

## **Disputed Waters: Use of the Mountain Aquifer**

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In the post-Annapolis era and in the intermittent talks between Israel and the Palestinians, much is heard about discussion of the core issues – borders, security, Jerusalem, and refugees. On the other hand, little is heard about the subject of water, and it seems that the issue has long fallen into oblivion. However, following several dry years in succession, and when Israel's and the Palestinians' water reserves are shrinking to crisis proportions, it is important to direct the spotlight to a less security-political oriented issue, the division of water from the Mountain Aquifer, a water source shared by Israel and the Palestinians. Now is an appropriate time to examine how significant this issue will be when it is raised in the talks, and what can be done at this stage to achieve a future agreement.

### **The Dispute**

Since Israel withdrew from Gaza in 2005 and thereafter stopped using the groundwater in the Gaza Strip, the dispute between Israel and the Palestinians over water has focused on the only water reservoir actually shared by the sides – the Mountain Aquifer basin.<sup>1</sup> The aquifer, the highest quality underground reservoir in Israel and the Palestinian Authority, filled principally by rainwater, stretches from the foothills of Mount Carmel to the Beersheba Valley, and from the crest of the Judean and Samarian Hills to the Mediterranean Sea. The aquifer flows in three directions: in the north – to the hills of Gilboa, the Jezreel Valley and Beit She'an; in the west – to the Yarkon springs and the Taninim springs; and in the east – to the Jordan River and the Dead Sea. Most of the water from the aquifer is obtained via drilling and pumping, and a small amount by using spring water. Israel uses an estimated 70-75 percent of the year's water from the aquifer yield, about 430-460 million cubic meters (mcm). This quantity comprises around 30 percent of Israel's annual consumption of "natural water" (in contrast with "restored water" that has been purified).<sup>2</sup> The Palestinians consume an estimated 25-30 percent of the aquifer water, around 160-170 mcm. This quantity comprises 100 percent of natural

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water consumption in the West Bank and 55 percent of annual natural water consumption in the whole of the Palestinian Authority. Following the Oslo Accords a joint committee was established to coordinate and administer shared water issues, but the committee stopped functioning in 2000.

The dispute between Israel and the Palestinians relates to the amount of water from the aquifer to which each side is entitled. The Palestinians claim that the manner in which the water is divided between the sides is unjust and they should have a far larger share of the aquifer water, at the expense of the water that Israel pumps in its territory. They argue that the vast majority if not all of the aquifer water legally belongs to them, as most of the aquifer (80-90 percent) fills up from rainwater that falls in the West Bank. They also claim that the limits Israel has placed on drilling and pumping water in the West Bank since 1967 have impinged on the ability of the local population to provide for its basic water requirements, a situation, they claim, that contravenes international law.<sup>3</sup>

For its part, Israel claims that the water it draws from the aquifer is legally its own, as it mainly uses water that naturally emerges in its territory (the aquifer's flow to the west and north) and that it used this water even before it conquered the West Bank in 1967. The limits placed on the Palestinians after the war, it claims, were designed to avoid further over-pumping of water from the aquifer, to avoid damaging the quality of the water.

Previous treaties between the sides as well as international water law do not unequivocally determine how to divide the aquifer water between Israel and the Palestinians. Thus, the last agreement signed, the "interim agreement" of 1995, determined that "the future needs of the Palestinians on the West Bank are estimated at (an additional) 70-80 mcm." At the same time, the topic remained open: "Israel recognizes the Palestinians' water rights on the West Bank, [which] will be discussed in permanent status negotiations."<sup>4</sup> Similarly, international water law contains only general principles relating to the manner in which shared water reserves are to be apportioned, while the clear preference is for the matter to be settled through negotiations between the sides based on fair division and consideration of the parties' interests and needs.<sup>5</sup> Presumably the future division of the aquifer water will therefore also be based on the two sides' current water-related needs and viable alternatives, and not only on previous

nebulous agreements and vague international legalities. Hence the need to analyze the water requirements of Israel and the Palestinians as well as the alternatives available to them, to better understand the nature and possible timing of the expected settlement on division of the aquifer water.

### **The Respective Needs**

A comprehensive analysis of the natural water sources of Israel and the Palestinians in light of their respective current and future needs indicates that without a comprehensive solution that provides a considerable increase in the volume of water available, Israel will be hard pressed to forego a substantial part of the Mountain Aquifer water. The severe condition of the water reserves on both sides demands that large alternative sources of water be found before the sides can reach an agreement over a significantly different apportionment of the aquifer water.

The severe condition of the Israeli and Palestinian water reserves is a result of several factors. First, the water reservoirs are unable to satisfy overall consumption. Israel and the Palestinians (including the water Israel gives to Jordan in accordance with the peace treaty) together consume around 2,000 mcm of natural water a year: Israel uses about 1,680 mcm and the Palestinians about 320 mcm.<sup>6</sup> On the other hand, in an average year the refilling by rainwater of all the sources of water of Israel and the Palestinians together – the Sea of Galilee basin, and the various underground basins in the north, the mountain, the coast, Negev, and Gaza – is estimated to total just 1,850-1,900 mcm, 100-150 mcm less than the consumption level. In other words, even in a year of average rainfall the supply of water in the natural basins does not match the actual level of consumption, and thus the level of water in the reservoirs is steadily dropping. Moreover, the supply of natural water is expected to continue dropping in the coming years. Due to massive construction in the center of Israel and the filling of land areas that previously allowed rainwater to filter to the coastal underground reservoir, the water supply will be overtaxed further by about 70-150 mcm of water each year by the year 2020.

Furthermore, the water policy, as has been the case for several decades, is based on a tight squeeze approach, with no breathing space in case of a number of dry years in succession. In such scenarios, the sides have to contend with the water shortage in ways

that damage natural resources – by over-pumping, which affects the quality of the water in the reservoirs – and damage the consumers, by imposing restrictions on the domestic and agricultural sectors. This means that the volume of water available in the reservoirs (even before the level drops and barring several successive years of drought) does not provide a solution for the current level of water consumption.

Second, the water reservoirs are not able to meet the current level of demand for water. Not only does the available level of water not provide a solution for the current actual consumption, but these figures do not reflect the actual demand for water, which is far greater. There is an "unspoken" demand, particularly on the Palestinian side, which is not reflected in the calculation of the actual level of consumption. The discrepancy is a result of two factors:

- The average consumption of water in urban areas of the West Bank is about 60.5 liters per person a day, and in Gaza it is about 88.<sup>7</sup> This is a far lower level than the recommended minimum per capita consumption level. According to the World Health Organization, a person requires a minimum of 100 liters of water a day to maintain the barest level of existence – drinking, washing, sanitation, cleaning public areas, and so on (some experts put the minimum level at 275 liters a day). In comparison, the average per capita consumption a day in Israel is just over 300 liters.
- In many Palestinian towns there is a water shortage during the summer months, and in many villages there is no running water at all most of the year. A total of about 215,000 people in the West Bank are not even connected to an established water grid and as a result are forced to collect rainwater by various means and to buy water at inflated prices from commercial dealers.

In other words, the amount of available water from reservoirs does not provide a solution for the full demand of the Palestinians, both because it does not provide a minimum solution for the population's basic needs and because of the number of people who are not connected to the water supply system.

Third, the water reserves fall below the future demand for water, which is expected to continue rising, particularly because of the population growth and improvement in the standard of living. In 1986, total water consumption in Israel in the

domestic sector (as opposed to agricultural and industrial consumption) was 423 mcm. Twenty years later, in 2005, domestic consumption had risen to 715 mcm, and this pattern of growth is continuing. According to forecasts by the Israeli water commission, in 2015 domestic water consumption in Israel will reach 916 mcm and, if we take into consideration the expected added demand of 25 mcm for irrigating the countryside, Israel will need an additional 225 mcm by 2015.<sup>8</sup> As for the Palestinian situation, according to a United Nations report based on research by the head of the Palestinian water authority, if we consider the size of the Palestinian population today, its expected growth, the anticipated rise in the standard of living, and the increase in agricultural areas in the West Bank, total Palestinian consumption is expected to increase by 370 mcm by 2015.<sup>9</sup>

According to these forecasts, therefore, by 2015 total demand for water of both sides is expected to increase by about 600 mcm a year. The existing water reserves cannot provide a solution for this sharp rise in demand for water.

Fourth, over-pumping in the various water basins over decades and particularly in drought years has led to a drastic drop in water levels, damage to the quality of the water, and exhaustion of possible reserves. The winter of 2007-8 was the fourth successive dry winter in the region, and the basins of the Sea of Galilee, the mountain, and the Western Galilee received only 50-60 percent of the annual yearly precipitation. The situation has deteriorated so badly that all the water reservoirs are close to their red line, the threshold after which further pumping damages the quality of the water to an extent that it is unfit for human consumption. The level of the Sea of Galilee is currently about three meters lower than the level of four years ago and, according to the director general of the Water Authority, by July 2008 pumping is expected to bring the level of water down below the lower red line and cause it ecological damage. In December the level is expected to reach “the black line,” the level from which it is technically impossible to pump water out of the Sea of Galilee. The levels of the aquifers are also very low, and are about 1.5-2 meters lower than they were as recently as last year. According to the head of the Water Authority, the Mountain Aquifer is “in an unprecedented deficit.”<sup>10</sup> The drastic drop in the levels in all the basins means that the water sources of Israel and the Palestinians are in an enormous “hydrological overdraft” of about 1.5-2 billion cu.m of water (this

volume would be sufficient for the domestic consumption of both sides for around two years) and the quality of their water continues to deteriorate.

The Gaza aquifer too is in a dire situation. The average natural filling of the aquifer is about 45-90 mcm a year, but the residents of Gaza pump out about 145 mcm a year. This over-pumping damages the aquifer, as it gradually reduces the level and allows saline seawater to penetrate and contaminate the water. According to tests that were carried out, only 7 percent of the domestic water in Gaza is of good quality.

Increasing the volume of available water must therefore be achieved by an alternative, reliable, and abundant source that will not only satisfy current and future demand for water but will also in the long term help rehabilitate the severe hydrological condition of the reservoirs, i.e., about 600-800 mcm a year. Hence, until additional sources of water are found, Israel will presumably find it hard to forego any substantial portion of the water it consumes from the Mountain Aquifer. A significant change in the way the aquifer water is apportioned that suits Israel's water interests and also provides for Palestinian needs can only happen gradually and as part of a total solution for the severe water shortage of both sides.

### **Scope of the Solution**

There are many ways to conserve water and thereby increase the available amount, but they cannot, either individually or collectively, provide a suitable and comprehensive solution to the problem.<sup>11</sup>

- Purifying contaminated reservoirs and wells in Israel can yield water savings of 100-150 mcm a year.
- Cutting water usage in the domestic sector in Israel can yield water savings of about 80-120 mcm a year.<sup>12</sup>
- Savings in gardening irrigation systems in Israel can generate savings of about 50 mcm a year.
- Increased usage of treated waste water in the agricultural sector in Israel can generate savings of up to 90 mcm<sup>13</sup> a year.<sup>14</sup> Water savings can also be made in the Palestinian agricultural sector, as the Palestinians purify only a negligible amount of sewage water and nearly all of it is not reused.

Thus even if Israel and the Palestinians, both at the official and civilians levels, take all the aforementioned steps, which is highly unlikely given the immense difficulty in implementing them, the total savings will reach about 240-410 mcm of water a year – much less than demanded by the deficit. Consequently, a comprehensive solution for the water shortage between the Mediterranean and the Jordan has to involve finding alternative sources of water in quantities that will provide a suitable and long term solution to the problem. Two such potential alternatives are desalination of seawater and imported water. Apparently the Israeli government is already pursuing both tracks.

Many countries rely on desalination to provide part of their drinking water needs,<sup>15</sup> and Israeli industries are leaders in the construction of desalination plants around the world. For many years, primarily due to financial considerations, Israel did not desalinate seawater in large quantities.<sup>16</sup> However, as the water crisis worsens it appears that the Israeli government has understood that desalination is an available and reliable solution. In the last few years Israel has built two desalination plants, in Ashkelon and at Palmahim, and another plant in Hadera is currently under construction. By 2009 about 240 mcm of seawater will be desalinated a year in Israel, accounting for around 18 percent of total yearly consumption of fresh water in Israel. In early July 2007 the government also approved an increase in the supply of desalinated water in Israel to 505 mcm a year by 2013 (about 38 percent of annual fresh water consumption), by constructing additional desalination plants (at Soreq and Ashdod) and increasing the output of the existing plants.

Regarding imports, there has recently been significant progress in advancing the “infrastructure corridor” project between the Turkish port of Ceyhan and the port of Haifa (the Med Stream project), covering a distance of about 460 km across the Mediterranean Sea. The project includes examining the possibility of laying pipes between the two countries in the Mediterranean to pipe also 400-1,000 mcm of fresh water a year from Turkey to Israel.<sup>17</sup> The estimated cost of the project is \$2-4.5 billion, depending on the number of pipes laid and the amount to be supplied. The project will take an estimated three years, and the current date of completion is 2012-13.

If these projects materialize, Israel will gain an additional 500-900 mcm of water a year and will presumably extricate itself from its current crisis. Israel will be able to

satisfy the increasing demand for water, even during droughts, and it will be able to rehabilitate its natural water reservoirs. Israel will also be able to gradually reduce its dependence on the Mountain Aquifer water and be more flexible in its talks with the Palestinians over dividing up the water.

However, importing water from Turkey will make Israel at least in part dependent on a foreign party for its essential water resources.<sup>18</sup> Moreover, assuming it is in Israel's interest to maintain the greatest amount of aquifer water in the permanent settlement,<sup>19</sup> the more Israel's needs are provided by "outside" sources, such as desalination and imports, the more the Palestinians will demand use of the only natural source of water they have in the West Bank – the Mountain Aquifer. This demand will naturally come at the expense of water Israel uses. In other words, finding a solution for Israel's water problem by finding alternative sources of water will apparently put Israel in an inferior position in future negotiations over division of the aquifer water.<sup>20</sup>

### **Conclusion**

The Israeli and Palestinian water reserves are already in a critical situation. There is not enough water to satisfy existing demand – not to mention future demand – and water reservoirs are at a nadir. The sides' water deficit is expected to reach 600-800 mcm a year by 2015. As such, it does not currently seem reasonable that Israel will agree to cede a significant quantity of Mountain Aquifer water in talks with the Palestinians. However, implementation of various water savings programs, together with realization of government plans to import 400-1,000 mcm of water a year from Turkey by 2013, and/or by that year desalinating annually around 500 mcm of water, is expected to fundamentally change this reality. Israel will be able to display greater flexibility in negotiations with the Palestinians over division of the Mountain Aquifer water and reach an agreement regarding this issue.

As part of the agreements that will be achieved between the sides, it is possible that Israel will be forced to forego some (possibly even a significant part) of the water it currently uses from the Mountain Aquifer.<sup>21</sup> Therefore, Israel must prepare for this scenario in two ways. First, in order to make the process of concession of part of the aquifer water to the Palestinians more efficient when signing a permanent settlement,

Israel should start now gradually reducing its dependence on the aquifer water. Reorganization and foresight regarding Israel's water sources, their transport, and supply will generate savings and increase efficiency when Israel is forced to ultimately concede part of the aquifer water.

Second, in order to preserve as much as possible of the aquifer water in the permanent settlement (assuming a decision is made that this is in Israel's interests), Israel must demand that the Palestinians and the interested international community increase the Palestinian water supply as soon as possible, but not from the aquifer at the expense of the Israeli consumption. For example, the Palestinians can repair the water supply infrastructures in the Authority that are in disrepair, as they cause the loss of large quantities of water; treat water for industrial and agricultural use; and develop alternative sources of water supply such as a desalination plant on the Gaza coast. The Palestinians declared in the interim agreement that they recognize the need to develop additional water sources for their use. The time has arrived to ask them, with the support of the international community, to translate this declaration into action.

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<sup>1</sup> The Palestinians are also demanding possession of part of the water from the Jordan River, but as they currently have no access to the Jordan River and its sources, most of their claim relates to the Mountain Aquifer, their only actual water source in the West Bank.

<sup>2</sup> The water is used for drinking water in the Dan region, Jerusalem, and other population centers, as well as for irrigation of extensive agricultural areas, particularly in the Jezreel Valley and Beit She'an.

<sup>3</sup> Israel in principle has accepted the underpinnings of the international water law, according to which every country that shares a water reservoir has the right to ensure that the minimum conditions it needs to survive are met.

<sup>4</sup> The interim treaty, appendix III, addendum I, clause 40, sub-clauses 1 and 6.

<sup>5</sup> International law's general criteria for dividing shared water reserves are historic rights, the amount of water that flows upstream and downstream, alternative sources of water, and the minimum amount of water required for the survival of the population on each side. However, water treaties signed in the twentieth century were based on formulas that calculate the needs of the different populations, and not on other criteria like sovereignty or historical rights.

<sup>6</sup> This figure does not include private collection of rainwater in the Palestinian Authority.

<sup>7</sup> The figures were calculated after deducting the quantity of water lost due to the poor state of the Palestinian Authority's water infrastructures.

<sup>8</sup> Water consumption in industry and agriculture is not expected to rise much, if at all.

<sup>9</sup> The Israeli water expert Haim Gwertzman likewise forecasts that Palestinian domestic consumption will increase by 260 mcm between 2000 and 2020.

<sup>10</sup> Shahrar Ilan, "Concern: From December it will No Longer be Possible to Pump Water from the Sea of Galilee," *Haaretz*, March 19, 2008.

<sup>11</sup> Other ideas raised but not discussed here because it is not clear how much water can be conserved by implementing them or because it is very difficult to implement them include separation between the urban drainage and sewage networks in a way that will allow individual handling of runoff rainwater and having it drain into the aquifer; a water solution as part of a general arrangement with "water rich" countries such as Syria and Lebanon; a reduction of evaporation from top reservoirs; and the "Red Sea-Dead Sea canal" idea.

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<sup>12</sup> Water can also be conserved in the Palestinian domestic sector by repairing infrastructures, which causes losses of up to 40 percent of total potable water supplied. However, this saving has already been taken into account in calculating the increase in Palestinian consumption and therefore is not included here.

<sup>13</sup> Consumption of fresh water in the agricultural sector was 540 mcm in 2005. Experts believe the minimum amount of fresh water required to maintain the sector is between 450 and 530 mcm a year, in other words, an annual savings of 10-90 mcm can be achieved. The agricultural sector, however, is already based on treated waste water, far more than in the past. In 1984, for example, the sector used only 60 mcm of treated waste water, while in 2005 (including water from the main purifying facility) this was 341 mcm. As a result, in the past decade the allotment of fresh water to the agricultural sector has been reduced by over 55 percent.

<sup>14</sup> The argument that Israel's water problem can be solved by ending subsidization of water to the agricultural sector and ending "water exporting" through agricultural exports is not accurate, as:

- a. In accordance with an agreement signed by the government and the Israel Farmers Federation in late 2006, subsidization of water prices to the agricultural sector is expected to end in 2013, at the latest. Moreover, according to the water prices reform planned by the Water Authority, the cost of fresh water for water consumers, in lower volumes, will be even lower than the price of fresh water for farmers.
- b. According to water experts' estimates, export agriculture uses about 100 mcm of fresh water a year, which is far less than the amount needed to provide a suitable solution for the acute water problem.

<sup>15</sup> For example, Saudi Arabia desalinates over half of its drinking water.

<sup>16</sup> A small desalination plant used in Eilat for several decades desalinates about 10,000 cu.m of seawater a day.

<sup>17</sup> Prof. Uri Shani, director of the Water and Sewage Authority, is a participant in the Israeli study team in order to check the feasibility of laying a water pipeline.

<sup>18</sup> This is of course already true with regard to oil and gas.

<sup>19</sup> The opposite rationale argues that as preventing future friction over apportioning the aquifer water and its contamination is an Israeli interest, making a significant concession over the aquifer water is in line with this interest.

<sup>20</sup> Regarding the economic aspect of alternative water sources: although Israel is expected to desalinate water at Hadera at the lowest price in the world, this cost will be higher than producing water from natural sources and will be entirely covered by the consumer. Thus, due in part to the cost of establishing desalination plants, the price of water for consumers was raised in December 2007. The cost of importing water is expected to be even greater than the cost of desalination.

<sup>21</sup> This premise is based on three main arguments that the Palestinians will raise in negotiations: 1. they do not have any real ability to construct a large number of desalination plants like Israel, because the Gaza shoreline is not long enough. 2. Israel depends on a number of reservoirs while the Palestinians on the West Bank depend solely on the Mountain Aquifer. 3. Israel's per capita consumption is far greater than that of the Palestinians.