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The Monitoring and strife aspects of waters among Palestine and Israel

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Abstract

Palestine utilizes four groundwater basins, three of which are transboundary or shared waters. Palestine is a riparian country in the Jordan River but it is denied its water rights. Palestine and Israel signed an interim water agreement in 1995 (called Oslo II accord) and a final agreement is yet to be negotiated and signed. There is still a serious conflict between Palestine and Israel over water resources whether they are either endogenous or shared. This conflict is about water rights and management of these water resources. This conflict has to be settled and solved in the final status negotiations between the two parties. The final status negotiations are yet to start seriously. This paper addresses the core issues of differences and concentrates on the management of water resources and identifies the Palestinian water rights for the final status negotiations. The difficulties and shortcomings of Oslo II accord are that the interim agreement never addressed all water resources and it was in favor of Israel. Israel controls now 100% of the Palestinian water rights in the Jordan River and 86% of the Palestinian groundwater resources (shared and endogenous) resulting in an unequal per capita water consumption ration of 4:1 in favor to Israel. Also, Israel's mismanagement of the transboundary waters lacks the holistic and integrated approach and is based on putting huge pressure on the aquifers (abstraction scenario for Israeli use) in drought periods which only increase the suffering of Palestinians in terms of meeting their water needs. The paper analyses both the Palestinian and the Israeli positions about the conflict over water in the final status negotiations. This paper shows that there is a need to a final agreement between the two parties in which the International Law will be used to solve the conflict over water. This paper concludes that the Palestinians should recover their absolute sovereignty over their endogenous water resources and recover their fair share in shared water resources.

Keywords: Palestine, Israel, shared water resources, International law, water rights, conflict, negotiations.

INTRODUCTION AND THE HYDROLOGICAL SETUP

Palestine utilizes four groundwater basins, three of which are transboundary waters. The three shared groundwater aquifers are the; Western Aquifer Basin, Northeastern Basin and Coastal Aquifer Basin.

The shared surface water resources are the Jordan River and the surface runoff that drain to the west (Western wadis). The endogenous water resources are the eastern aquifer basin and the eastern wadis. Figure 1 shows the extent of shared aquifers between Palestine and Israel. Figure 2 shows the shared surface water resources.

The West Bank is a hilly area with variable elevations from 400 m below sea level in the Jordan Valley to 1000 m above sea level in the hills. The rainfall of the West Bank is strongly seasonal mainly from October to May. Rainfall is orographic across the West Bank and generally varies from 700 mm/yr in the mountains to 100 mm/yr in the Jordan Valley. The Gaza Strip is located on the extreme edge of a shallow coastal aquifer with a total small area of 365 km^2. The major source of renewable groundwater in the aquifer is rainfall. Rainfall is sporadic across Gaza and generally varies from 400 mm/yr in the north to about 200 mm/yr in the south. Table 1 provides a summary of all water resources in historical Palestine.

There are two surface catchments areas in Palestine: the Western catchments areas that drain in the Mediterranean Sea and the Eastern catchments areas which drain into the Jordan River and the Dead Sea Basin. The total quantity of surface runoff which originates from the Palestinian territories in the western catchment is

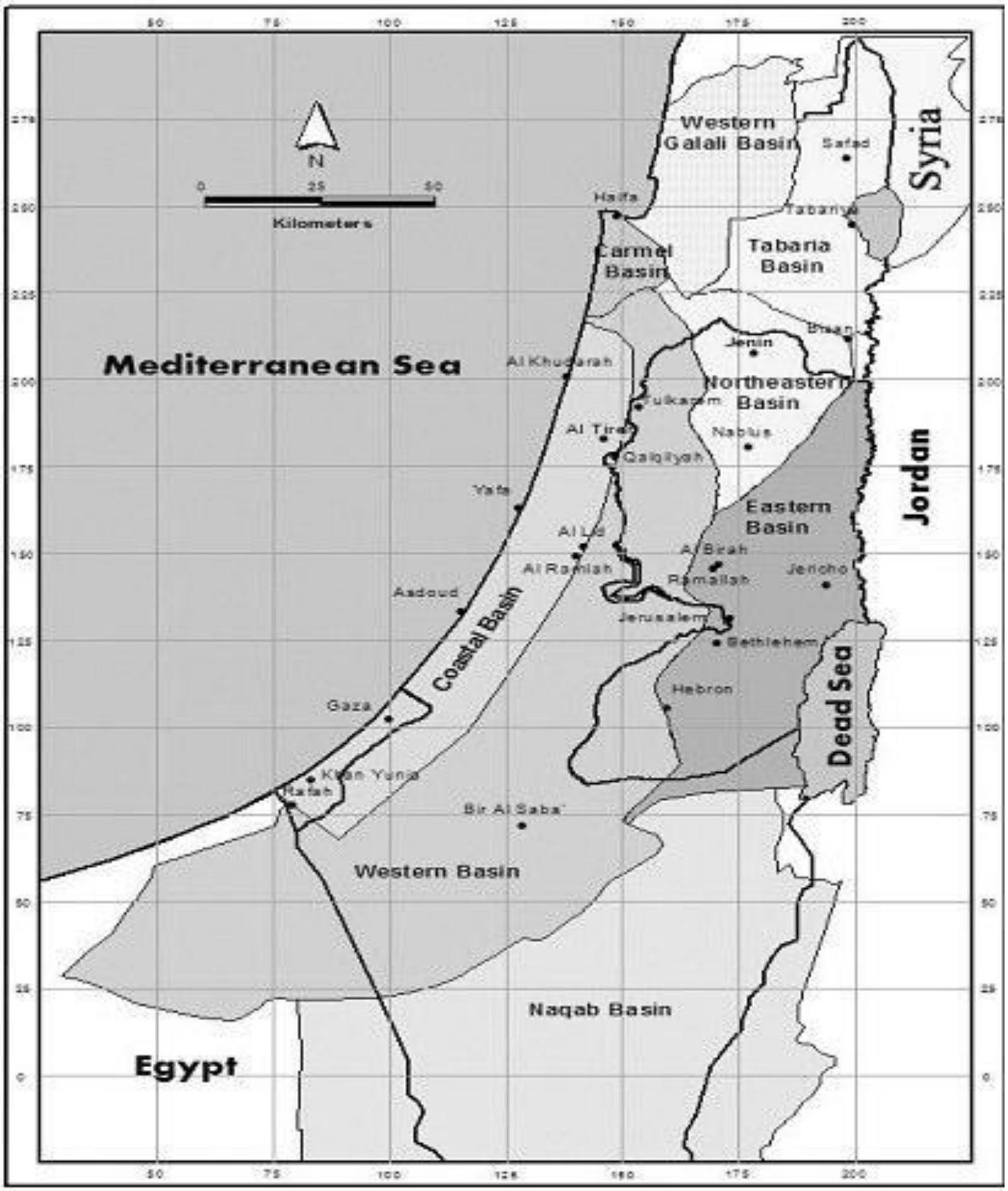

Figure 1. Shared aquifers between Palestine and Israel.

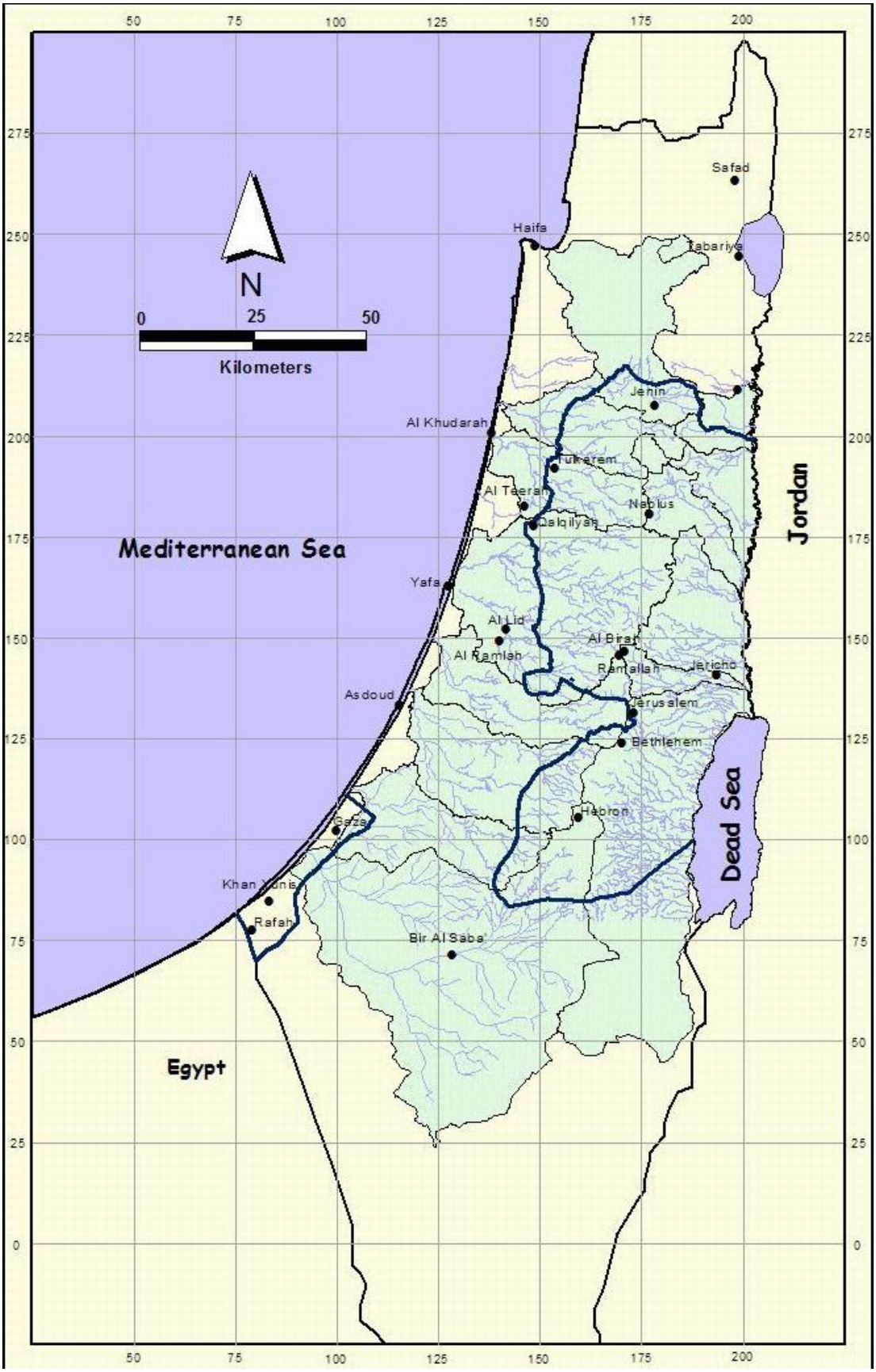

Figure 2. Shared surface water resources.

Table 1. Water resources in historical Palestine (Mcm/yr) for reference year period: 1980 - 1999.

Water resources In historical Palestine (Mcm/yr)								
			Palestinian water control			Total utilization	Natural flow/ Recharge	Resource
% from recharge	% from total utilization	Volume	% from recharge	% from total utilization	Volume			
86	83	1265	17	17	251	1503	1454	Ground water
90	100	870	0	0	0	870	965	Jordan River
82	90	177	9	10	20	197	215	Runoff
87	89	2299	10	11	271	2570	2634	Total

Source: SUSMAQ (2001). Mcm/yr: million cubic meters per year.

catchments is 72 Mcm/year with the total surface area being equal to 2950 km^2 inside the Palestinian territories. The eastern catchments are all presented as part of the Jordan River and Dead Sea Basins. The total catchments area of the eastward draining Wadis of the Dead Sea and the Jordan River Basin (including Wadi Araba) is 40,650 km^2 of which Wadi Araba is 11,300 km^2. The total area inside the Palestinian territories is 2750 km^2 or 6.8%. The total average flow from the West Bank is 17.4 Mcm/year.

Wadi Gaza is the major wadi (as surface water) in the Gaza Strip that originates in the Negev Desert in a catchment area of 3500 km^2 and with an estimated average annual flow of 20 to 30 Mcm/year (PWA, 2000). In addition, Wadi Gaza at present is diverted by the Israelis towards reservoirs for artificial recharge and irrigation. This means that nowadays, only a little water out of the huge floods may reach the Gaza Strip, if any, due to the Israeli practices.

The Jordan River Basin is the most important surface water resource in the region. The total natural flow of the Jordan River, in the absence of extraction, ranges from 1485 to 1671 Mcm/yr at the entrance to the Dead Sea. The total area of the Jordan River Basin covered by isohyetes over 300 mm is 14,847 km^2. Of this area, 1638 km^2 (11%) is within Palestinian territories. Israel is the greatest user of the Jordan River water where its present use is around 59% of the total flow. Israel transfers huge quantities of surface water through the National Water Carrier from Upper Jordan to the Negev, where these quantities equal 420 Mcm/yr. At the same time, Palestinians have been denied use of the Jordan River water due to the Israeli occupation since the 1967 war. In addition, Jordan uses 23% of the Jordan River flow; Syria uses 11% and Lebanon uses around 0.3% of total natural flow.

Based on the above, Palestinian surface water rights are 270 Mcm/year distributed as follows: 181 Mcm/year from the Jordan River, 17.4 Mcm from Dead Sea Basin, 72 Mcm/year from Western Wadis (SUSMAQ, 2001). The available water resources in Palestine are shared through trans-boundary aquifers, the Jordan River and Wadi Runoff. However the water rights and management of these shared water resources and also for the Palestinian endogenous water resources are still a problem between Palestine and Israel and should be addressed and solved in the final status negotiations.

Even after Oslo II accord Israel is still in control of the utilization of both the Palestinian shared and endogenous water resources. As a result the water supply in the West Bank is complex in a way to keep Israel's control over the water resources in the West Bank.

Figure 3 shows the complex picture of the water use and control in the West Bank for the year 2005. This complexity is due to the following:

1. The presence of the Israeli illegal settlements inside the West Bank. These settlements consume some 35 Mcm/yr from wells drilled in the West Bank and controlled by Israel plus a mixed source of water supplied to these settlements by the West Bank Water Department (WBWD). This mixed source is based largely on Palestinian wells that are operated by the WBWD. Relatively little water used by Israeli West Bank settlements is delivered from Israeli wells outside the 1967 West Bank borders.
2. While Palestinians consume their water from water resources under their control in the West Bank, they also purchase some 25 Mcm/yr of water per year from Israeli sources outside the West Bank as well as some 22 Mcm/yr from the WBWD.
3. The ownership of WBWD wells has yet to be settled in negotiations. Accordingly it is difficult to consider these wells to be fully within Palestinian sovereignty. According to the Oslo II agreement, the responsibilities and authorities over the West Bank Water Department (WBWD) should have been transferred to the Palestinian Water Authority, but this did not take place.

The complexity of the Israeli control of water resources has led to:

a. Shared utilization of aquifers is 86 / 14% in favor of Israel.
b. For all sources including the Jordan River and wadi runoff, the overall spilt in water utilization is 89% (Israel) and 11% (Palestine).
c. When viewed in terms of per capita consumption, the

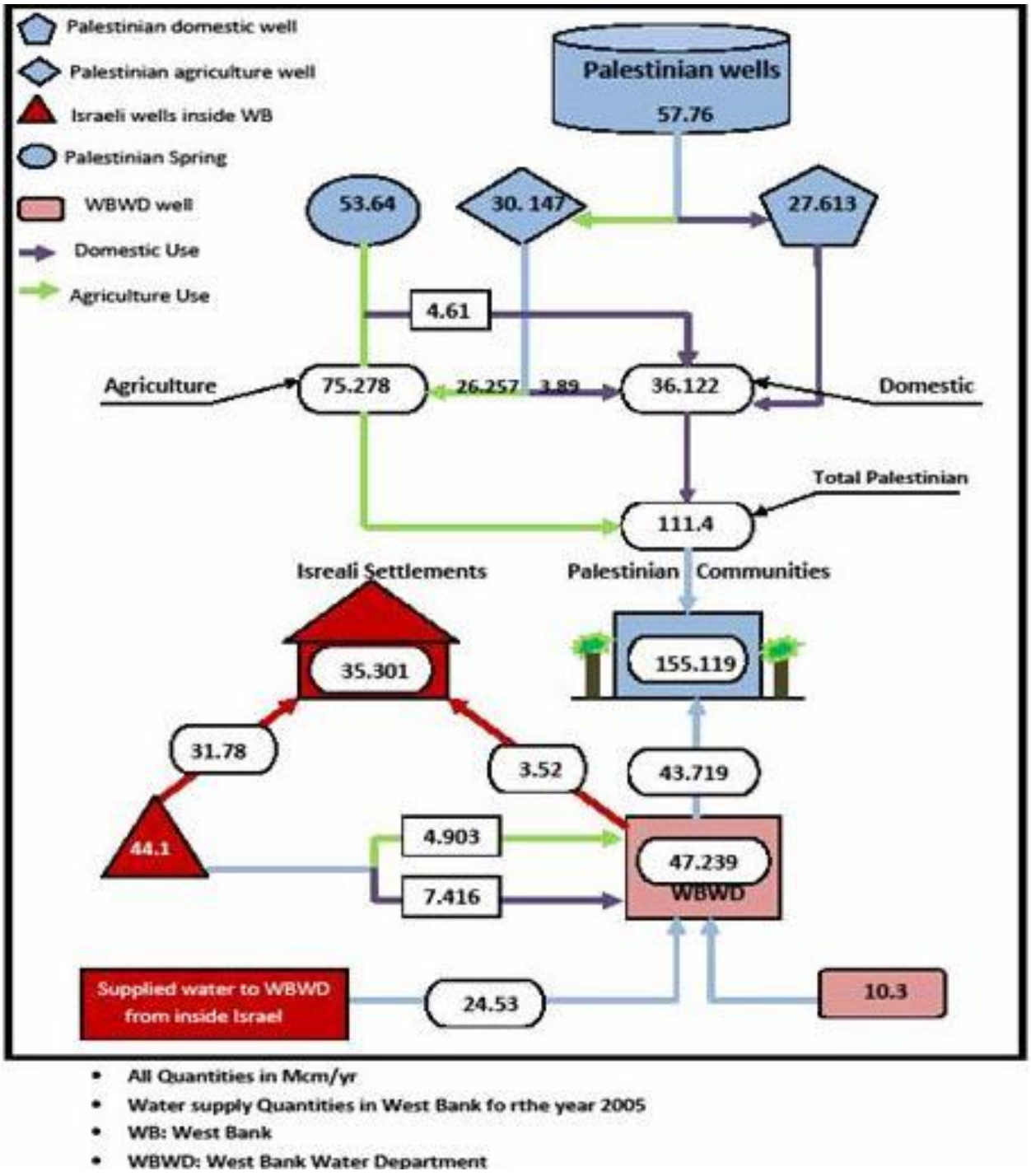

Figure 3. The complex picture of the water use in the West Bank.

ratio of Israeli to Palestinian consumption is roughly 4:1.

d. Per capita use of water of Palestinians in the West Bank is on average 50 l/day, which is one-third of the amount specified by the World Health Organization of 150 l/capita per day.

In the Gaza Strip, of the total water supplied to the domestic sector only some 8.9 Mcm/yr may be considered of acceptable quality (based on health considerations). This 8.9 Mcm/yr corresponds to only 18% of the water supplied by municipal wells and translates to an acceptable per capita supply rate for domestic use of only about 13 l/c/d – less than 150 l/c/d of the WHO recommended levels (Aliewi and Assaf, 2003). This average per capita consumption and the lack of some 350 Mcm/yr to the Palestinians in the West Bank and Gaza place a constant pressure on the stability of the socio-economic

future of the Palestinians (Aliewi, 2005). At present, Palestinian citizens pay about $1.25 per 1m ^{3} of water which is a high cost compared to the average income of the Palestinian citizen. At a minimum, Palestinians argue that Palestinian citizens should be entitled to receive a basic quantity of water (basic human right to water) amounting to at least 150 liter per day at an affordable cost. This water should be safe, acceptable and physical accessible.

MANAGEMENT AND CONTROL PROBLEMS

The above inequitable control and utilization of shared and endogenous water resources has led to a huge gap between the Palestinian supply and demand. It is important to note that the total utilization (1010 Mcm/yr) exceeded the estimated total average recharge for the three aquifers (679 Mcm/yr according to Oslo II agreement) by almost 50%.

Israel's mismanagement of the transboundary waters lacks the holistic and integrated approach and is based on putting huge pressure on the aquifers (abstraction scenario for Israeli use) in drought periods which only increase the suffering of Palestinians in terms of meeting their water needs. In 1999 Israel pumped 572 Mcm/yr from the Western Aquifer when rainfall was about 480 mm/yr (that is, recharge in that year was about 225 Mcm/yr) meaning they abstracted 2.5 times its recharge. The Palestinians consider this as a mismanagement of the Western Aquifer Basin.

The Palestinians see management of endogenous and shared water resources to cover the following:

i) Full control and utilization of endogenous water resources. This means that Israel should hand over all water resources it utilizes and controls in the West Bank to the Palestinians.
ii) Equitable utilization and control of shared water resources.
iii) Optimal use of shared resources.
iv) Ecological protection of shared resources.
v) Sustainable development of shared resources.

Instead Israel over- utilizes the shared waters and further pollutes the shared aquifers by the Israeli settlements in the West Bank which further bedevil the cross-national implications of water scarcity in the Palestine-Israel region. For many years, raw sewage effluents from Israeli settlements in the West Bank have been discharged in the Wadis. Moreover, leachate from Israeli dumping sites, industrial wastes, agricultural returns rich with agro-chemicals and hazardous wastes in addition to over-pumping of aquifers have caused groundwater quality of Palestinian aquifers to deteriorate (SUSMAQ, 2003). Since the carbonate aquifers of the West Bank have pronounced mature karst features, both above and below the water table, these aquifers show high potential for extensive pollution.

Israel imposes facts on the ground to preserve the status quo with regard to the allocation of shared groundwater aquifers without recognizing Palestinian water rights. One example is the mining of the West Bank and Gaza aquifers by dense networks of wells inside the West Bank and alongside the border lines between Israel and the West Bank on one side and Israel and Gaza on the other side (Figure 4).

Unlike Palestinian wells, Israeli wells tap deeper aquifers. The deep wells drilled by the Israeli authorities in the area have affected water quality and quantity of Palestinian wells. The Israelis have imposed obstacles before the Palestinians for drilling new wells to meet their needs in shared and endogenous groundwater aquifers. No permit was given in the Western Aquifer Basin since 1967.

The Israelis control the utilization zones of the shared groundwater aquifers and recently they confirmed that by constructing the Separation Wall. By building the Separation Wall, the Israelis confiscate land, aquifers, springs and wells. The Israeli have undertaken the following water related activities:

a. Intercepting groundwater from reaching the Gaza coastal aquifer.
b. Intercepting surface wadis flowing to Gaza.
c. Israeli Wells around the Gaza Strip.
d. Israeli control of the water resources in the West Bank.
e. Diverting the route of the Jordan River to the Negev and as a result the Dead Sea area is halved.
f. Polluting the groundwater aquifers especially by the wastes of the Israeli settlements.
g. The shared aquifers have been exposed periodically to the problem of illegal trans- frontier dumping. Debris is dumped on the outcrops of the shared aquifers even though it is known that these outcrops are karstified and thus provide easy paths for pollutants to reach water levels.
h. Forcing Water Supply Systems and their infrastructure in the West Bank to be mixed (mish-mash).
i. Complicated procedures of licensing Palestinian water projects including drilling wells.

This resulted in insufficient and unreliable service (40% of Palestinian communities are unserved) with poor quality and with large losses in the systems (25 - 40%). The Israeli “operator” also cut off supplies periodically, thereby discriminating unfairly between Palestinians and Israeli settlers when shortages or problems occur (especially during periods of droughts, since water supply networks are mixed).

The general acceptable policy concerning the management of water resources by Israel should not be limited only to equitable utilization and control but it should also include optimal use and ecological protection of shared aquifers as well as the sustainable development of these resources (Assaf, 2000, 2004).

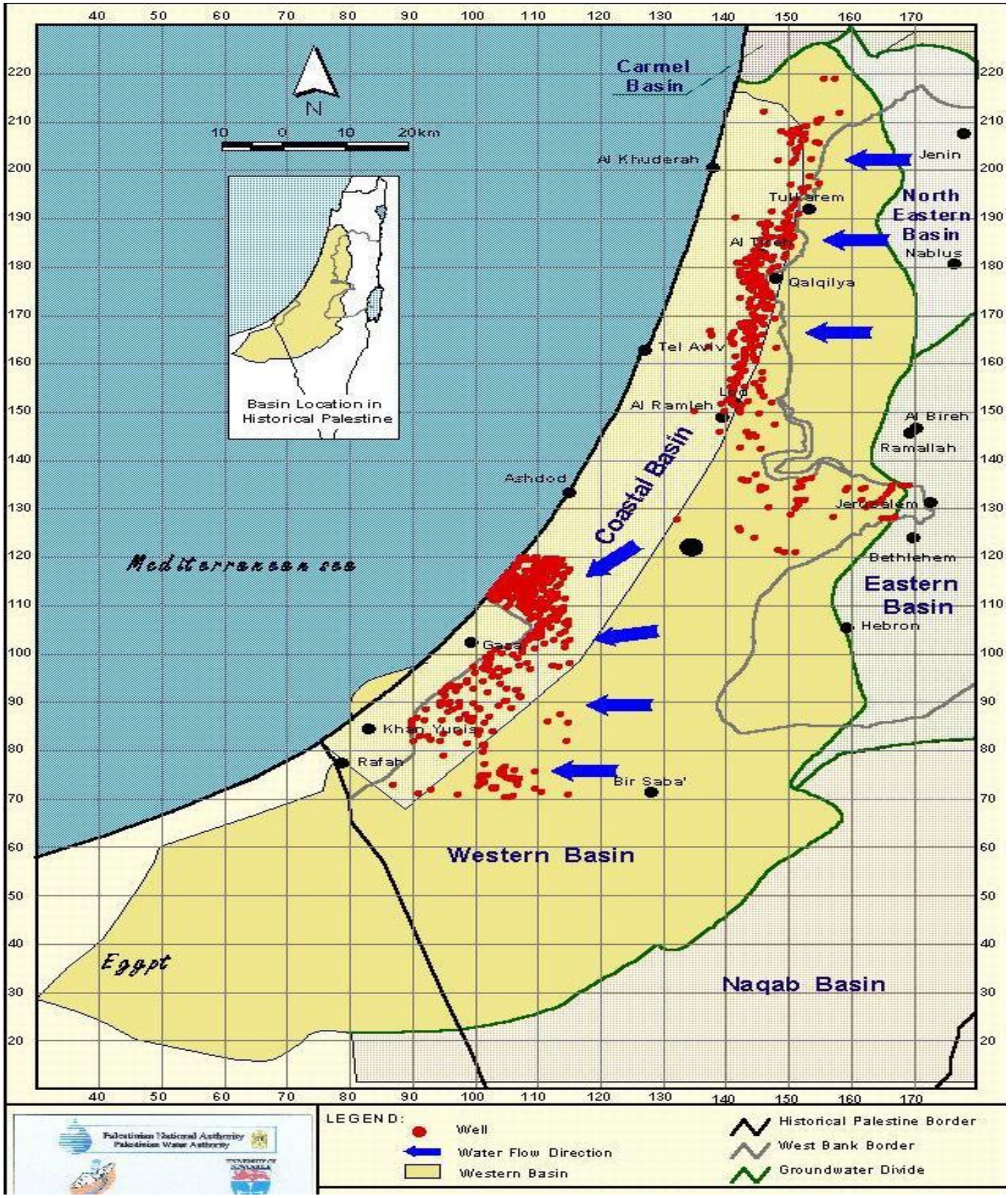

Figure 4. Israeli pumping of the West Bank and Gaza aquifers.

EXISTING SITUATION AND BILATERAL AGREEMENTS: DISCUSSION

Israel and Palestine signed bi-lateral agreements (Oslo II) over water but these agreements were in favor of the Israel in the following terms:

1. They neglected the Palestinian water rights in the Jordan River which is a transboundary river.
2. The agreements were about the Palestine water use inside the West Bank that gives Israel the veto over any water development project through the Joint Water Committee (JWC).
3. The Palestinian water rights in shared groundwater resources were neglected.
4. After 14 years since the signature on agreements, Israel allowed to implement a small proportion of what was agreed upon.

The Israeli stance about transboundary aquifers is still a difficult one that allows them to keep the current status as it is and convert the Palestinian water rights to how the Palestinians can purchase water from Israel at costs they normally cannot afford. In other words Israel's stance is that Israel would negotiate how the Palestinians would purchase water from Israel to meet their water needs without any negotiations about the absolute sovereignty of the Palestinian waters in their political boundaries (of West Bank and Gaza) . On the other hand, the Palestinians already made their stance clear that Palestine should develop necessary plans that allow it to develop, utilize and control its water within its international boundaries such that the utilization of transboundary waters will cause no harm to Israel according to International Law.

Israel's position is based on 'prior-use' according to the International Law (Shuval, 2007). Israel argues that if the Palestinians have absolute sovereignty over their water re-sources in the West Bank then the current use of water by Israel from shared water resources will be significantly harmed. Israel's position on the use of the water of the Jordan River is to deny the rights of the Palestinians in this river claiming that there is nothing in the International Law to stop Israel from diverting the river from Lake Tiberias to the Negev (Shuval, 2007). In other words Israel wants to impose a 'win-lose' situation over shared wa-ter resources. This Israeli argument is not accepted as the Palestinians had used and developed the water resources in the Jordan River Basin pre- 1967. Around 150 pumps on the Jordan River had been used for irrigation of lands in the Jordan Valley. This fact alone solidifies the rights of Palestinians to use the Jordan Ri-ver water resources according to International Water Law prior-use principle. Also, Israel cannot divert the route of a shared rived such as the Jordan River because this river is shared by other 4 countries: Syria, Lebanon, Jordan and Palestine. Since Palestine is a full riparian party in the river, Israel cannot divert the river to benefit its people only on the expense of the Palestinian Water Rights. At the moment the Palestinians have no water rights in the river. Similarly, the Palestinians can intercept shared aquifers upstream and impact the current Israeli use of water downstream.

Also, Israel claims that the groundwater resources especially the shared ones are fully utilized even before the 1967 war (Shuval, 2007). This argument is not true because recent studies (SUSMAQ, 2005) regarding one particular shared aquifer -the Western Aquifer Basin (WAB) in this case- show that its sustainable yield is about 443 Mcm/yr not 362 Mcm/yr as claimed by Israelis in Oslo II accord. Also, the figure of 362 Mcm/yr can be referred about the Upper Aquifer of WAB while the Lower Aquifer of WAB is utilized for a much less degree. This argument illustrates clearly that the sustainable yield figures claimed by Israel and in Oslo II accord are inaccurate and need to be agreed upon by both Palestinian and Israeli experts before the start of the final status negotiations take place between Palestine and Israel. It should also be noted that at the moment Israel controls and utilizes 96% of this basin against 4% for the Palestinians although more than 70% of the rainfall recharge to this basin originates in the West Bank of Palestine. The area of historical Palestine (which now comprises of both Israel and Palestine) does not lack shortages of rainfall. But the Israeli practices of diverting the Jordan River from Lake Tiberias in North Israel to the Negev Desert (South Israel) and the Israeli activities of drilling wells inside the West Bank to supply Israeli Settlers in the West Bank with water and the Israeli control of the Palestinian endogenous and shared water resources will only lead to make Palestine an area with 'artificial' droughts. Israel's policies to solve the 'artificial' drought of Palestine are two-fold.

First of all, to encourage big desalination projects such as the Dead-Sea Canal Project in which Palestinians would purchase water as an economic good at higher costs than they can afford. In principles the Palestinians are putting plans to utilize additional water resources from desalination plants, reuse of treated wastewater for irrigation and others. But the Palestinians argument is that each party (Palestine and Israel) should develop ne-cessary plans that allow it to develop and utilize its water within its international borders according to absolute sovereignty and international law.

Secondly, to sell water to Palestinians from the Israeli Water Company, 'Mekkoroth'. As an example Ramallah City is purchasing some 70% of the water it consumes from Mekkoroth. This leaves the water situation in Ramallah fragile. In this arrangement Israel can reduce the 70% to any low figure depending on its policies and

Table 2. Palestinian water rights.

Source	Quantity Mcm/yr	Shared or indigenous	Palestinian water rights (Mcm/yr)
1.Eastern Aquifer Basin	172	Endogenous	172 (100%)
2. Northeastern Aquifer Basin	150	Shared	90 (60%)
3. Western Aquifer Basin	443	Shared	266 (60%)
4. Gaza Coastal Aquifer	350	Shared	65 (19%)
4. Jordan River including eastern Wadis	1500	Shared	181 (12%)
5. Western Wadis*	72	Shared	72
6. Dead Sea Wadis*	17.4	Shared	17.4
7. Wadi Gaza*	25	Shared	25
Total			888 Mcm/yr

*: quantities inside Israel are not mentioned.

needs during less rainfall seasons.

In conclusion Israel is still acting as an Occupying Force instead of implementing a full scale of cooperation to solve water shortage problems in Palestine. Israel is still (in real terms) using the military orders imposed after 1967 Occupation to the West Bank and Gaza. This has to change through negotiations that lead to full cooperation between Israel and Palestine to implement the signed agreements.

PALESTINIAN WATER RIGHTS

This paper calls for the full implementation of the principle of equitable utilization of the International Law so that the Palestinians will meet their vital human water needs. The author of this paper conducted a number of studies to identify the Palestinian water rights to use in the final status negotiations. Mimi and Aliewi (2006) concluded that the Palestinian water rights in the Western Aquifer Basin is 60% not 4% as is currently the case because of the Israeli control through military orders or through the JWC which gives Israel the right to veto water projects inside the West Bank. The study by Mimi and Aliewi (2006) uses a multi- criteria analysis based on all principles of the International Law. Aliewi and Assaf (2007) argue that the current utilization and control of shared water resources by Israel is not based on equitable utilization and control which impacted the social and economic needs of the Palestinians. The Palestinians will only claim their share according to International Law. As an example if we arrive at a final agreement that the Palestinian and the Israeli share the Western Aquifer Basins with 60% and 40% respectively, the Palestinian will discuss to accept utilizing their share (60%) without exceeding that and thus will cause no harm to the 40% share of the Israeli's in this Aquifer Basin.

The author sees that the Palestinian water rights in endogenous and shared water resources as presented in the Table 2. It shows Palestinian claims for water rights that reach a total of 888 Mcm/yr. This means that this quantity needs to be available in order to meet future Palestinians water needs. According to Table 1 earlier, the Palestinians utilize only 271 Mcm/yr (30%) of this quality.

Conclusion

The specific quantities that should be allocated to the Palestinians constitute a core political matter in the final status negotiations. But even so, a sustainable solution to the Palestinian water crisis will require effective management, development and planning of the resources. A consensus in this regard among Palestinians includes the following points:

1. Palestinian water rights should be solved according to international legal principles (such as equitable utilization) which will guarantee sufficient quantities and grant sovereignty to Palestinians to utilize and control their water resources.
2. The Palestinians will only claim their share according to International Law. In this effect, the Palestinians believe that Israel is over applying the principle of prior-use of the International Law. First, they deny any Palestinian access to the Jordan River although they had used and developed the water resources in the Jordan River Basin pre-1967. The Palestinians will not in any final water agreement deny Israel's rights in shared water resources or caused them any harm as the Israelis claim. As an example if we arrive at a final agreement that the Palestinian and the Israeli share any water resource based on equitable utilization principle, the Palestinian will accept utilizing their share without exceeding that and thus will cause no harm to the share of the Israelis in this shared water resource.
3. Palestinian water rights should extend to their endogenous and shared ground water aquifers as well as surface water including the Jordan River.
4. Final agreements will have to ensure removal of any obstacles in Palestinian lands that limit to Palestinian

rights (e.g., access to wells currently controlled by Israel inside the West Bank, the separation wall constraints imposed by Israeli settlements, the diversion of the Jordan River to the Negev etc).

5. The sustainable yield figures of aquifers and the natural volumes of surface water resources claimed by Israel and in Oslo II accord are inaccurate and need to be agreed upon by both Palestinian and Israeli experts before the start of the final status negotiations take place between Palestine and Israel.

6. Bi-lateral and multi-lateral cooperation remain key elements in any final status negotiations over Palestinian water rights. Israel is still acting as an Occupying Force instead of implementing a full scale of cooperation to solve water shortage problems in Palestine. Israel is still (in real terms) using the military orders imposed after 1967 Occupation to the West Bank and Gaza. This has to change through negotiations that lead to full cooperation between Israel and Palestine to implement the signed agreements.

The Israeli management of transboundary aquifers is a critical one as they over-utilize aquifers by two orders in drought periods. The Palestinian water rights in transboundary aquifers are yet to be recognized and respected by Israel.

The average per capita consumption of 50 liter per day in the West Bank and the 13 liter per day per capita (suitable for drinking purposes) in Gaza put a constant pressure on the stability of any socio-economic future of the Palestinians. Without a sufficient and safe supply of water it will be difficult to ensure a stable future for the emerging Palestinian State. The existence of additional water sources will make Palestinians perceive the quantities of water allocated to the new state as a core political issue in the final status negotiations. Such issues must be resolved before moving on to the problem of sustainable management, development and planning.

The growing gap between the water supply and the needs of Palestinian communities makes additional conventional and non-conventional water resources essential. Moreover, putting in place water policies based on a sustainability assessment of the water resource taking into consideration socio-economic, governance and environmental issues will be an important stage in the move toward sustainability.

Protecting water quality is critical for ensuring the sustainable supply of water from West Bank groundwater resources. Water management strategies must provide solutions to the associated risks of pollution.

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