joint Water Committee (JWC) and Joint Supervision and Enforcement Teams (JSETs). These constitute the base for a coordinated management of the shared aquifers. Finally, the two parties agreed to cooperate on wastewater treatment and protection of the aquifer, while Israel transferred the responsibility over the local water systems to the Palestinians.

The negotiations leading to this agreement were conducted intensively over a four month period. The teams that negotiated the water agreement were composed mostly of water experts. According to participants, from both parties, most of the time was spent on negotiating the water rights article and the specific allocations.

As the water negotiations were conducted as part of a comprehensive agreement, negotiators were constrained by the timing of decisions on other issues. Thus, in the last 48 hours of the negotiations many decisions were reached, without the presence of some of the professionals who were involved in the negotiations prior to this stage, and under pressure from the upper-most echelons to conclude the negotiations. During this time period many of the more important decisions were taken, such as the recognition of Palestinian water rights and the decision to establish the JWC and JSETs.

Interviews with negotiators from both sides indicate that the JWC idea was raised at a relatively late stage in the negotiations, and was not discussed extensively. Moreover, it seems there was no opposition from either side to this idea. This may be partially explained by the fact that negotiators from both sides were well acquainted with an ongoing academic study that discussed and advanced a flexible sequen-

tial joint management proposal.¹¹ Thus, while the JWC is not a joint management structure, but rather a coordination mechanism, the recognition that some cooperation in management is necessary was well accepted by both parties at the time of negotiations.

Discussion: The Political Economy of the Israeli-Palestinian Agreement

In order to understand the reasons that allowed an agreement over the Mountain aquifer to be reached in a relatively short time, despite the fact that both sides suffer from absolute water scarcity, had little confidence in each other and had significant local oppositions to such an agreement, one has to identify the interests of both parties, and the political context of the negotiations. To this end, two facets of the agreement are discussed: the differential re-allocation of water by sub-basin and the formation of the coordination mechanism. Then the reasons which allowed the negotiations to be concluded relatively rapidly are examined.

The western Mountain aquifer is an integral part of the Israeli water supply system. It is a major storage area, in a region where storage capacity is crucial and at a premium. Thus, any change in utilization patterns of the western Mountain aquifer will have a substantial effect on the Israeli water supply system, in both quantitative and quality terms, as it will constrain the operation of the national system. Moreover, at the time of negotiations, in mid-1995, all the alternative options for addressing water scarcity in Israel, whether by supply enhancement through desalination or demand management through pricing, were perceived to be politically infeasible due to the impasse described above. Hence, preservation of maximal flexibility in the operation of the three-basin system (of which the western Mountain aquifer is one) was of primary importance to the Israeli negotiators. This internal constraint on Israeli negotiators pertained less to the north-eastern aquifer and not at all to the eastern Mountain aquifer.

A second constraint on Israeli negotiators was that the agreement should not impinge on existing uses, including agriculture. As the head of the Israeli delegation came from the agricultural sector it is clear that the Israeli team was sensitive to such concerns. From this perspective too the western and north-eastern aquifers were much

¹⁰ As there are differences between sources in estimates of prior use, which were made for different years in the late 1980s and early 1990s, a range is presented in Table 1. Extreme values which are clear outliers relative to all other sources were omitted.

¹¹ At the time of the negotiations only a draft interim report existed. However, several of the Palestinian negotiators were part of the research team, and the Israeli side was also well-informed. For a (later) description of the propositions made at this phase of the study see Feitelson and Haddad (1998).

more sensitive from an Israeli perspective than the eastern aquifer. The reason is that both of these aquifers are the main water sources for substantial agricultural areas within pre-1967 Israel, and hence any reduction in the quantities available from these sources would adversely affect farming interests within Israel.¹² As a result of these two considerations the win-sets available to Israeli negotiators with regard to the western aquifer were much more constrained than those available with regard to the north-eastern aquifer, which in turn were more constrained than those available with regard to the eastern aquifers.

Palestinians, suffering from severe water shortages, were largely concerned with two issues. The first was to augment supplies to the Palestinian population. The second was to obtain a recognition of their water rights and assume control over the water resources of the West Bank. As the most severe shortages at the time were in the southern part of the West Bank (particularly the Hebron area), which can be supplied from wells in the area around Herodion which tap the eastern aquifer, they were less sensitive to the sub-basin from which water will be used.

The combination of Israeli and Palestinian concerns, detailed in Table 2, helps to explain the specifics of the agreement. Israel continued to maintain its prior use of the western Mountain aquifer, and gave up only a marginal amount of water in the north-eastern aquifer. At the same time, it allowed for substantial development of the eastern Mountain aquifer, in which it has lesser interests. The main effects of increased utilization of the eastern aquifer are likely to be felt in the nature reserves along the Dead Sea coast. However, as nature concerns were not represented in the Israeli water decision making structures at the time, it is not surprising that they were not viewed as a constraint in the negotiations. The Palestinians at the same time received a promise for additional supplies in the short term, and recognition of their need for additional water in the permanent agreement, as well as recognition of their rights to water (presumably from the aquifer).

A second component of the agreement that needs to be explained is the readiness of both parties to establish a coordination mechanism that includes both the JWC and the JSETs. Kingdon (1984) argues that new policy ideas are implemented when policy entrepreneurs manage to push through their propositions in propitious moments, when policy windows open. However, the actions of the policy entrepreneurs that advanced the joint management ideas, noted above, are insufficient for explaining why they were accepted as readily as they were.

The major concerns, from an Israeli perspective, were the need to protect the aquifers from pollution and address the sewage treatment problems of the West Bank and to prevent illegal well drilling in the areas that were to be transferred to Palestinian control. These concerns were

¹² While it can be argued that the marginal value product of water for the Israeli economy is not high, the actual loss suffered by specific farmers in the affected areas may be substantial, and hence the expected opposition.

partially fueled by the extent of unregulated pumping that took place in the parts of the Gaza strip from which Israel withdrew in 1994.¹³ Thus, from an Israeli perspective it was imperative that some sort of mechanism be established that will preclude unregulated pumpage and coordinate water resource development. At the same time, Israel did not wish to relinquish sovereignty over the territories within pre-1967 Israel, or to compromise its ability to operate its water system freely. Thus, it sought to coordinate actions in the West Bank and establish a supervision and enforcement mechanism as part of the agreement.

The Palestinians in 1995 were faced with the challenge to establish a new independent agency that will manage water supply and resource utilization in the West Bank once they assume control over parts of it. This was a complex task, not least due to the internal Palestinian water politics (Trottier 1999). Essentially, such an agency (the Palestinian Water Authority – PWA) had to contend both with the challenge of establishing a new organization, and the challenge to establish its authority over the local interests among the Palestinians. According to Trottier (1999) one of the mechanisms used by the Palestinians was to “fabricate the enemy”. While it cannot be proven at present, this insight may assist in understanding the behavior of Palestinian negotiators. Essentially, it can be hypothesized, or speculated, that the Palestinian negotiators had an interest in a situation whereby criticism of their inability to supply all demands can be shifted toward the Israelis, and at the same time use Israeli pressures as an argument in the struggles they expected with the well-entrenched local interests within the Palestinian society.¹⁴ Thus, the interests of negotiators from both parties with regard to the coordination mechanism coincided.

Water negotiations often take a long time. For example the negotiations between the U.S. and Mexico over the Rio-Grande and Colorado rivers took almost forty years to conclude. In contrast, the water negotiations over the West Bank aquifers took only a few months, despite the severe water scarcity in the region and the complexity of the issues involved. The explanation of this seeming paradox lies in the context of the negotiations. In the Israeli-Palestinian case (as in the Israeli-Jordanian case) water issues were negotiated as part of a wider agreement between the parties. Moreover, water was a secondary issue. In contrast, in most transboundary water treaties water was the main issue negotiated. When negotiations pertain only to water the extent of tradeoffs available to negotiators is limited, and thus negotiations are concluded only when they are expanded by changing the scale of negotiations and/or linking them to other issues (Fischhendler and Feitelson 2003). In the Israeli-Palestinian case negotiators on the water issues worked within strict time constraints determined by the negotiations at the higher (or more senior) level. In this case,

¹³ Based on Palestinian sources Trottier (1999 p. 172) reports that some 1500 illegal wells were dug in the Gaza strip in 1995 alone following the Israeli withdrawal.

¹⁴ See Trottier (1999) for an account of these interests and the difficulties faced by the PWA.

Table 2 The Parties, Interests and the Interim Agreement

| Party/ Interest Group | Internal Interest | External Interest | Agreement |
|-------------------------------|---|--|---|
| Israel | | | |
| Water managers | Maximal flexibility in W aquifer; desalination; demand management | Minimal constraints mainly in W basin; minimal water transfers; protect aquifers – sewage treatment and effective control of pumpage | No reduction of extraction from W aquifer; JWC coordinates only; Caps Palestinian water needs; JSETs |
| Farmers | Maximal freshwater allocations; Desalination; Low rates | Minimize transfers mainly from W and NE basins; | Trivial reduction in existing use, none from W basin |
| Treasury | Reduce subsidies; Increase water rates | Minimal financial obligations | Limited financial obligations on Israel for supply enhancements |
| Environmental bodies | Water for nature; Water quality at source and in taps | Reduce pumpage; Sewage treatment; Aquifer protection | Greater stress on aquifers; Vague on sewage; JSETs |
| Urban consumers | Reliable supply; Quality at the tap | Limited and gradual transfer of water; pollution prevention | Limited and gradual transfer of water; pollution hardly addressed |
| Palestinians | | | |
| National water managers (PWA) | Establish control over water supply and obtain legitimacy; Establish enforcement mechanisms | Share in decision making over aquifer; Recognition of rights; Obtain financial assistance; Increase available supply; | JWC allows some share in decision making; JSETs for enforcement; Water rights recognized; Limited increase in water supply; |
| Consumers (urban and rural) | Reliable supply; Low rates | Increase in water availability; better supply systems; Foreign assistance | Some additional water; Limited direct assistance |

JWC = Joint Water Committee

JSETs = Joint Supervision and Enforcement Teams

therefore, negotiators did not have a real option of breaking off the negotiations, as neither party would allow the water issue to scuttle the comprehensive agreement that was being negotiated. It is important to note the inverse case is true too. That is, when negotiations at the higher level fail, as they did in Camp David in July 2000, then a water agreement will not be signed, even if all the major water issues were actually resolved.

Moreover, as the water agreements were ratified as part of the ratification of the whole agreement, the power of particular interest groups was diminished. That is, specific interest groups that may be adversely affected by the water agreements could not single out these issues and separate them from the higher politics of the Israeli-Palestinian conflict, and thus could not muster an effective lobby to change a particular clause in the water article of the agreement during the ratification process.

In recent years, since the agreement was signed, there has been substantial criticism of it. Some observers criticized it for being a tool for continued Israeli domination of the West Bank water (Selby 2003), while others have criticized it for being non-optimal in terms of water use patterns. This also seems to be the opinion of many professionals (Kliot and Shmueli 1999). However, international agreements are the art of the possible, not an exercise in optimal management. The analysis herein shows that the Israeli-Palestinian interim water agreement met the most important underlying interests of the negotiators from both parties. It allowed the Palestinians to get additional water for domestic consumption, without being forced to tackle the well entrenched local institutions, and it allowed the Israelis to maintain their previous water use and the water management system largely intact.

Conclusions

Aquifer management is most commonly discussed as a technical-hydrological issue. The implicit assumption behind such discussions is that if an optimal management regime can be identified it will indeed be implemented. The main impediments to optimal groundwater use are thus implicitly assumed to be the lack of knowledge, and/or lack of institutional capacity.

Yet, as Feitelson (2005) has shown for the Israeli case aquifers may be mismanaged also when capacities are high, and the need, means and knowledge are available, as a result of internal power structures. This is particularly true when aquifers underlie boundaries, as international relations are anarchical and thus there is no mechanism that can force the parties to accept a transboundary management regime, which may require them to constrain water extraction from groundwater within their territory.

The main impediment to the signing of agreements on transboundary aquifers, as many other transboundary issues, is the array of domestic power structures. This array may prove to be a particularly high hurdle in the case of transboundary aquifers, as such aquifers are largely invis-

ible, and the transboundary inter-relations difficult to perceive. Thus the number of parties that are cognizant of these issues is especially small. Hence, those parties may prove to be particularly effective interest groups, which may scuttle domestically any agreement that impinges upon their interests. The interesting question, therefore, is under which circumstances are any agreements on shared aquifers reached at all?

The analysis of the seemingly unlikely Israeli-Palestinian case provides some insights that may help answer this question. It shows that an agreement may be reached if the underlying interests of the negotiators from both parties are recognized and addressed, and that these interests are structured by the domestic political economy of water. Thus, in preparations for negotiations, and in analyses of agreements over a shared aquifer, the domestic interests of the parties have to be assessed. Ultimately, the interests of negotiators and domestic actors will determine the outcome of negotiations - and not notions of efficiency, justice or optimality that have been the focus of many studies of transboundary water agreements.

A second important lesson from the Israeli-Palestinian case is that high level politics may play not only a detrimental role, by precluding the resolution of outstanding water issues, but also a positive role. In cases where the water issues are subsumed in a more comprehensive set of negotiations, the timetable and desire to resolve the larger (high level political) questions may force the water negotiators to reach an agreement in a relatively short while. The likelihood that this will be the case also requires a deep understanding of the domestic political economy scene. Thus, it seems that the domestic political economy of water is the key to understanding what the impediments to the management of shared groundwater are, and what is the likelihood and possible options for overcoming these impediments.

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