

Till the Last Drop: The Palestinian Water Crisis in the West Bank, Hydrogeology and Hydropolitics of a Regional Conflict

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Abstract

The Palestinian water crisis is often attributed to natural climatic and hydrogeological factors. However, it is a known fact that that Israel has been very successful in securing itself a sufficient water supply. This paper questions the myth of Palestine as a desert and presents an outline of the reasons for the current severe crisis. It will shed light especially on the severe imbalance in water use of Palestinians and Israeli. Thereby, the hydrogeological causes will be taken into consideration as well as the historical development, the Israeli – Palestinian conflict over water resources and the most recent developments. A short outlook onto the different technical solutions will conclude the paper.

Hydrogeological background

A common misconception about Palestine, is to portray it as a desert. The Zionist myth talks about "making the desert bloom" and even water experts in Europe and overseas associate Palestine with a desert landscape. However, Palestine, and especially the West Bank, the focus of this paper, is far from being a desert.

Except for the Jordan Valley with rain below 200 mm/a, the climate in the West Bank should more correctly be called semi-arid and even sub-humid.

Rainfall is concentrated over a short period, with more than 60% of the annual precipitation commonly occurring in less than two months. Intensive rain, low evapotranspiration rates and the karstic nature of the outcropping aquifers allows for high recharge rates, above 30% of the total rainfall.

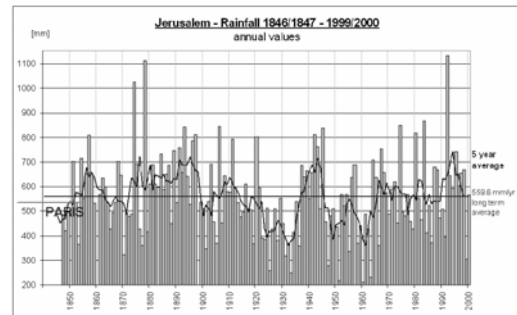


Fig. 1 shows long term annual rain heights from a rain gauging station in the Old City of Jerusalem and, for reason of comparison, average rain heights in Berlin, Germany (582mm)

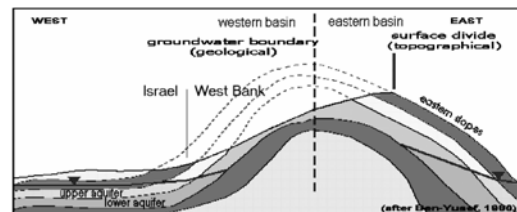


Fig. 2 shows a schematic section through the West Bank anticline. Note water divides, recharge zones and confined water levels in the foothills. Note the central highland where outcropping aquifers are exposed to direct recharge. Groundwater flows down the slopes and undergoes transition to confined conditions towards the coastal plain (western basin or WAB) and the Jordan Valley (eastern basin or EAB).

Contrary to its excellent groundwater potential the West Bank is void of surface water: Wadi runoff is relatively low and there are no permanent lakes. Unless Palestinians gain access to their only river – the Jordan River - they solely depend on groundwater from the deep-seated Cretaceous aquifers and the minor shallow aquifers.

A rough estimate of groundwater recharge to the mountain aquifers, formulated in Oslo-II (1995), presents a figure of 679 mcm/a. This figure is right only in its approximate overall dimension but is far from being accurate, or even based on solid data, when it comes to specifics. For the time being, recharge remains a figure that evades precise quantification. It should be stressed that around ninety percent of the recharge of the north-eastern aquifer basin (NEAB) and the western basin (WAB) takes place within the

West Bank. The eastern basin (EAB) is even an autochthonous Palestinian basin.

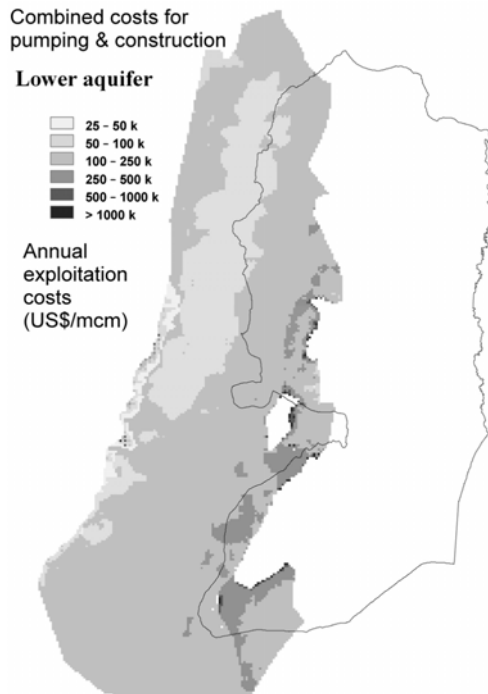


Fig. 3 shows a combination of best drilling conditions (better in the West Bank, because aquifer is not deeply buried) and best pumping conditions (better in the coastal plain, because here the aquifers are strongly confined): The resulting most favourable well locations lie mainly in Israel and only in a narrow strip along the green line inside the West Bank.

Yet, Palestinians enjoy little of these riches. The 1995 Oslo figure of 680 mcm/a distributed over a population of then 2 Million Palestinians in the West Bank would provide an amount of 340cu-m/a per person or almost 1 cu-m or 1000 litres per day for each person. In contrast, Palestinians only have a net supply of 60 l/d/c or even less; GTZ (1996) names a figure of 17 cu-mc/a. The total of well abstractions under Palestinian control from all 3 West Bank aquifers was as low as 72.3 mcm/a, while the total abstractions from these aquifers, inside the West bank and Israel was as high as 725.3 mcm/a (in the year 1999/2000 - SUSMAQ, 2002).

Historical development

So, the question is here: Why is the level of Palestinian well pumpage so low? A look

into a well distribution map shows that wells in the West Bank can be divided into three categories: Israeli (and settler) controlled, wells under Palestinian control and West Bank Water Department (WBWD) wells that are nominally Palestinian, but in reality Israel still has the last word in the operation of these wells.

The Israeli wells are found mainly in the EAB, near the Jordan Valley, because groundwater in this autochthonous Palestinian basin does not flow into Israel. Thus, these wells mainly supply settlers and their intensively irrigated agriculture in the Jordan Valley. Outside the West Bank, in the WAB, Israel disposes of hundreds of deep and productive wells.

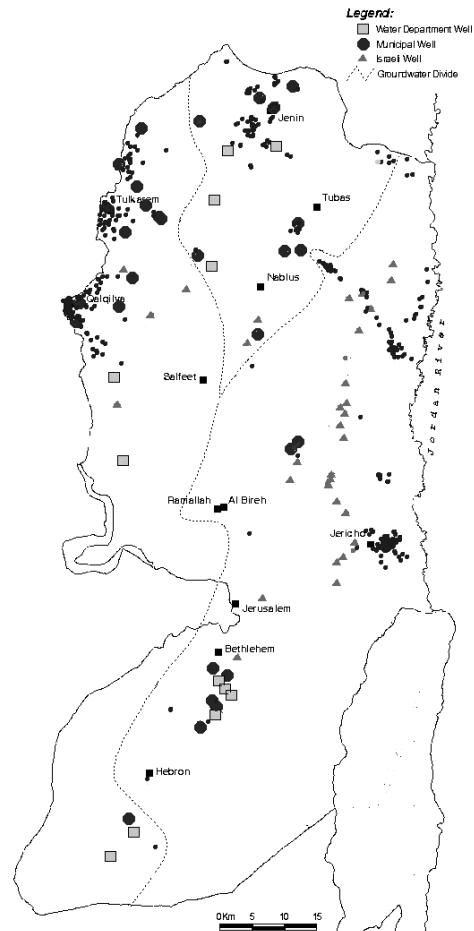


Fig. 4: Water supply and Israeli Wells in the West Bank. Israeli wells (red triangles); Water supply wells under full Palestinian control (blue circles); WBWD wells (light green squares)

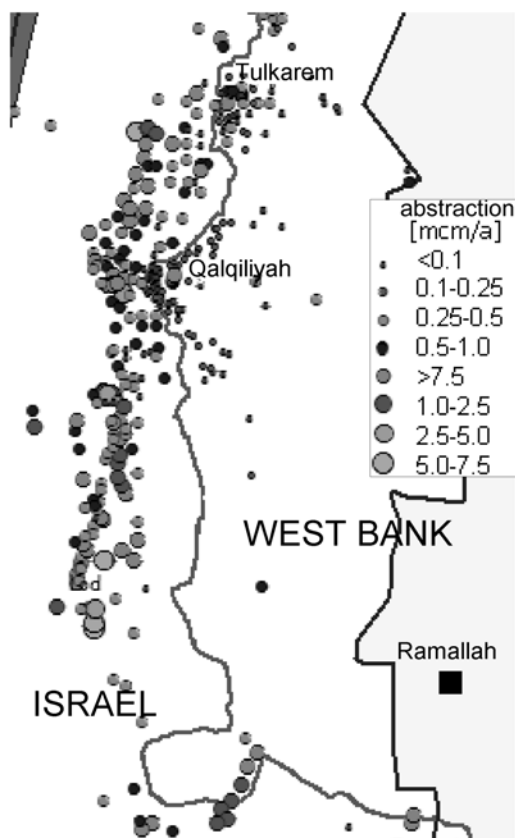


Fig. 5: Amount and productivity of WAB wells inside West Bank/ in Israel; the largest circles have 75 times the well yield of the smallest circles !

Most Palestinian wells are small and shallow agricultural wells. The number of actual deep and productive water supply wells is extremely low, as shown in figures 4 and 5. The reason for this lies in the history.

Water politics under the Occupation

By 1967 Jordan had merely started to develop the groundwater resources in the West Bank. Older private wells existed mainly around Tulkarem and Qalqilyah, where the phreatic Upper Aquifer could be tapped in depths below 200m bgl. However, these shallow old wells often do not fully penetrate the aquifer and their pump setting lies just below the dynamic water level. Thus, these wells are extremely vulnerable to water level drops, due to the massive abstraction further west, in Israel.

Therefore, the natural situation was reversed: It is not Israel, the downstream riparian, that suffers from the concentration

of wells, but the Palestinian side. This is contrary to all Israeli claims that it is vulnerable in the Western and Northern Basin and that it is exposed to the threat of Palestinian interception of groundwater flow. However, the most important factor is the direct use of military force that has prevented Palestinian well development since 1967.

Only a handful of wells were drilled from 1967 until 1996, and only in the Eastern and Northern basin. In addition, these wells are the aforementioned West Bank Water Department (WBWD) wells, effectively under Israeli control. In the western basin, not one single new Palestinian well has been added since 1967. From the start of the occupation, Israel has enforced this policy through Israeli Military Orders in the West Bank. It is noteworthy to mention that with not more than 3 Military Orders (MO), Israel has created a mechanism of total control over water in the West Bank. The three Orders all stem from the beginning of occupation (1967 and 68). MO 92 puts all control of water resources in the hands of an Israeli official in charge, appointed by the Israeli military Area Commander. MO 158 starts the infamous permit system for water projects. Permits can be denied without explanation. MO 291 cancels "all prior settlements" and the military commander can even overrule Israeli civil courts. This blunt and continuous breach of international law has led to a situation in which Palestinian water infrastructure still crumbles at a level of almost 40 years ago. The most drastic example of unfair distribution is found in agriculture. Over the last decades, this sector accounts for more than 60% of Israel's water balance. Palestinians however, have much less than the minimum to satisfy their needs. The numbers, presented by the Water Commissioner (Fig. 6) show that Palestinians are supplied with around 10 mcm/a (= 1%) out of 1022 mcm/a allocated to irrigation.

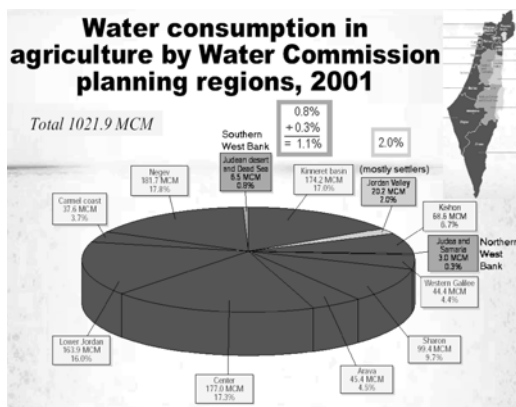


Fig. 6: Data of the Israeli Water Commissioner (2002): S-WB = 0.8%; NW-WB: 0.3%; Jordan Valley (settlers): 2%

Another 2 % (or 20 mcm/a) go to the settlers in the Jordan valley. This means that a few thousand settlers in the Jordan valley dispose of double the amount that all Palestinians in the West Bank have. However, it should be noted that 97% are used inside Israel. This shows that the large amounts of irrigation water are not locked in the settlements, but are to be found in Israel proper.

So, through its water policy a pattern of Israel's domination can be discerned.

1. Israel does not need to drill inside the West Bank to use the water in the western and north-eastern basins. The natural groundwater flow transports the water to the coastal plain. All it has to do is to prevent Palestinians from developing their share in order to enjoy almost exclusive utilization of this resource. Therefore, contrary to a common notion, Israel's main activities inside the West Bank are not active steps (like drilling) but preventive measures.
2. In domestic consumption, around 60 litres daily are allocated to each Palestinian in the West Bank, as opposed to an average of 220 litres per day for each Israeli. This is a drastic disproportion. However, the pattern in the field of irrigation water is much more extreme as shown above. This is partly due to lack of international awareness and pressure and partly due to an active Israeli interest in undermining the basis of an

independent Palestinian economy during more than 35 years of occupation.

The hopes of Oslo

The Oslo interim agreements raised hopes in the water sector that the time lost could be recovered. However, these hopes vanished as soon as it became clear that the agreement, especially Annex III, Art. 40 not only favoured the Israeli position but even served as some kind of legitimation to the Israeli claim of „established use“, a pattern of use that was established through force and the illegal measures and military orders mentioned above.

New forms of domination

However, it turned out, that the institution of the Joint Water Committee does not break but rather perpetuates the old system of Israeli domination, on the guise of an apparent symmetry within the JWC. Israel has three levels of veto in this committee.

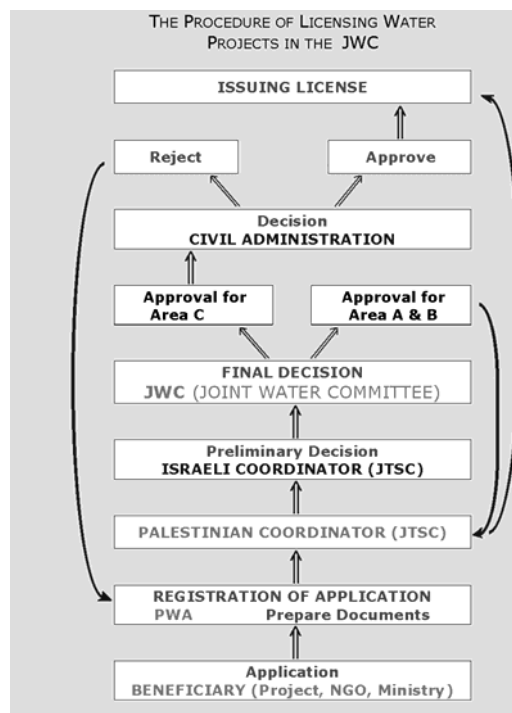


Fig. 7: Scheme of the licensing procedure in the JWC. Israel has three levels of „decision“

Both, Israeli and Palestinians have the right to veto water projects – INSIDE the

occupied territories. The important difference is, that for Israel, wells inside the West Bank are only of marginal importance because it has much more favourable pumping and supply conditions inside its own territory. The Palestinians, on the other hand, depend exclusively on the water resources inside West Bank and they have no resources other than the mountain aquifers. A good example of this situation is the management of the western aquifer. Israel, in Oslo-agreements insisted that the yield of the basin was no more than 362 Mcm/a. Therefore, no additional wells could be drilled by the Palestinians. However, in dry years, Israel pumps amounts reach way beyond this so-called „estimated potential“: 545Mcm instead of 340 Mcm in 1999. Palestinians have no means of vetoing this far-reaching unilateral action. The Israeli scheme of operation is not even discussed in the Joint Water Committee, since the JWC only deals with water facilities within the West Bank.

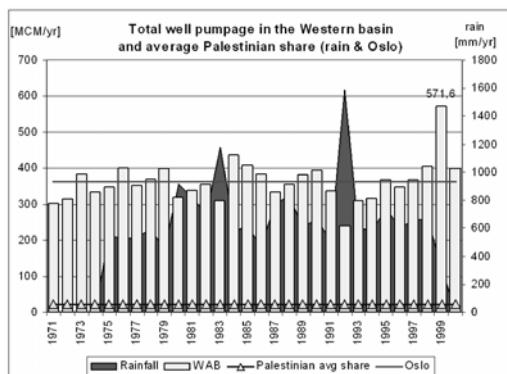


Fig. 8: WAB overall pumpage (bars) and Palestinian share (triangles); background: rain; yield acc. to Oslo II. Note the pumpage in 1999.

Around 80 mcm/a additional water production was envisaged under the Oslo interim agreement to be developed by the Palestinian side until 1999 and chiefly from the eastern basin. However, despite extensive efforts of the donor countries in the first years after signing Oslo and up until the beginning of the Intifadha, only around 15 mcm/a of additional well abstractions were achieved, less than one fifth of the expected. The Palestinian population has

grown dramatically in the last 10 years, while water production has seen only an insignificant increase.

Ten years after Oslo II, Palestinians are more than ever depending on the costly and unreliable supply from Israel.

Disappointed expectations

Contrary to Israel's promises in the Oslo-agreements, the eastern aquifer is more difficult to develop than the western basin. Deeper water levels coincide with higher risks of failed boreholes. The natural structural fragmentation of the eastern aquifer into many sub-basins makes each of these basins much more vulnerable towards over-abstractions.

More importantly however, and to the great surprise of most of the donors, even within the autochthonous eastern aquifer that has no connection to Israel, drilling permits were very difficult to obtain. The licensing procedure often took years and several times Israel demanded repositioning of drilling locations. Sometimes, proposed locations were rejected with the open "justification" that this location might be used in the future to drill wells for illegal Jewish settlements.

It was only by spring 2001 that a larger amount of new Palestinian drilling locations, 38 sites, were approved through JWC. However, by then, the second Intifadha had started and existing water projects were barely able to complete their tasks. More over, Israeli incursions into the West Bank led to great destruction and damages on water infrastructure - \$7 Million worth during operation Defensive Shield in April 2002 - despite an agreement from the early days of the Intifadha, in which Israel signed not to damage Palestinian water facilities (Local Aid Coordination Committee, 2002). In view of the previously mentioned obstacles, many donors became frustrated and left this sector and thus acceding to Israeli pressures to allocate donor money to waste water projects for protection of the aquifers.

Recent developments

Israel has returned to unilateral measures. By building the wall at an unprecedented pace, Israel continues to damage the vulnerable Palestinian fabric of water production and supply. This fabric is a highly complex mesh of Ottoman and British Mandate rules and agreements, together with Jordanian law, Israeli Military Orders and recent self-rule regulations. The most affected by the fence and wall are the farmers in Tulkarem and Qalqilyah district, one of the most important districts for Palestinian irrigated agriculture. The wells that fall on the eastern side of the barrier have a combined pumpage of around 11 mcm/a. Due to the very small Palestinian share, this amounts to almost 50% of current Palestinian use in the WAB.

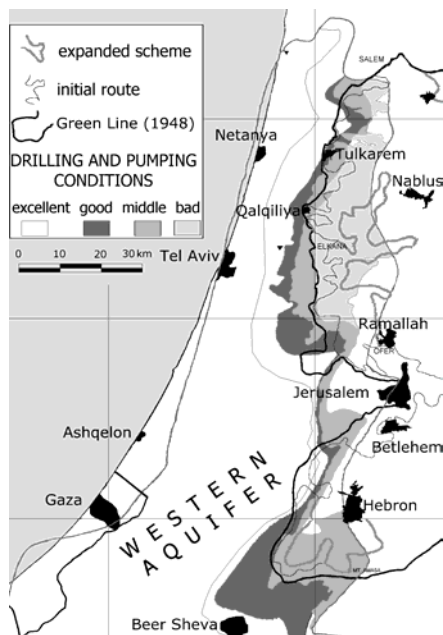


Fig. 9: light grey: up. Aq. Dry; mid grey: low aq. phreatic; dark grey: Up.Aq. phreatic; blue: Confined

More importantly however, Israel creates facts on the ground by depriving the Palestinians from the most important areas for future development of their groundwater resources, even after successful negotiations and a peaceful settlement. If the wall remains, 90% of the western basin's future water resources potential will be inaccessible to Palestinians. Thus, this

current kind of "separation" is not a real separation in the sense that it would lead to an agreement on the division of shared water resources. To the contrary, it is a unilateral measure that

- defragments the Palestinian water landscape
- separates Palestinian farmers and villages from their lands and wells
- continues and deepens the connection between settlements and Israel
- inhibits Palestinian future access to the resource
- and thus blocks them from a better future.

Perspectives:

The first priority for solving the Palestinian water crisis is to increase groundwater supply to the population centres in the West Bank.

In most neighbouring countries, the phase of initial groundwater development is already over and water projects focus on other agendas, for example using additional unconventional water sources. Palestine however, yet has to make up for the lost 35 years. It cannot jump over this stage by directly going to unconventional water sources and additional sources, as Israel demands. Obviously, a reallocation of the very unjust water distribution is indispensable.

It should be stressed that there is no natural reason for a water crisis in the West Bank, at least not for a domestic supply crisis. A net amount of less than 100 mcm/a would be needed to guarantee the minimum domestic supply of 100 litres per day and person in the West Bank at current population levels (including 35% water losses this is equivalent to roughly 125 mcm/a). Much higher figures are, of course, needed to satisfy long-term demands of agricultural, industrial and domestic supply for a rapidly growing population. However, even for these basic needs, intensive groundwater development in the West Bank will be necessary.

In recent years, it has become popular, to favour sources other than groundwater such as treated waste water, rainwater harvesting, desalination and import from outside.

- Waste water treatment is a necessity, if only for preventing pollution of aquifers. However, if total well abstractions under Palestinian control remain at a level of 72 mcm/a, the input of waste water is already too small to satisfy the needs, even if all water was to be recycled to the very last drop. Recycling is a valuable, but only complementary source of water supply, especially in an area where groundwater abounds.
- Rainwater harvesting is a very practical answer for remote communities with no other networks at hand. It is clearly not a lasting solution in densely populated areas, towns and refugee camps.
- Import from other countries, such as Turkey, clearly belongs to the category of measures to be employed after all other sources have been fully developed.
- Desalination is now the big issue. It is strongly favoured by a small but vociferous lobby that senses enormous profits in building gigantic plants under Israeli control, with foreign money and for high prices, especially investment costs that are dimensions away from conventional groundwater development. (\$ 800 million for a desalination plant in Haifa are equivalent to the drilling costs of 400 deep boreholes!) Desalination is not only unecological and unsustainable; it is also economically unsound for a poor society with no major oil resources.

It should not be forgotten, that the whole discourse on additional sources emerges on the background of a clear Israeli interest and steady pressure in order not to deal with the results of 35 years of occupation and to take the resulting great disproportion in water distribution as a given.

It is an illusion to think that the future of the water sector could be secured without addressing these soaring issues. A future

peace process will have a chance only if past injustices are addressed and corrected.

A typical Israeli position says:

- A) We sit downstream at the mountain aquifer. Palestine has to take this into consideration. → We, Israel, have to make sure that Palestinians do NOT over-pump and thus affect our well yield.
- B) We have established a certain use. This has to be maintained.
- C) We are a dry country. We cannot forgo any drop of our current use.
- D) The aquifers (most) are used at their limit.
 - No reallocation of water (use)
 - Palestinians must use additional sources.

A typical Palestinian answer to these claims should include the following principles of reciprocity, legality, internal re-allocation and scientific figures:

- A) Israel sits *upstream* at the Jordan river and in the case of Gaza, etc. [*reciprocity*]
- B) The *established use* was created and is maintained by blunt military force. [*legality*]
- C) Israel over-uses water. A lot can be saved in agricultural and domestic sectors. [*internal re-allocation*]
- D) Oslo-yield is pure imagination [*scientific figures*]
 - Reallocation is a must.
 - Additional sources come after the existing ones have been shared in a fair way, not before.

References:

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